

**SECTION 12345.1 - MODULAR STEEL LABORATORY CASEWORK****PART 1 — GENERAL****1.01 SUMMARY**

- A. Section Includes:
1. Steel casework
  2. Table frames
  3. Work surfaces-Stainless Steel
  4. Sinks

**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, tops rails and bottoms) shall meet in the same plane without overlap.
- B. 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.
- C. Drawers:
1. Drawer fronts: 5/8" thick, double wall construction, assembled with sound deadening honeycomb; top front corners fitted smooth.
  2. Drawer bodies: Stainless steel bottom and all sides formed into one-piece construction with all sides coved and formed top edges.
  - 3a. Drawer suspension: Self-closing slide made with 16 gauge galvanized steel, nylon tired rollers and 100 lbs. load rating capacity (standard option).
  - 3b. Drawer suspension: Full extension Accuride slides 150 lbs. load rating capacity (optional).
  4. Provide drawer with rubber bumpers. Friction centered devices are not acceptable.
  5. Provide security panels for drawers with keyed different locks.
  6. File drawers: Provide with full extension slides for full access and operation.
- D. Case openings: Rabbeted-like joints all four sides of case opening for hinged doors and two sides for sliding doors in order to provide dust resistant case.
- E. Framed glass glazed doors: Identical in construction, hardware and installation to solid panel doors. Design frame glazed doors to be removable for glass replacement.

## Specifications – Dimensional Series

### 1.03 CASEWORK PERFORMANCE REQUIREMENTS

- A. Structural Performance Requirements: Casework components shall withstand the following minimum loads without damage to the component or to the casework operation:
1. Steel base unit load capacity: 500 lbs. per lineal foot. When leveled on four leveling feet
  2. Suspended units: 300 lbs. per lineal foot when sitting on uprights, performance of supporting structure is not inferred.
  3. Drawers in a cabinet: 100 lbs.
  4. Utility tables (4 legged): 300 lbs. When leveled on four leveling feet
  5. Hanging wall cases: 300 lbs. per lineal foot when sitting on uprights, performance of supporting structure is not inferred.
  6. Load capacity for shelves of base units, wall cases and tall cases: 150 lbs. evenly distributed, when leveled and sitting on four shelf clips.

## PART 2 — PRODUCTS

### 2.01 JAMESTOWN

- A. Casework and equipment manufacturer: Jamestown Metal Products, Inc., 178 Blackstone Avenue, Jamestown, New York, 14701.

### 2.02 CASEWORK MATERIALS

Gauges of metal used in construction of cases shall be 18 gauge, type 304 # four finish stainless steel shall meet the general requirements of the federal specification ASTM-A 240, 18 gauge mill finish cold rolled steel shall meet ASTM A 366 except as follows:

- A. Corner gussets for leveling bolts and drawer suspension, 12 gauge.
- B. Hinge reinforcements, case and drawer suspension channels, 14 gauge.
- C. Double pan door outer #18 gauge, #20 gauge inner.

All exposed seams on joints will be welded, ground and polished to an equivalent mill finish.

### 2.03 CASEWORK FABRICATION

- A. Base Units and Cases:
1. Base units 24-3/8", 28" and 35-3/4" high base units: One piece end panels and back, design, reinforced with internal reinforcing front posts.
  2. 30", 36", 42", and 48" high wall and 83-1/2" high tall cases: Formed end panels with front reinforcing post channels; back shall be formed steel panel, wall case recessed 3/4" and tall case recessed 1/8" 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. Base unit backs: Provide drawer units without backs and cupboard units with removable backs.
5. Bottoms: Base units and 18", 24-1/2", 30", 36", 42", and 48" 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.
6. Top rail for base units: Interlock with end panels, flush with front of unit. Reinforced with 14 gauge channels.
7. Base for base units: 4" high x 3" deep with formed steel base and 12 Ga. die formed steel gussets at corners Provide 1/2" diameter leveling screw with integral bottom flange of minimum 0.56 sq. in. area at each corner.
8. Tops of wall cases: One piece, with front edge formed into front rail.

#### B. Drawers:

1. Drawer fronts: 5/8" thick, double wall construction, assembled and sound deadened.
2. Drawer bodies: Stainless steel bottom and sides formed into one-piece construction with bottom and sides coved and top edges formed. (No tool required for removal.)
3. JMP Drawer Suspension: Removable self-closing (2-member) nylon tired roller slides, 100-lbs. per pair rating.
4. Provide drawer with rubber bumpers: Friction centering devices are not acceptable.
5. Provide security panels: for drawers with keyed different locks (as required).

#### C. Doors:

1. Solid panel doors: 3/4" thick, double wall, telescoping box steel construction with interior sound deadened, all outer corners fitted smooth. 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 that are removable for installation or replacement of glass. Provide 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. Doors shall ride on nylon tired sleeve bearing rollers in aluminum extended bottom hung track and shall close against rubber bumpers.
4. Unframed sliding glass doors: Glass with edges ground set in extruded aluminum shoe with integral pull (top and bottom extruded aluminum track). Provide rubber bumpers at fully opened and closed door position.

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## D. Shelves:

1. 18 Ga. Die Formed Steel, Form front and back edges down and back 1". Form ends down 3/4".
2. Pull out shelves: (Same suspension as specified for drawers) from 18 gauge steel.

## E. Base molding: 4" high, black rubber or vinyl; inside corners mitered and outside corners wrapped

## F. Hardware:

1. Drawer and door pulls: Shall be modern design, offering a comfortable hand grip, and be securely fastened to doors and drawers. All pulls shall have a satin chrome finish. Two pulls shall be required on all drawers over 24" long. Use of plastic pulls (molded or extruded), or a design not compatible for usage by the disabled shall not be acceptable.
2. Flush pulls: Shall be satin finish chrome providing a recessed finger grip. Finger holes or slots machined into doors shall not be acceptable.
3. Hinges: Shall be of .106" thick stainless steel type, 5-knuckle, frictionless hinges, not less than 2" long with fast pin and rounded ends. Between each knuckle, a spacer of lubricant impregnated nylon to prevent metal-to-metal contact and provide permanent lubrication. Hinges to have brushed satin finish. Hinges shall be attached to both door and case with three (3) screws through each leaf. Welding of hinges to door case shall not be accepted. Doors under 36" in height shall be hung on one pair of 2" high hinges, and doors over 42" high shall be hung on 1-1/2" pair of hinges.
4. Removable Core Locks: Shall be applied to doors and drawers where specifically called for on the drawings, in the specifications or on the equipment list and shall be keyed and master-keyed as directed.
5. Friction Catches: For doors shall be nylon roller type, adjustable with strike.
6. Leveling Devices: Shall be zinc plated 1/2-13 threaded bolt type.
7. Shelf Adjustment Clips: Shall be zinc plated steel.
8. Leg Shoes: Shall be provided on all table legs, unless otherwise specified, to conceal leveling device. Shoes shall be pliable, black vinyl material. Use of a leg shoe that does not conceal leveling device shall not be acceptable.
9. Base Molding: Shall be 4" high and a pliable black vinyl material with an adhesive backing for easy application. Black vinyl corner clips shall then be secured to all exposed corners. Use of a rigid material, which does not follow contour of floor or offer water-seal and dust-proofing qualities, shall not be accepted.
10. Label Holders: Where shown or called for, shall be self adhesive type aluminum with satin finish and designed for 2-1/2" x 1-1/8" cards, unless otherwise specified.

11. Up-and-Down Bolts: When used on hinged full height storage cases, they shall have a right hand door provided with an active knob and up-and-down bolt assembly. Left hand door shall be provided with a dummy knob. Up-and-down bolts shall be concealed in the stiles of glazed doors and between pans of solid panel doors.
12. Sink Supports: Sink supports shall be the hanger type, suspended from top front and top rear horizontal rails of sink cabinet by four (4) 1/4" dia. rods, threaded at bottom end and offset at top to hang from two full length reinforcements welded to the front and rear top rails. Two 3/4" x 1-1/2" gauge channels shall be hung on the threaded rods to provide an adjustable sink cradle for supporting sinks. When sink capacity exceeds 3,750 cu. in., the sink supports shall be suspended from full length reinforcements welded to the two end rails. Two 1" x 2" x 10" gauge full length channels shall be hung from the four 1/4" dia. rods to provide an alternate sink cradle.

#### G. Tops:

1. Maple Wood Tops (ACID-Resistant): Shall be 1" thick and built up of maple strips, finger joint construction using urea resin glue and electronically cured. All tops shall have a 1/4" wide by 1/8" deep drip groove on underside and all exposed top edges and corners shall be radiused 1/4". Finish shall consist of a polymerized resin coated evenly applied to all surfaces, baked between coatings, with a final baking at 145 degrees F. The result shall be an acid, alkali and solvent resistant surface, uniformly ebony black in appearance.
2. Hard Wood Tops (Natural): Shall be 1" thick and shall be built up of maple strips, finger joint construction, in natural finish, using urea resin glue and electronically cured. All tops shall have a 1/4" wide by 1/8" deep grip groove on underside and all exposed top edges and corners shall be radiused 1/4". One coat of sealer shall be applied to all surfaces. Finish shall consist of a highly water and abrasion resistant synthetic varnish, baked between coatings, with a final baking at 130 degree F. The result shall be smooth semi-gloss surface.
3. Plastic Surfaced Tops: Plastic surfaced tops and back-splash shall be built up to a 1/16" thick plastic surface (of the color and pattern selected), attached to the sub-top with a water resistant adhesive. Substrate shall be of 40-45 lbs. medium density particleboard to make a finished top thickness of 1". All exposed edges shall be self-edge banded unless otherwise specified. Self edges shall be applied prior to the application of the top sheet and overlapped by the top sheet. All particle board edges and underside of top shall be sealed.
4. Stainless Steel Tops: Stainless steel tops and working surfaces shall be Type 304 stainless steel unless otherwise specified. All exposed surfaces shall be 16 gauge stainless steel reinforced on the underside by 16 gauge galvanized steel channels, so spaced as to prevent twisting, oil-canning or buckling. Exposed edges of tops shall be formed into a 1 1/4" thick channel shape. Splash rails and curbs shall be formed from the same sheet as the top or so welded thereto that they form integral parts thereof. Top edges of curbs and splash-

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backs shall be formed into a channel shape. Where stainless steel sinks are supplied, the sink bowl shall be so welded to the top as to form an integral part thereof. All welds shall be ground smooth and polished to a uniform satin finish over the entire top and sink assembly. Soldering of the sinks, curbs or splash rails to the top shall not be permitted. Mechanical joints or field joints, where made necessary by size, shall be a tight butt joint of the top surfaces, reinforced and held in alignment with steel reinforcements. After fabrication and polishing, surfaces of the tops shall be given a strippable protective coating to protect the tops during shipment and installation. Underside of tops and sinks shall be coated with a sound deadener.

### 5. Epoxy Resin Work Surface

- a. Material: Chemical and abrasion resistant, durable top of one inch thick cast material of epoxy resins and inert products, cast flat, with a uniform low-sheen black surface. NOTE: Edit the following to meet project requirements. Maximum epoxy resin backsplash height is 4".
- b. Backsplash curb: Same material as top, [4] [ ]" high, [integral with top, with 5/8" covered juncture to top surface] [butt jointed and cemented to top]. Provide [where indicated on drawings] [where tops abut wall surfaces] [and at reagent ledges]. Include end curb where top abuts end wall.
- c. Reagent ledges: Same material as top. Provide 6' high x 7-1/2" wide single faced units and 6" high x 9" wide double faced units [as shown on drawings] [as required]. Ledge face shall permit installation of service fixtures and top shall be removable for access to service utilities. The following are work surface performance requirements which the specifier may wish to insert into Part 1 of the casework specifications.

### 6. Work Surface Performance Requirements

- a. Test procedure: Apply five drops of each reagent to surface and cover with 25MM watch glass, convex side down; test volatiles using one ounce bottle stuffed with saturated cotton. After 1 hour exposure flush surface, clean, rinse and wipe dry. Evaluate after 24 hours at 73 degrees fahrenheit and 50 degrees fahrenheit at 5% relative humidity.
- b. Evaluation ratings: Change in surface finish and function shall be described by the following ratings:
  1. No Effect: No detectable change in surface material.
  2. Excellent: Slight detectable change in color or gloss, but no change to the function or life of the work surface material.
  3. Good: Clearly discernible change in color or gloss, but no significant impairment of work surface function or life.
  4. Fair: Objectionable change in appearance due to surface discoloration or etch, possibly resulting in deterioration of function over an extended period.
  5. Failure: Pitting, cratering or erosion of work surface material; obvious and significant deterioration.

c. Test Results - Epoxy Resin Work Surface:

<u>REAGENT</u>	<u>RATING</u>
1. Hydrochloric Acid	37% Excellent
2. Sulfuric Acid	33% No Effect
3. Sulfuric Acid	77% No Effect
4. Sulfuric Acid	96% Failure
5. Formic Acid	90% Excellent
6. Nitric Acid	20% Excellent
7. Nitric Acid	30% Excellent
8. Nitric Acid	70% Good
9. Hydrofluoric Acid	48% Fair
10. Phosphoric Acid	85% No Effect
11. Chromic Acid	60% Failure
12. Acetic Acid	98% Excellent
13. 3 & 8 Equal Parts	Excellent
14. Ammonium Hydroxide	28% No Effect
15. Sodium Hydroxide	10% No Effect
16. Sodium Hydroxide	20% No Effect
17. Sodium Hydroxide	40% No Effect
18. Sodium Hydroxide Flake	No Effect
19. Sodium Sulfide	Excellent
20. Zinc Chloride	No Effect
21. Tincture of Iodine	Excellent
22. Silver Nitrate	No Effect
23. Methyl Alcohol	No Effect
24. Ethyl Alcohol	No Effect
25. Butyl Alcohol	No Effect
26. Benzene	Excellent
27. Xylene	No Effect
28. Toluene	Excellent
29. Gasoline	No Effect
30. Dichlor Acetic Acid	Good
31. Di Methyl Formamide	Excellent
32. Ethyl Acetate	No Effect
33. Amyl Acetate	Excellent
34. Acetone	Excellent

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35. Chloroform	Excellent
36. Carbon Tetrachloride	No Effect
37. Phenol	Excellent
38. Cresol	Excellent
39. Formaldehyde	No Effect
40. Trichlorethylene	Excellent
41. Ethyl Ether	Excellent
42. Furfural	Good
43. Methylene Chloride	Excellent
44. Mono Chlor Benzene	Good
45. Dioxane	Excellent
46. Methyl Ethyl Ketone	Excellent
47. Acid Dichromate	Fair
48. Hydrogen Peroxide	No Effect
49. Naphthalene	Excellent

**H. Sinks:**

1. Stainless steel sinks shall be fabricated from Type 304 stainless steel, except where Type 316 stainless steel shall be used. All expose surfaces shall be finished in No. 4 finish. All sink surfaces (sides & bottoms) shall be full 16 gauge metal thickness unless heavier gauges are specified. Deep drawn sinks are not acceptable. All sink joints shall be continuously welded by heliarc welding process. Inside radii shall be 1". Bottoms shall be pitched to the drain indent. Sink bowl shall be welded to the top as to form an integral part thereof where sinks are built into stainless steel tops or working surfaces. Top edges of free standing sinks shall be formed into a channel formation with all joints welded and ground smooth and polished. No soldering shall be permitted in connection with sink construction. Stainless steel sinks shall be furnished with crumb cup strainers unless otherwise specified.

**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.

**2.05 METAL FINISH (Painted Series)**

- A. Preparation: Spray clean metal with a heated cleaner/phosphate solution, pretreat with iron phosphate spray, water rinse, and neutral final coat. Immediately dry in heated ovens, then gradually cool prior to application of finish.
- B. 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 thicknesses:
  - 1. Exterior and interior surfaces exposed to view: 1.5 mil average and 1.3 mil minimum.
  - 2. Backs of cabinets and other surfaces not exposed to view: 1.0 mil average.

C. Chemical Resistance

- 1. Test procedure: Apply 10 drops (approximately 0.5 cc) of each reagent identified to the surface of the finished test panels laid flat and level on a horizontal surface. Ambient temperature: 68-72 degrees F. (20-22 degrees C.) After one hour flush away chemicals with cold water and wash surface with detergent and warm water at 150 degrees F. (65.5 degrees C.) and with alcohol to remove surface stains. Examine surface under 100 foot-candles of illumination.
- 2. Evaluation ratings: Change in surface finish and function shall be described by the following ratings:
  - a. Excellent: Indicates excellent to superior integrity of finish film. Includes no effect of slight change in gloss and slight discoloration.
  - b. Good: Allows change of gloss or discoloration or slight swelling while retaining integrity of finish film.
  - c. Failure: Obvious and significant deterioration, including blistering, pitting, cratering, erosion and/or loss of finish material.

3. Test Results:

<u>REAGENT</u>	<u>RATING</u>
Acetate, Amyl	Excellent
Acetate, Ethyl	Excellent
Acetic Acid	98% Excellent
Acetone	Excellent
Acid Dichromate	5% No Effect
Alcohol, Butyl	No Effect
Alcohol, Ethyl	Excellent
Alcohol, Methyl	Excellent
Ammonium Hydroxide	28% No Effect
Benzene	No Effect

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Carbon Tetrachloride		No Effect
Chloroform		Excellent
Chromic Acid	60%	No Effect
Cresol		Good
Dichlor Acetic Acid		Failure
Dimethylformamide		No Effect
Dioxane		Good
Ethyl Ether		No Effect
Formaldehyde	37%	No Effect
Furfural		Fair
Gasoline		No Effect
Hydrochloric Acid	37%	Good
Hydrochloric Acid	48%	No Effect
Hydrofluoric Acid	48%	Failure
Hydrogen Peroxide	3%	No Effect
Iodine, Tincture of		Good
Methyl Ethyl Ketone		Excellent
Methylene Chloride		Excellent
Mono Chlorobenzene		Excellent
Naphthalene		No Effect
Nitric Acid	20%	No Effect
Nitric Acid	30%	No Effect
Nitric Acid	70%	Good
Phenol	90%	Good
Phosphoric Acid	85%	No Effect
Silver Nitrate, Saturated		Good
Sodium Hydroxide	10%	No Effect
Sodium Hydroxide	20%	No Effect
Sodium Hydroxide	40%	No Effect
Sodium Hydroxide, Flake		No Effect
Sodium Sulfide, Saturated		No Effect
Sulfuric Acid	33%	No Effect
Sulfuric Acid	77%	Good
Sulfuric Acid	96%	Fair
Sulfuric Acid (77%) & Nitric Acid (70%)		Good
Toluene		No Effect

Trichloroethylene	No Effect
Xylene	No Effect
Zinc Chloride, Saturated	No Effect

D. Provide independent certified test report on chemical resistance of finish.

**PART 3 EXECUTION**

**3.01 INSTALLATION– REFER TO INSTRUCTION AND INSTALLATION MANUAL**

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.
5. Remove and discard shipping clip and associated screws from top of shelf, (thin galvanized angle) install 4 shelf clips into integral standard and set shelf. Check for level and adjust clips as required.

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.

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### 3.03 CLEANING

- A. Clean shop finished casework, touch up as required.
- B. Clean counter tops 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. Take 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.

### 3.05 DELIVERY, STORAGE AND HANDLING

- A. Schedule delivery of casework and equipment 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. 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".

**END OF SECTION**

**FLUSH OVERLAY LABORATORY CASEWORK**

Revised March 2004

**SECTION 12345.2 – FLUSH OVERLAY LABORATORY CASEWORK****PART 1 — GENERAL****1.00 SUMMARY**

## A. Section Includes:

1. Steel casework with [steel] [wood] [plastic laminate] drawer and door fronts.
2. Table frames.
3. Work surfaces.
4. Sinks and outlets.
5. Service fittings.
6. Accessory equipment.

## B. Related sections:

1. Section 11610 and 11611 – Laboratory Fume Hoods are a part of the work of this section.

**1.01 CASEWORK DESIGN REQUIREMENTS**

## A. Flush overlay construction:

Surfaces of doors and drawers shall overlay the cabinet ends, top or bottom rails. Horizontal and vertical case shell members (panels, top rails and bottoms) shall be concealed behind drawer and door fronts. Reveals shall be a uniform 1/8" horizontally between drawer and door fronts and 5/32" vertically between adjacent drawer and door.

## B. Slimline styling: Front width of end panels 3/4".

## 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 unit: Easily cleanable, flush interior. Base cabinets that are 30" and wider, with double swinging doors, shall provide full access to 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-like joints all four sides of case opening for hinged doors and two sides for sliding doors in order to provide structural integrity.

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

## Specifications – Dimensional Series

### 1.02 CASEWORK PERFORMANCE REQUIREMENTS

- A. Structural performance requirements: Casework components shall withstand the following minimum loads without damage to the component or to the casework operation:
1. Steel base unit load capacity: 500 lbs. per lineal foot.
  2. Suspended units: 300 lbs. per lineal foot.
  3. Drawers in a cabinet: 150 lbs. per drawer.
  4. Utility tables (4 legged): 300 lbs. per lineal foot.
  5. Hanging wall cases: 200 lbs. per lineal foot, not to exceed 600 lbs.
  6. Load capacity for shelves of base units, wall cases and tall cases: 150 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 1,000 gm wheel pressure and Calibrase #CS10 wheel.
  2. Hardness: Surface hardness equivalent to 4H or 5H pencil.
  3. Humidity resistance: Withstand 1,000 hour exposure in saturated humidity at 100 degrees Fahrenheit.
  4. Moisture resistance:
    - a. No visible effect to surface finish after boiling water trickled over test panel inclined at 45 degrees 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. See Appendix E.1.

### 1.03 WORK SURFACE PERFORMANCE REQUIREMENTS

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

#### 1.04 SUBMITTALS

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

- A. Shop Drawings: Provide 1/2" = 1'-0" scale elevations of individual and battery of casework units, larger scale details and sections as required. 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 laboratory certified test reports verifying conformance to test performance specified

#### 1.05 QUALITY ASSURANCE

- A. Single source responsibility: Casework, work surfaces, laboratory fume hoods, equipment 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 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.
- C. Installer's qualifications: Factory trained and/or certified by the manufacturer.
- D. 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.

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### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Schedule delivery of casework and equipment 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. 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".

### 1.07 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

- A. Design, materials, construction and finish of casework specified is the minimum acceptable standard of quality for flush overlay laboratory casework. The basis of this specification is Jamestown Metal Products Inc., 178 Blackstone Avenue, Jamestown, New York 14701 product.

### 2.02 CASEWORK MATERIALS

- A. Sheet steel: Mild, cold rolled and leveled unfinished steel.  
Stainless, annealed, #4 finish one side.
- B. Minimum gauges:
  - 1. 20 gauge: Interior drawer fronts, scribing strips, enclosures, and drawer bodies.
  - 2. 18 gauge: Case tops, ends, bottoms, bases, backs, uprights, top front rails, filler panels, shelves, security panels, sloping tops, and access panels.
  - 3. 16 gauge: Drawer suspensions, vertical posts, top rear gussets, intermediate horizontal rails, table legs and frames, leg rails and stretchers.
  - 4. 11 gauge: Table leg corner brackets and gussets for leveling screws.
- C. Glass for glazed swinging and sliding doors: 1/8" (3mm) framed doors, 7/32" (6mm) unframed doors, thick, clear float glass.

## 2.03 CASEWORK FABRICATION

### A. Base Units and cases:

1. Base units and 23-5/16", 30-7/8" and 36" high wall cases: End panels and back reinforced with internal reinforcing front and rear posts. Base units shall be 22" overall in depth.
2. 47-13/16" and 84" high cases: Formed end panels with front and rear reinforcing post channels; back shall be formed steel panel.
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.
5. Bottoms: Base units and 23-5/16", 30-7/8", 36" and 47-13/16" 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.
6. Top rail for base units interlock with end panels, flush with front of unit.
7. Horizontal intermediate rails: Recessed behind doors and drawer fronts.
8. Base for base units: 4" high (4-3/16" with leveling gusset) x 3" deep with formed steel base and 12 gauge die formed steel gussets at corners. Provide 1/2" diameter leveling screw with integral bottom flange of minimum 0.97 sq. in. area at each corner.
9. Tops of wall cases: One piece, with front edge formed into front rail.

### B. Drawers:

1. Drawer fronts: 3/4" thick, double wall construction, assembled with sound deadening honeycomb; top corners fitted smooth.
  - a. Red Oak drawer fronts: 3/4" thick combo core material, consisting of alternating layers of both plywood and MDF. Veneer to be A-1 plain sliced golden narrow heart with vertically matched grain. Edge banding to be 3mm thick.
  - b. Maple drawer fronts: 3/4" thick combo core material, consisting of alternating layers of both plywood and MDF. Veneer to be A-1 plain sliced select white maple with grain direction to run vertically and matched. Edge banding to be 3mm thick.
2. Drawer bodies: Stainless steel bottom and sides formed into one-piece construction with bottom and sides coved; formed top edges.
3. Drawer suspension: Removable full extension (3-member) ball bearing drawer guides, 150lbs. per pair rating.
4. Provide drawer with resilient bumpers. Friction centering devices are not acceptable.
5. Provide security panels for drawers with keyed different locks (as required).

**Specifications – Dimensional Series**

## C. Doors:

1. Solid panel doors: 3/4" thick, double wall, box steel construction with interior sound deadening. Hinges shall be removable; welding of hinges not acceptable. Doors shall close against rubber bumpers.
  - a. Red Oak wood doors: 3/4 " thick combo core material, consisting of alternating layers of both plywood and MDF. Veneer to be A-1 plain sliced golden narrow heart, grain direction to run vertically. Edge banding to be 3mm thick.
  - b. Maple wood doors: 3/4 " thick combo core material, consisting of alternating layers of both plywood and MDF. Veneer to be A-1 plain sliced select white maple with grain direction to run vertically. Edge banding to be 3mm thick.
2. Frame glazed doors: Outer head to be one piece construction. Inner head to be one piece construction that is removable for installation or replacement of glass. Provide 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. Doors shall be top hung wheel assembly with top and bottom guide tracks. Provide resilient bumpers at fully opened and closed door position.
4. Unframed sliding glass doors: Glass, with edges ground, top hung wheel assemblies and top and bottom guide tracks. Provide resilient bumpers at fully opened and closed door position.

## D. Shelves:

1. Form front and back edges down and back 1". Form ends down 1".
2. Reinforce shelves over 36" long with welded hat channel reinforcement the full width of shelf.
3. Roll out shelves: Same suspension as specified for drawers.

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

## F. Hardware:

1. Chrome plated brass with brushed finish, screw attached at 4" centers.
2. Hinges: Institutional type, five knuckle projecting barrel hinges, minimum 3" long, stainless steel with brushed finish. 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.
3. Door catches: Adjustable type, spring actuated nylon roller catches.
4. Removable core locks can be keyed alike or different, and grand-master-keyed as directed.
5. Label holders: Formed steel with powderpaint finish, 1" x 1-1/2".
6. Shelf clips: Peg style steel, zinc plated, designed to engage in shelf adjustment holes.

## 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.

## 2.05 METAL FINISH

- A. Preparation: Spray clean metal with a heated cleaner/phosphate solution, pretreat with iron phosphate spray, water rinse, and neutral final coat. Immediately dry in heated ovens, then gradually cool prior to application of finish.
- B. 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 thicknesses:
  - 1. Exterior and interior surfaces exposed to view: 1.5 mil average and 1.3 mil minimum
  - 2. Backs of cabinets and other surfaces not exposed to view: 1.0 mil average.
- C. Chemical Resistance
  - 1. Test procedure: Apply 10 drops (approximately 0.5 cc) of each reagent identified to the surface of the finished test panels laid flat and level on a horizontal surface. Ambient temperature: 68-72 degrees Fahrenheit. (20-22 degrees C.) After one hour, flush away chemicals with cold water and wash surface with detergent and warm water at 150 degrees Fahrenheit. (65.5 degrees C.) and with alcohol to remove surface stains. Examine surface under 100 footcandles of illumination.
  - 2. Evaluation ratings: Change in surface finish and function shall be described by the following ratings:
    - a. Excellent: Indicates excellent to superior integrity of finish film. Includes no effect of slight change in gloss and slight discoloration.
    - b. Good: Allows change of gloss or discoloration or slight swelling while retaining integrity of finish film.
    - c. Failure: Obvious and significant deterioration, including blistering, pitting, cratering, erosion and/or loss of finish material.
    - d. Fair: Objectionable change in appearance due to surface discoloration or etch, possibly resulting in deterioration of function over an extended period.
    - e. Failure: Pitting, cratering or erosion of work surface material; obvious and significant deterioration.

**Specifications – Dimensional Series**

## 3. Test Results:

<u>REAGENT</u>	<u>RATING</u>
Acetate, Amyl	Excellent
Acetate, Ethyl	Excellent
Acetic Acid, 98%	Excellent
Acetone	Excellent
Acid Dichromate, 5%	No Effect
Alcohol, Butyl	No Effect
Alcohol, Ethyl	Excellent
Alcohol, Methyl	Excellent
Ammonium Hydroxide, 28%	No Effect
Benzene	No Effect
Carbon Tetrachloride	No Effect
Chloroform	Excellent
Chromic Acid, 60%	No Effect
Cresol	Good
Dichlor Acetic Acid	Failure
Dimethylformamide	No Effect
Dioxane	Good
Ethyl Ether	No Effect
Formaldehyde, 37%	No Effect
Furfural	Fair
Gasoline	No Effect
Hydrochloric Acid, 37%	Good
Hydrochloric Acid, 48%	No Effect
Hydrofluoric Acid, 48%	Failure
Hydrogen Peroxide, 3%	No Effect
Iodine, Tincture of	Good
Methyl Ethyl Ketone	Excellent
Methylene Chloride	Excellent
Mono Chlorobenzene	Excellent
Naphthalene	No Effect
Nitric Acid, 20%	No Effect
Nitric Acid, 30%	No Effect
Nitric Acid, 70%	Good

Phenol, 90%	Good
Phosphoric Acid, 85%	No Effect
Silver Nitrate, Saturated	Good
Sodium Hydroxide, 10%	No Effect
Sodium Hydroxide, 20%	No Effect
Sodium Hydroxide, 40%	No Effect
Sodium Hydroxide, Flake	No Effect
Sodium Sulfide, Saturated	No Effect
Sulfuric Acid, 33%	No Effect
Sulfuric Acid, 77%	Good
Sulfuric Acid, 96%	Fair
Sulfuric Acid (77%) & Nitric Acid (70%)	Good
Toluene	No Effect
Trichloroethylene	No Effect
Xylene	No Effect
Zinc Chloride, Saturated	No Effect

D. Provide independent certified test report on chemical resistance of finish.

**2.06 WORK SURFACES**

Insert specification for selected work surface 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.

## Specifications – Dimensional Series

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 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**

**LABORATORY CASEWORK/RELATED PRODUCTS**

Revised January 2004

**SECTION 12345.3 – LABORATORY CASEWORK AND RELATED PRODUCTS  
(Flexible Casework/Shelving Support System)****PART 1: CONSTRUCTION****A. STRUCTURAL MODULES:**

The Structural Module is the primary support structure for the Adjustable Worksurface Frames, Shelving, and Suspended Casework. It can also be used as a chase and support structure for electrical and plumbing services.

**1. Wall/Core Structural Modules:**

- a. 3" Structural Modules are designed to mount directly to the wall, to be free standing, or to be ganged to produce a flexible core frame. 6" and 12" Structural Modules are designed to be free standing, lagged to floor, or connected to deck and /or used as core frames. The structural modules accommodate optional moveable access panels and provide support for adjustable worksurface support frames, shelving, and suspended casework. Vertical adjustment is on 1" increments.
- b. Module uprights are formed cold rolled steel slotted for shelving and adjustable worksurfaces on 1" increments. On 84" high modules, the upright may be split at either the 36" or 48" height to allow for future removal or relocation of the upper portion.
- c. Module frames are manufactured of 14 gauge CRS or Type 304 stainless steel and include two uprights and two horizontal members. These frames are designed to accommodate the removable access panels, adjustable shelving, upper and lower cabinets and a variety of accessories and are provided with electrical cutouts when indicated by model number or shown on the drawings.
- d. Removable access panels are 18 gauge CRS or Type 304 stainless steel, and are removable without the use of tools. Access panels may be punched for services.
- e. Structural Modules are available in heights of 36", 48", and 84", and are available in widths from 24" to 60" in 6" increments.

**2. Core Panels:**

- a. Core panels are manufactured of 14 gauge CRS or Type 304 stainless steel and act as both the ganging member of a group of structural modules and as the vertical service chase in a core arrangement. Core panels are available in 1" width (primarily used as a spacer) 3", 4", 7" to 19" in 6" increments.

## Specifications – Flex Core® System

- b. Core panel interior filler panels are manufactured of 18 gauge CRS or Type 304 stainless steel and may be cut, drilled, or pre-punched for services as required. They are available full height or shortened to stop above sitting height, bench height, or ADA height worksurfaces.
3. Adjustable horizontal members:
  - a. Horizontal ledge supports are constructed of 14 gauge CRS or Type 304 stainless steel and function as a support for the section of worksurface between the uprights. They are adjustable on 1 ¼" increments between 28" and 42" above finished floor. Ledge supports are available in widths and depths to match the various structural module and core arrangement sizes
  - b. Horizontal structural members are constructed of 14 gauge CRS or Type 304 stainless steel and function as equipment supports or upper case (wall cabinet) supports. They are available in widths corresponding to the structural module widths.
4. Upper Carriers:
  - a. Add-on Fixed Furniture Upper Carriers are constructed similar to Support modules, but are designed to attach to the working surface of fixed casework installations to provide adjustable overhead shelving support.
  - b. Adjustable Worksurface Frames and Tables:

Adjustable Worksurface Frames and Tables provide support for the worksurface, and suspended casework. Cantilevered Worksurface Frames get their support from the Structural Modules and are adjustable in height in 1 ¼" increments. Freestanding Table Frames are floor mounted, with the option of being attached to a Structural Module.
5. Adjustable Height Cantilevered Worksurface Frame:
  - a. The frame is a 4 sided welded assembly of 2 ½" x 1 ¼" x 14 gauge CRS or Type 304 stainless steel channel in channel construction, resulting in a 0.150" thickness in the vertical walls. The frame is bolted to 14 Gauge/ 12 Gauge cantilever support brackets that hang on 12 Gauge shelf hooks, these hooks engage the uprights as an adjustable shelf does. The 12 Gauge construction and 8 hook engagement results in a rigid and very strong assembly. The frame height may be adjusted without the use of tools.
6. Adjustable Height Freestanding Table Frame:
  - a. The upper frame is the same as 5. a. above.
  - b. The lower support leg is a 12 gauge rectangular shaped assembly with perforations allowing adjustability on 1" increments. The lower leg is equipped with a threaded block for use with leveling bolts or threaded stem casters.
  - c. The upper leg is a 16 gauge telescoping member, which marries into the lower leg section, providing height adjustability in 1" increments.
  - d. The Adjustable Height Free Standing Table Frame can be attached (optional) to a Structural Module by use of attachment kit.

7. Adjustable Height Mobile Table Frame:
  - a. This table is the same as 5. a., above, but includes 3 1/2" heavy duty phenolic resin tired castors mounted to bottom support member.
8. Upper Carrier/Flexible Frame Shelving:
  - a. Upper Carrier Module Core Shelves are 18 gauge steel double pan construction, providing a clean appearance all around. The upper pan of the shelf is reinforced with a 16 gauge CRS or Type 304 stainless steel reinforcement channel which fits snugly against the lower shelf panel when engaged.
  - b. Shelves are adjustable in height on 1 ¼" increments through the "hook" punching on the shelf brackets. Adjustment is accomplished without the use of tools.
  - c. Shelf Brackets are available as bookend brackets, standard triangular brackets, bottom hung triangular brackets, or angular adjustable brackets (for part bins etc.). Shelf brackets are constructed of 14 gauge CRS or Type 304 stainless steel
  - d. Shelves are available 6", 8", 9", 10" and 12" deep, and are available in lengths from 24" to 60" on 6" increments, to match the length of the Structural Module.
  - e. Wood shelves are 1" thick hardwood plywood with veneer species as specified on all exposed surfaces. A front edge seismic lip is available when specified by model number or when indicated on the drawings.
  - f. Phenolic shelves are 1" thick phenolic resin. A front edge seismic lip is available when specified by model number or when indicated on the drawings.
9. Adjustable Interior (Core) Shelving:
  - a. Adjustable interior shelves are identical to the upper carrier / flexible frame shelves except they are finished on the two long sides. They are adjustable in height on 1 ¼" increments.
  - b. Interior (Core) Shelves are available in depths of 6", 8", 9", 12", 18", and 24". Shelves are available in lengths from 24" to 72" on 6" increments, to match the Support Module length and core panel widths.
10. Casework:

Casework for the Flexible Framing System consists of both suspended and floor mounted styles, and includes base units, wall cases, tall cases, and apron assemblies. Refer to Jamestown Metal Products specifications and catalog for complete specification and offering information for each casework option.

## Specifications - Flex Core® System

### B. TOPS:

1. Maple Wood Tops (ACID-Resistant): Shall be 1" thick and built up of maple strips, finger joint construction using urea resin glue and electronically cured. All tops shall have a 1/4" wide by 1/8" deep drip groove on underside and all exposed top edges and corners shall be radiused 1/4". Finish shall consist of a polymerized resin coated evenly and applied to all surfaces, baked between coatings, with a final baking at 145 degrees Fahrenheit. The result shall be an acid, alkali and solvent resistant surface, uniformly ebony black in appearance.
2. Hard Wood Tops (Natural): Shall be 1" thick and shall be built up of maple strips, finger joint construction, in natural finish, using urea resin glue and electronically cured. All tops shall have a 1/4" wide by 1/8" deep grip groove on underside and all exposed top edges and corners shall be radiused 1/4". One coat of sealer shall be applied to all surfaces. Finish shall consist of a highly water and abrasion resistant synthetic varnish, baked between coatings, with a final baking at 130 degree. The result shall be smooth semi-gloss surface.
3. Plastic Surfaced Tops: Plastic surfaced tops and back-splash shall be built up to a 1/16" thick plastic surface (of the color and pattern selected), attached to the sub-top with a water resistant adhesive. Substrate shall be of 40-45 lbs. medium density particle board to make a finished top thickness of 1". All exposed edges shall be self-edge banded unless otherwise specified. Self edges shall be applied prior to the application of the top sheet and overlapped by the top sheet. All particle board edges and underside of top shall be sealed.
4. Stainless Steel Tops: Stainless steel tops and working surfaces shall be Type 304 stainless steel unless otherwise specified. All exposed surfaces shall be 16 gauge stainless steel reinforced on the underside by 16 gauge galvanized steel channels, so spaced as to prevent twisting, oil-canning, or buckling. Exposed edges of tops shall be formed into a 1 1/4" thick channel shape. Splash rails and curbs shall be formed from the same sheet as the top or so welded thereto that they form integral parts thereof. Top edges of curbs and splash-backs shall be formed into a channel shape. Where stainless steel sinks are supplied, the sink bowl shall be so welded to the top as to form an integral part thereof. All welds shall be ground smooth and polished to a uniform satin finish over the entire top and sink assembly. Soldering of the sinks, curbs, or splash rails to the top shall not be permitted. Mechanical joints or field joints, where made necessary by size, shall be a tight butt joint of the top surfaces, reinforced and held in alignment with steel reinforcements.

After fabrication and polishing, surfaces of the tops shall be given a strippable protective coating to protect the tops during shipment and installation.

Underside of tops and sinks shall be coated with a sound deadener.

5. Epoxy Resin Work Surface:
  - a. Material: Chemical and abrasion resistant, durable top of one inch thick cast material of epoxy resins and inert products, cast flat, with a uniform low-sheen black surface.

NOTE: Edit the following to meet project requirements. Maximum epoxy resin backsplash height is 4".

- b. Backsplash curb: Same material as top, [4] [ ]" high, [integral with top, with 5/8" coved juncture to top surface] [butt jointed and cemented to top]. Provide [where indicated on drawings] [where tops abut wall surfaces] [and at reagent ledges]. Include end curb where top abuts end wall.
- c. Reagent ledges: Same material as top. Provide 6' high x 7-1/2" wide single faced units and 6" high x 9" wide double faced units [as shown on drawings] [as required]. Ledge face shall permit installation of service fixtures and top shall be removable for access to service utilities.

The following are work surface performance requirements which the specifier may wish to insert into Part 1 of the casework specifications.

6. Work Surface Performance Requirements:

- a. Test procedure: Apply five drops of each reagent to surface and cover with 25MM watch glass, convex side down; test volatiles using one ounce bottle stuffed with saturated cotton. After 1 hour exposure, flush surface, clean, rinse and wipe dry. Evaluate after 24 hours at 73 degrees Fahrenheit and 50 degrees Fahrenheit at 5% relative humidity.
- b. Evaluation ratings: Change in surface finish and function shall be described by the following ratings:
  - 1. No Effect: No detectable change in surface material.
  - 2. Excellent: Slight detectable change in color or gloss, but no change to the function or life of the work surface material.
  - 3. Good: Clearly discernible change in color or gloss, but no significant impairment of work surface function or life.
  - 4. Fair: Objectionable change in appearance due to surface discoloration or etch, possibly resulting in deterioration of function over an extended period.
  - 5. Failure: Pitting, cratering, or erosion of work surface material; obvious and significant deterioration.
- c. Test Results – Epoxy Resin Work Surface:

<u>REAGENT</u>	<u>RATING</u>
Hydrochloric Acid	37% Excellent
Sulfuric Acid	33% No Effect
Sulfuric Acid	77% No Effect
Sulfuric Acid	96% Failure
Formic Acid	90% Excellent
Nitric Acid	20% Excellent
Nitric Acid	30% Excellent
Nitric Acid	70% Good
Hydrofluoric Acid	48% Fair

## Specifications - Flex Core® System

Phosphoric Acid	85%	No Effect
Chromic Acid	60%	Failure
Acetic Acid	98%	Excellent
3 & 8 Equal Parts		Excellent
Ammonium Hydroxide	28%	No Effect
Sodium Hydroxide	10%	No Effect
Sodium Hydroxide	20%	No Effect
Sodium Hydroxide	40%	No Effect
Sodium Hydroxide Flake		No Effect
Sodium Sulfide		Excellent
Zinc Chloride		No Effect
Tincture of Iodine		Excellent
Silver Nitrate		No Effect
Methyl Alcohol		No Effect
Ethyl Alcohol		No Effect
Butyl Alcohol		No Effect
Benzene		Excellent
Xylene		No Effect
Toluene		Excellent
Gasoline		No Effect
Dichlor Acetic Acid		Good
Di Methyl Formamide		Excellent
Ethyl Acetate		No Effect
Amyl Acetate		Excellent
Acetone		Excellent
Chloroform		Excellent
Carbon Tetrachloride		No Effect
Phenol		Excellent
Cresol		Excellent
Formaldehyde		No Effect
Trichlorethylene		Excellent
Ethyl Ether		Excellent
Furfural		Good
Methylene Chloride		Excellent
Mono Chlor Benzene		Good
Dioxane		Excellent

Methyl Ethyl Ketone	Excellent
Acid Dichromate	Fair
Hydrogen Peroxide	No Effect
Naphthalene	Excellent

### C. SINKS:

1. Stainless steel sinks shall be fabricated from Type 304 stainless steel, except where Type 316 stainless steel shall be used. All exposed surfaces shall be finished in No. 4 finish. All sink surfaces (sides & bottoms) shall be full 16 gauge metal thickness unless heavier gauges are specified. Deep drawn sinks are not acceptable. All sink joints shall be continuously welded by heliarc welding process. Inside radii shall be 1". Bottoms shall be pitched to the drain indent. Sink bowl shall be welded to the top as to form an integral part thereof where sinks are built into stainless steel tops or working surfaces. Top edges of free standing sinks shall be formed into a channel formation with all joints welded and ground smooth and polished. No soldering shall be permitted in connection with sink construction. Stainless steel sinks shall be furnished with crumb cup strainers unless otherwise specified.

### Part 2 — METAL FINISH (Painted Series)

- A. Preparation: Spray clean metal with a heated cleaner/phosphate solution, pretreat with iron phosphate spray, water rinse, and neutral final coat. Immediately dry in heated ovens, then gradually cool prior to application of finish.
- B. 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 thicknesses:
  1. Exterior and interior surfaces exposed to view: 1.5 mil average and 1.3 mil minimum
  2. Backs of cabinets and other surfaces not exposed to view: 1.0 mil average.
- C. Chemical Resistance:
  1. Test procedure: Apply 10 drops (approximately 0.5 cc) of each reagent identified to the surface of the finished test panels laid flat and level on a horizontal surface. Ambient temperature: 68-72 degrees Fahrenheit. (20-22 degrees C.) After one hour, flush away chemicals with cold water and wash surface with detergent and warm water at 150 degrees Fahrenheit. (65.5 degrees C.) and with alcohol to remove surface stains. Examine surface under 100 footcandles of illumination.
  2. Evaluation ratings: Change in surface finish and function shall be described by the following ratings:
    - a. Excellent: Indicates excellent to superior integrity of finish film. Includes no effect of slight change in gloss and slight discoloration.

**Specifications – Flex Core® System**

- b. Good: Allows change of gloss or discoloration or slight swelling while retaining integrity of finish film.
- c. Failure: Obvious and significant deterioration, including blistering, pitting, cratering, erosion and/or loss of finish material.

## D. Test Results:

<u>REAGENT</u>	<u>RATING</u>
Acetate, Amyl	Excellent
Acetate, Ethyl	Excellent
Acetic Acid	98% Excellent
Acetone	Excellent
Acid Dichromate	5% No Effect
Alcohol, Butyl	No Effect
Alcohol, Ethyl	Excellent
Alcohol, Methyl	Excellent
Ammonium Hydroxide	28% No Effect
Benzene	No Effect
Carbon Tetrachloride	No Effect
Chloroform	Excellent
Chromic Acid	60% No Effect
Cresol	Good
Dichlor Acetic Acid	Failure
Dimethylformamide	No Effect
Dioxane	Good
Ethyl Ether	No Effect
Formaldehyde	37% No Effect
Furfural	Fair
Gasoline	No Effect
Hydrochloric Acid	37% Good
Hydrochloric Acid	48% No Effect
Hydrofluoric Acid	48% Failure
Hydrogen Peroxide	3% No Effect
Iodine, Tincture of	Good
Methyl Ethyl Ketone	Excellent
Methylene Chloride	Excellent
Mono Chlorobenzene	Excellent

Naphthalene	No Effect
Nitric Acid	20% No Effect
Nitric Acid	30% No Effect
Nitric Acid	70% Good
Phenol	90% Good
Phosphoric Acid	85% No Effect
Silver Nitrate, Saturated	Good
Sodium Hydroxide	10% No Effect
Sodium Hydroxide	20% No Effect
Sodium Hydroxide	40% No Effect
Sodium Hydroxide	Flake No Effect
Sodium Sulfide, Saturated	No Effect
Sulfuric Acid	33% No Effect
Sulfuric Acid	77% Good
Sulfuric Acid	96% Fair
Sulfuric Acid (77%) & Nitric Acid (70%)	Good
Toluene	No Effect
Trichloroethylene	No Effect
Xylene	No Effect
Zinc Chloride, Saturated	No Effect

E. Provide independent certified test report on chemical resistance of finish.

**PART 3 — EXECUTION**

**3.01 INSTALLATION—REFER TO INSTRUCTION AND INSTALLATION MANUAL**

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.
5. Remove and discard shipping clip and associated screws from top of shelf, (thin galvanized angle) install 4 shelf clips into integral standard and set shelf. Check for level and adjust clips as required.

## Specifications – Flex Core® System

### 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 counter tops 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. Take protective measures to prevent exposure of casework and equipment 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.

**3.05 DELIVERY, STORAGE AND HANDLING**

- A. Schedule delivery of casework and equipment 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. 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".

**END OF SECTION**



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## SECTION 11610 – LABORATORY FUME HOODS

### PART 1 – GENERAL

#### 1.01 SUMMARY

A. Section Includes:

1. Laboratory fume hoods.

B. Related Sections:

1. Section 12345 - Steel Laboratory Casework: Base unit and working surface for fume hood/base unit assembly.
2. Division 15: Furnishing and installation of plumbing utilities and final connections to fume hoods.
3. Division 15: Furnishing and installation of exhaust duct work and equipment, and final connection of fume hoods.
4. Division 16: Furnishing and installation of electrical utilities and final connections to fume hoods.

#### 1.02 FUME HOOD GENERAL DESIGN REQUIREMENTS

- A. All fume hoods are *Isolator* type with a top and bottom airfoil and aerodynamically shaped fascia posts to minimize turbulence. The design incorporates an automatic air bypass system so that the exhaust air volume is constant. Bypass is recessed behind plane of the sash and affords velocity tempering performance with face velocities not in excess of 3.8 times full-open face velocity.
- B. Design fume hoods for consistent and safe air flow through the hood face. Negative variations of face velocity shall not exceed 20% of the average face velocity at any designated measuring point as defined in this section.
- C. Average illumination of work area: minimum 80 foot-candles. Work area shall be defined as the area inside the superstructure from side to side and from face of baffle to the inside face of the sash, and from the working surface to a height of 48 inches.
- D. Fume hood shall be designed to minimize static pressure loss with stainless steel round duct collar configuration. Maximum average static pressure loss readings taken three diameters above the hood outlet from four points, 90 degrees apart, shall not exceed the following maximums:

Face Velocity at sash full open – measured S.P.L. (W.G.)

75 F.P.M.	.30 inches
100 F.P.M.	.50 inches
125 F.P.M.	.80 inches
150 F.P.M.	1.16 inches

## Specifications – Laboratory Fume Hoods

- E. Fume hood shall maintain essentially constant exhaust volume at any baffle position for safety. Maximum variation in exhaust CFM, static pressure and average face velocity as a result of baffle adjustment shall not exceed 5% for any baffle position at the specified face velocity.

### 1.03 SUBMITTALS

- A. Submit manufacturer's test data and installation instructions for each type of fume hood. Provide data indicating compliance with ANSI/ASHRAE Standard 110-1995.
- B. Provide samples of the following:
  - 1. 6" x 6" section of the interior fume hood liner material.
  - 2. 12" x 12" section of countertops with dish formation.
  - 3. Color samples of manufacturer's finish.
  - 4. Hardware and accessories including sample sash handle and/or pulls, chains, axles, and sprockets.

Samples of the approved manufacturer will be kept at the job site or the office of the architect until completion of the project.

- C. Provide submittal drawings for fume hoods showing plans, elevations, sections and service run spaces. Details shall include notation of all specified items.
  - 1. Provide location and type of service fittings as related to the fume hood when required.
  - 2. Provide rough-in drawings for mechanical and electrical services as related to the fume hood when required.
  - 3. Provide face opening, air volume, and static pressure drop data.

### 1.04 QUALITY ASSURANCE

- A. All laboratory fume hoods specified herein will be the product of one manufacturer and will be based on the specifications of the product line described in Part 2. All manufacturers other than those of the specified products will provide evidence of expertise in the manufacture of fume hoods and be willing to have their manufacturing facility scrutinized by the customer.
- B. All manufacturers desiring approval for this project must maintain a fume hood test facility at their factory location. This facility must provide for variable exhaust and make-up air control. In addition, any facility that provides for fume hood make-up air by using floor-to-ceiling wall diffusers is unacceptable. All qualified test facilities must contain, as part of their permanent equipment, ANSI/ASHRAE 110-1995 testing hardware as specified in that standard. In addition, all data readings shall be computer-recorded and the raw data submitted in disc format.

- C. The manufacturer shall provide certification that fume hoods shall meet the performance requirements described under Appendix A “Fume Hood Performance Testing Requirements.”
- D. The manufacturer shall warrant the sash counterweight system, excluding glass, against defects in materials and workmanship for the life of the fume hood. The manufacturer will repair any material or manufacturing defect in these components without charge.
- E. The manufacturer shall, for a period of three years from date of shipment, warrant that furnished products shall be free from defects in material and workmanship. The manufacturer shall also warrant the products to be as represented and will repair or replace any part, under normal use, if examination discloses it to have been defective within the warranty period.

**1.05 DELIVERY, STORAGE AND HANDLING**

- A. Coordinate delivery of fume hoods with delivery of other laboratory casework components and with work of other trades.
- B. Deliver, store, and handle laboratory fume hoods in a manner designed to prevent damage and disfigurement to the product.
- C. Protect all surfaces from damage during transit.

**1.06 PROJECT CONDITIONS**

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

- A. Windows and doors are installed and the building is secure and weather-tight.
- B. Ceiling, overhead ductwork and lighting are installed.
- C. All painting is completed and floor tile located below casework is installed.

**PART 2 – PRODUCTS**

**2.01 MANUFACTURER**

Design of laboratory fume hoods and casework is based on products manufactured by Jamestown Metal Products, Inc., 178 Blackstone Avenue, Jamestown, New York 14701. All fume hoods shall be the product of one manufacturer.

**2.02 FUME HOOD MATERIALS**

- A. Steel: High quality, cold rolled, mild steel meeting requirements of ASTM A366; 12 and 18 gauge U.S. Standard.

**Specifications – Laboratory Fume Hoods**

- B. Stainless steel: Type 304 or Type 316; 14, 16, 18 and 20 gauge U.S. Standard. Stainless steel shall be supplied with:

Standard:	A #4 finish free of burrs, weld marks, or other imperfections.
Optional:	A mirror-like ultra polished finish exposing maximum chromium and nickel content free of weld marks or other imperfections.

- C. Galvanized steel: 18 gauge, G90 finish.
- D. Sash Glass: 1/4" (6 mm) clear tempered glass.
- E. Sash tracks: Corrosion-resistant polyvinyl chloride (PVC).
- F. Fastenings:
1. Interior fastening devices: Nylon bolts, PVC fasteners, PVC-capped 410 stainless screws.
  2. Exterior structural member attachments: 410 stainless screws.
  3. Exterior panel member fastening devices: PVC-capped 410 stainless screws.

- G. Interior Liners:

The liner consists of all interior surfaces, including sides, top, back and baffles. See also Appendix B.

Standard:	Fiberglass reinforced polyester material (polyglass), 1/4" thick, white
Optional:	Type 304 stainless steel, 16 gauge, with a #4 finish
Optional:	Type 316 stainless steel, 16 gauge, with a #4 finish
Optional:	Epoxy resin, 1/4" thick, black
Optional:	PVC plastic sheet, 1/4" thick, white
Optional:	Polypropylene plastic sheet, 1/4" thick, white

**2.03 CONSTRUCTION – BENCH HOODS**

- A. Superstructure  
Superstructure shall consist of 18 gauge galvanized steel side pans and back pans, maximum 4-3/4" thick, holding side and rear liner panels, and fastened together with pinions and screws so that the entire structure is secure and rigid. Any framing system not providing structural support is unacceptable.

Front and both sides of the superstructure are aligned and precision fit, eliminating the need for exterior gaskets.

**B. Hood Roof**

The hood roof shall be fabricated from 18 gauge galvanized steel with liner material identical to that used in the rest of the containment cavity mounted to the interior. Such construction affords additional containment for accidental fire.

**C. Airfoil Construction**

Bottom airfoil shall be constructed of 14 gauge 304 #4 finish stainless steel with a minimum clearance of 3/4" from the work surface to insure maximum operating efficiency and minimum eddy effects. Bottom airfoil shall also be equipped with power cord/tube pass-throughs 3" square near each side post. These pass-throughs shall allow sash handle to seal against airfoil without running cords and tubes under the airfoil, but by simply resting cords and tubes into the pass-through cavity. Painted steel parts in the fume hood airfoil are not acceptable.

Top airfoil shall be constructed of 18 gauge 304 #4 finish stainless steel.

**D. Sash (*Select One*)**

Provide a frameless vertical sash containing a 1/4" (6 mm) tempered glass panel and a full width anodized aluminum aerodynamic wedge-shaped sash handle connected to a steel rear-hung counterweight system insuring non-tilting, non-binding, and non-creeping sash performance. Rear-mounted counterweight shall be connected to a #35 case-hardened steel chain engaging a twin sprocket axle system with positive master link connection points both front and rear. Sash systems utilizing cables and pulleys are not acceptable. Painted steel parts in the sash are not acceptable.

Provide a combination sash with horizontal sliding panels no wider than 18". Sash elements are tempered glass panels set into an aluminum track housed within the stainless steel sash frame giving either horizontal or vertical movement options to the end user. A steel rear-hung, counterweight system is used to insure non-tilting, non-binding, and non-creeping sash performance. Rear-mounted counterweight shall be connected to a #35 case-hardened steel chain engaging a twin sprocket axle system with positive master link connection points both front and rear. Sash systems utilizing cables and pulleys are not acceptable. Painted steel parts in the sash are not acceptable.

Provide a horizontal sliding sash consisting of a stainless steel top rail holding stainless steel framed glass panels and an aluminum bottom track. Sash elements are tempered glass panels set into an aluminum track housed within the stainless steel rail. Painted steel parts in the sash are not acceptable.

Provide a framed vertical sash containing a 1/4" (6 mm) tempered glass panel set into a stainless steel frame connected to a steel rear-hung counterweight system insuring non-tilting, non-binding, and non-creeping sash performance. Rear-mounted counterweight shall be connected to a #35 case-hardened steel chain engaging a twin sprocket axle system with positive master link connection points both front and rear. Sash systems utilizing cables and pulleys are not acceptable. Painted steel parts in the sash are not acceptable.

**Specifications – Laboratory Fume Hoods**

- E. Baffles providing controlled air vectors into and through the fume hood shall be fabricated of the same material as the liner. Provide three fixed baffles and one bottom adjustable baffle.
- F. Bypass system shall be Isolator Viewpass system consisting of a 1/4" (6 mm) smoked tempered glass panel allowing complete visual display of fume hood interior.
- G. Duct collar(s) will be 10" or 12" round exhaust outlet collar(s) and be fabricated of 20 gauge Type 304 stainless steel. Coated steel collars are not acceptable.
- H. All bench type fume hoods are designed to have an interior vertical clearance of not less than 47" in the front twelve inches of the hood depth. Accessories or options may affect internal dimensions.

I. Fume hood fascia posts shall be:

Standard: Painted, 18 gauge cold rolled steel.

Optional: Type 304 stainless steel.

J. Exterior end panels shall be:

Standard: Painted, 18 gauge cold rolled steel.

Optional: Type 304 stainless steel.

K. Interior Lighting

Standard: A hinged fluorescent light fixture configured for T-12 lamp tubes shall be provided and installed on the exterior of the fume hood roof. A tempered glass panel is provided and has a vapor-tight seal to isolate the fluorescent fixture from the hood interior. The largest possible double tube UL approved fixture is provided for each hood.

Optional: A hinged fluorescent light fixture configured for T-8 lamp tubes shall be provided and installed on the exterior of the fume hood roof. A tempered glass panel is provided and has a vapor-tight seal to isolate the fluorescent fixture from the hood interior. The largest possible double tube UL approved fixture is provided for each hood.

Optional: An incandescent, explosion-proof 150 watt light shall be provided.

Standard configurations for fluorescent light fixtures are: 36" hood (1-24" fixture); 48" hood (1-36" fixture); 60" hood (1-48" fixture); 72" hood (1-48" fixture); 96" hood (2-36" fixtures).

L. Fluorescent Tubes or Incandescent Bulbs

- Standard: Lamp tubes or bulbs shall be provided by others.
- Optional: Lamp tubes or bulbs shall be included with fixture.

M. Service Fittings and Fixtures When Required

1. All laboratory service fittings and fixtures shall be as manufactured by the Water Saver Fixture Company or an approved equal. Fixtures, including handles, shall be color coded to indicate the proper service. Color code requirements for indexing service fixtures shall be as follows:

<u>Service</u>	<u>Index Color</u>
Gas	Blue
Air	Orange
Vacuum	Yellow
Steam	Black
Cold Water	Green
Hot Water	Red
Deionized Water	White
Other Services	On Application

2. Finish of Service Fixtures (**Select One**)

- A. Laboratory service fixtures (except fittings inside the fume hood) shall have:
  - A polished chrome finish with clear epoxy coating.
  - A satin chrome finish with clear epoxy coating.
- B. Fittings inside the fume hood shall have an epoxy finish color-coded to match the fixture service index color.

N. Electrical Services When Required (**Select One**)

Specified electrical outlets and switches are shipped loose for field installation by the electrical contractor. All electrical receptacles are 3-wire, 20 amp duplex, 120/277VAC, or as specified. Light switch shall be 3-wire polarized grounded, 15 amp, 125VAC, or as specified. Faceplates are stainless steel.

Wiring harnesses shall be furnished for each specified fascia post-mounted electrical device and field-installed.

## Specifications - Laboratory Fume Hoods

Specified electrical services are prewired to a junction box located on the roof of the fume hood for field connection by the electrical contractor. All electrical receptacles are 3-wire, 20-amp duplex, 120/277VAC, or as specified. Light switch shall be 3-wire polarized grounded, 15 amp, 125VAC, or as specified. Faceplates are stainless steel.

### O. Fume Hood Work Surfaces (*Select One*)

All fume hood work surfaces are 1-1/4" thick molded epoxy resin tops made in the form of a watertight pan, not less than 1/4" deep to contain spillage. Work surfaces are non-glaring finish and black, gray, or light gray (lt.gray) in color.

All work surfaces are fabricated of 16 gauge, Type 304 stainless steel formed down, making a 1-1/4" high face, and dished to form a watertight containment not less than 1/4" deep to contain any spills within the fume hood.

### P. Instruction Plate

Corrosion resistant or plastic plate attached to the fume hood exterior with condensed information covering recommended locations for apparatus and accessories, use of sash and recommended safe operating procedures.

## 2.04 CONSTRUCTION - WALK IN HOODS

### A. Superstructure

Superstructure shall consist of 18 gauge galvanized steel side pans and back pans, maximum 4-3/4" thick, holding side and rear liner panels, and fastened together with pinions and screws so that the entire structure is secure and rigid. Any framing system not providing structural support is unacceptable.

Front and both sides of the superstructure are aligned and precision fit, eliminating the need for exterior gaskets.

### B. Hood Roof

The hood roof shall be fabricated from 18 gauge galvanized steel with liner material identical to that used in the rest of the containment cavity mounted to the interior. Such construction affords additional containment for accidental fire.

### C. Airfoil Construction

Top airfoil shall be constructed of 18 gauge 304 #4 finish stainless steel.

### D. Sash (*Select One*)

Provide two frameless vertical sashes, each containing a 1/4" (6 mm) tempered glass panel and a full width anodized aluminum aerodynamic wedge-shaped sash handle connected to a steel rear-hung counterweight system insuring non-tilting, non-binding, and non-creeping sash performance. Rear-mounted counterweight shall be connected to a #35 case-hardened steel chain engaging a twin sprocket axle system with positive master link connection points both front and rear. Sash systems utilizing cables and pulleys are not acceptable. Painted steel parts in the sash are not acceptable.

Provide two sashes; the upper being a combination sash with horizontal sliding panels no wider than 18" and the lower being a framed vertical sash. Sash elements in the combination sash are tempered glass panels set into an aluminum track housed within the stainless steel sash frame giving either horizontal or vertical movement options to the end user. Sash elements in the framed vertical sash are a 1/4" (6 mm) tempered glass panel set into a stainless steel frame connected to a steel rear-hung counterweight system insuring non-tilting, non-binding, and non-creeping sash performance. Rear-mounted counterweight shall be connected to a #35 case-hardened steel chain engaging a twin sprocket axle system with positive master link connection points both front and rear. Sash systems utilizing cables and pulleys are not acceptable. Painted steel parts in the sash are not acceptable.

Provide a horizontal sliding sash consisting of a stainless steel top rail holding stainless steel framed glass panels and an stainless steel bottom track. Sash elements are tempered glass panels set into an aluminum track housed within the stainless steel rail. Painted steel parts in the sash are not acceptable.

Provide two framed vertical sashes, each containing a 1/4" (6 mm) tempered glass panel set into a stainless steel frame connected to a steel rear-hung counterweight system insuring non-tilting, non-binding, and non-creeping sash performance. Rear-mounted counterweight shall be connected to a #35 case-hardened steel chain engaging a twin sprocket axle system with positive master link connection points both front and rear. Sash systems utilizing cables and pulleys are not acceptable. Painted steel parts in the sash are not acceptable.

- E. Baffles providing controlled air vectors into and through the fume hood shall be fabricated of the same material as the liner. Provide four fixed baffles and two adjustable baffles.
- F. Bypass system shall be Isolator Viewpass system consisting of a 1/4" (6 mm) smoked tempered glass panel allowing complete visual display of fume hood interior.
- G. Duct collar(s) will be 10" or 12" round exhaust outlet collar(s) and be fabricated of 20 gauge Type 304 stainless steel. Coated steel collars are not acceptable.
- H. All walk in type fume hoods are designed to have an interior vertical clearance of not less than 83" in the front twelve inches of the hood depth. Accessories or options may affect internal dimensions.
- I. Fume hood fascia posts shall be:
 

Standard:	Painted, 18 gauge cold rolled steel.
Optional:	Type 304 stainless steel.

**Specifications – Laboratory Fume Hoods**

## J. Exterior end panels shall be:

Standard: Painted, 18 gauge cold rolled steel.

Optional: Type 304 stainless steel.

## K. Interior Lighting

Standard: A hinged fluorescent light fixture configured for T-12 lamp tubes shall be provided and installed on the exterior of the fume hood roof. A tempered glass panel is provided and has a vapor-tight seal to isolate the fluorescent fixture from the hood interior. The largest possible double tube UL approved fixture is provided for each hood.

Optional: A hinged fluorescent light fixture configured for T-8 lamp tubes shall be provided and installed on the exterior of the fume hood roof. A tempered glass panel is provided and has a vapor-tight seal to isolate the fluorescent fixture from the hood interior. The largest possible double tube UL approved fixture is provided for each hood.

Optional: An incandescent, explosion-proof 150-watt light shall be provided.

Standard configurations for fluorescent light fixtures are: 48" hood (1-36" fixture); 60" hood (1-48" fixture); 72" hood (1-48" fixture); 96" hood (2-36" fixtures).

## L. Fluorescent Tubes or Incandescent Bulbs

Standard: Lamp tubes or bulbs shall be provided by others.

Optional: Lamp tubes or bulbs shall be included with fixture.

## M. Service Fittings and Fixtures When Required

1. All laboratory service fittings and fixtures shall be as manufactured by the Water Saver Fixture Company or an approved equal. Fixtures, including handles, shall be color coded to indicate the proper service. Color code requirements for indexing service fixtures shall be as follows:

<u>Service</u>	<u>Index Color</u>
Gas	Blue
Air	Orange

Vacuum	Yellow
Steam	Black
Cold Water	Green
Hot Water	Red
Deionized Water	White
Other Services	On Application

2. Finish of Service Fixtures (**Select One**)
- A. Laboratory service fixtures (except fittings inside the fume hood) shall have:
    - A polished chrome finish with clear epoxy coating.
    - A satin chrome finish with clear epoxy coating.
  - B. Fittings inside the fume hood shall have an epoxy finish color-coded to match the fixture service index color.
- N. Electrical Services When Required (**Select One**)
- 1. Specified electrical outlets and switches are shipped loose for field installation by the electrical contractor. All electrical receptacles are 3-wire, 20-amp duplex, 120/277VAC, or as specified. Light switch shall be 3-wire polarized grounded, 15 amp, 125VAC, or as specified. Faceplates are stainless steel.
  - 2. Wiring harnesses shall be furnished for each specified fascia post-mounted electrical device and field-installed.
  - 3. Specified electrical services are prewired to a junction box located on the roof of the fume hood for field connection by the electrical contractor. All electrical receptacles are 3-wire, 20-amp duplex, 120/277VAC, or as specified. Light switch shall be 3-wire polarized grounded, 15 amp, 125VAC, or as specified. Faceplates are stainless steel.
- O. Fume Hood Work Surfaces (**Select One**)
- 1. All fume hood work surfaces are 1-1/4" thick molded epoxy resin tops made in the form of a watertight pan, not less than 1/4" deep to contain spillage. Work surfaces are non-glaring finish and black, gray, or light gray (lt.gray) in color.
  - 2. All work surfaces are fabricated of 16 gauge, Type 304 stainless steel formed down, making a 1-1/4" high face, and dished to form a watertight containment not less than 1/4" deep to contain any spills within the fume hood.
- P. Instruction Plate
- Corrosion resistant or plastic plate attached to the fume hood exterior with condensed information covering recommended locations for apparatus and accessories, use of sash and recommended safe operating procedures.

## Specifications – Laboratory Fume Hoods

### 2.05 OPTIONAL FEATURES

#### A. Velocity Alarm

Fume hoods shall be equipped with Alert-Tech fume hood velocity alarm to detect low hood face velocities. The units are surface-mounted on the hood's fascia panel. Any system whose control module, when mounted, is thicker than 1-1/2" is unacceptable.

The UL approved velocity alarm signals an unsafe operating condition when the fume hood face velocity falls below a preset amount. The alarm set-point calibration is performed by the user/owner once a proper face velocity has been set and measured. The alarm system consists of the following:

1. A red LED digital display that registers face velocities between 0 and 200 FPM plus a safety reference display that actuates in low velocity conditions.
2. An interconnected set of micro-switches that serve as a way of selecting the alarm set point.
3. An audible alarm of at least 80 dB.
4. A flashing red warning light in synchronization with the audible alarm.
5. A silencer switch for the audible alarm that will not stop the red warning light.
6. A test mode that simultaneously tests L.E.D. function, sensor and alarm set point.
7. The alarm system is furnished complete with velocity detector, 110V/12VDC power supply, detector mounting hardware, alarm, and optional case. The system operates at 110V, 60 Hz. power.

#### B. Vapor Alarm

Fume hoods shall be equipped with a Vapor-Track flammable vapor-sensing device. Units are surface-mounted in the fume hood top or on the fascia posts. Any system that cannot be surface-mounted with 1-1/4" or less of projection from the fascia post is unacceptable.

The Vapor-Track signals an unsafe condition when flammable vapors are sensed inside the fume chamber above a level predetermined by the operator. The alarm system consists of the following:

1. An L.E.D. digital display that registers vapor concentration by an increasing value of 1 to 200 for higher concentrations.
2. An interconnected set of micro-switches that serves as a way of selecting any of the L.E.D. display lights as the alarm set point.
3. A warbling audible alarm (1,500 Hz to 3,000 Hz) of at least 85 dB.
4. A flashing red warning light in synchronization with the audible alarm.
5. A spring-loaded test switch that simultaneously tests L.E.D. function and alarm set point.

6. A TGS813 temperature-compensated sensor module for mounting on the hood interior sidewall.
7. The Vapor Track unit is furnished complete with sensor, sensor mounted hardware, alarm, and optional case for surface mounting. The system is D.C. driven by a UL approved plug-in conversion transformer.
8. Alarm sensitivity shall be 50 PPM.

## **PART 3 – EXECUTION**

### **3.01 INSTALLATION**

- A. Install fume hoods and equipment in accordance with manufacturer's instructions.
- B. Install equipment plumb, square, and straight with no distortion and securely anchored as required.
- C. Secure work surfaces to casework and equipment components with material and procedures recommended by the manufacturer.
- D. Accessory installation: Install accessories and fittings in accordance with manufacturer's recommendations.

### **3.02 OPTIONAL FIELD QUALITY CONTROL TESTING OF FUME HOODS (Select One)**

- A. Have [all] [a representative number of one of each width of the] fume hoods static tested for three (3) minutes using ANSI/ASHRAE 110-1995. All hoods shall pass with an average rating of AI 0.05 or less.
- B. Have [all] [a representative number of one of each width of the] fume hoods tested using SEFA 1.2 – 1996. All units tested shall pass using the specified criteria.

### **3.03 ADJUSTING**

- A. Repair (or remove and replace) defective work, as directed by Owner's Representative upon completion of installation.
- B. Adjust sash and other moving or operating parts to ensure smooth, near-silent and accurate sash operation with one hand and with uniform contact of rubber bumpers. Ensure counterweights operate without interference.
- C. Adjust fixtures and accessories to function smoothly.

### **3.04 CLEANING**

- A. Clean equipment, touch up as required.

## Specifications – Laboratory Fume Hoods

### 3.05 PROTECTION OF FINISHED WORK

- A. Provide all reasonable protective measures to prevent exposure of equipment to other construction activity.
- B. Advise contractor of procedures and precautions for protection of material and installed fume hoods from damage by work of other trades.

### 3.06 OPTIONAL USER TRAINING

Provide a factory-certified trainer for \_\_workshop sessions over a \_\_day period.

## APPENDIX A – FUME HOOD PERFORMANCE TESTING REQUIREMENTS

### A. GENERAL

One (1) hood of the same design as specified herein will be successfully tested as detailed below. Production of the hoods specified herein will not commence until the manufacturer has successfully performed the "Performance Test ". In general, the below detailed "Performance Test" will consist of the ANSI/ASHRAE 110-1995 test procedure using a five-minute tracer gas challenge at a rate of four (4) liters per minute. The PPM concentration outside the hood of a tracer gas released inside the hood will be measured utilizing a MIRAN 203 Gas Analyzer, or equivalent.

### B. TEST EQUIPMENT

1. Tracer gas orifice and ejector as specified in ANSI/ASHRAE 110-1995.
2. Tracer gas is sulfur hexafluoride supplied from a cylinder capable of maintaining 30-PSI pressure at the test flow rate for at least five minutes. The test flow rate is four (4) liters per minute.
3. Detector is a MIRAN 203 Infrared Spectrophotometer capable of indicating or recording concentrations of tracer gas in the range of 0.001 PPM, with an accuracy of + 10% and a response time not to exceed ten (10) seconds to 90% indication of actual concentration.
4. "Dummy" will be a mannequin such as used in clothing display. The height of the mannequin will be 67 inches with a shoulder height of 55" to 57", and otherwise represent normal proportions of the human body. Hairless dummies or torsos are unacceptable.
5. The detector is calibrated with a known concentration of tracer gas within 24 hours preceding a test, using the methods furnished or specified by the detector manufacturer.

### C. TEST CONDITIONS

Hood is tested with ceiling-supplied make-up air in a test area where face velocity, temperature, and room airflow can be monitored and documented.

#### D. HOOD CONDITION

1. The sash or sashes shall be located in the design position or positions.
2. If the hood has an auxiliary air supply, the supply shall be in operation.

#### E. QUANTITATIVE TEST PROCEDURE

1. Turn on detector, allow time to equilibrate.
2. Insert orifice in test diffuser to give (4) liter per minute release rate.
3. Install diffuser to a central test position. This position is equidistant from the inside sidewalls, six inches behind the sash plane.
4. Install mannequin standing 3" from the plane of the sash.
5. Turn on tracer gas block valve. Position the detector probe between the nose and lip of the mannequin.
6. Observe and record the detector readings automatically. Background readings are to be taken before each test and subtracted from the actual test readings. The tests are run for five (5) minutes. An average reading above 0.07 PPM constitutes unsatisfactory performance under the conditions that exist for that test.
7. During the sixth and seventh minute of testing, the sash is closed completely—then, at 420 seconds elapsed time, the sash is re-opened.
8. Between 450 and 510 seconds elapsed time, the hood perimeter is tested at a distance of 1" outside the plane of the sash.
9. During all these procedures, breathing zone gas concentration shall not exceed 0.05 PPM.

#### F. QUALITATIVE TEST PROCEDURE

Excerpt from SEFA 1.2 1996 (formerly SAMA Standard LF10-1981)

It is recommended that the user make provisions to have the following tests performed on all laboratory fume hoods. These tests should be performed by qualified personnel to verify proper operation of the fume hoods before they are put to use. The tests of the fume hoods should be performed after the installation is complete, the building ventilation system has been balanced and all connections made. Any unsafe conditions disclosed by these tests should be corrected before using the hood.

##### 7.1 Test Conditions

Verify that building make-up air system is in operation, the doors and windows are in normal operating position, and that all other hoods and exhaust devices are operating at design conditions.

## Specifications – Laboratory Fume Hoods

### 7.2 Test Procedures

#### 7.2.1 Equipment List

- (a) A properly calibrated hot-wire thermal anemometer.
- (b) A supply of 2 -minute smoke candles.
- (c) A bottle of titanium tetrachloride and supply of cotton swabs or other recognized device for producing smoke.

#### 7.2.2 Room Conditions

Check room conditions in front of the fume hood using a thermal anemometer and a smoke source to verify that the velocity of cross drafts does not exceed 20 percent of the specified average fume hood face velocity. Any cross drafts that exceed these values shall be eliminated before proceeding with fume hood test.

Caution: Titanium Tetrachloride fumes are toxic and corrosive. Use sparingly; avoid inhalation and exposure to body, clothing and equipment that might be affected by corrosive fumes.

Note: It must be recognized that no fume hood can operate properly if excessive cross drafts are present.

#### 7.2.3 Face Velocity

Determine specified average face velocity for fume hood being tested. Perform the following test to determine if fume hood velocities conform to specifications or to the designated fume hood class. With the sash(es) positioned, turn on the exhaust blower. The face velocity shall be determined by averaging the velocity readings taken at the open fume hood face. Note: If not in accordance with specified face velocity, refer to Appendix A (Troubleshooting Guide) of the complete SEFA document for aid in determining the cause of variation in airflow. If face velocity cannot be corrected to that specified, reclassify fume hood to conform to actual face velocity.

#### 7.2.4 Sash Operation

Check operation by moving sash(es) through its (their) full travel. Sash operation shall be smooth and easy. Vertical rising sashes shall hold at any height without creeping up or down, unless designed otherwise.

#### 7.2.5 Verification of Proper Air Flow and Patterns

##### 7.2.5.1 Fume Hoods Without Auxiliary Air

- (a) Turn fume hood exhaust blower on.
- (b) With sash(es) in full open position, check airflow into the fume hood using a cotton swab dipped in titanium tetrachloride or other smoke source.

Note: On fume hoods with horizontal sliding sash(es), check air flow with sash(es) at various full open positions. A complete traverse of the fume hood face should verify that airflow is into the fume hood over the entire face area. A reverse flow of smoke indicates unsafe fume hood operation.

- (c) Move a lighted smoke candle throughout the fume hood work area, directing smoke across the work surface and against the sidewalls and baffle. Smoke should be contained within the fume hood and be rapidly exhausted. (Fume hoods with horizontal sliding sash(es) will show reverse flow and turbulence behind sash panel, but no outflow of smoke shall be evident.)

#### 7.2.5.2 Fume Hoods With Auxiliary Air

- (a) Turn exhaust blower on and determine face velocity in accordance with 7.2.3.

Note: Face velocity and exhaust volumes shall be determined with the auxiliary air blower off.

- (b) Calculate exhaust volume from face velocity data.
- (c) Turn on auxiliary air, verify that auxiliary air volume is as specified. Locate a straight section of the supply air duct and drill two holes of a size appropriate for the pitot tubes to be used, 90 degrees apart, on a plane through the duct, at the downstream end of the straight section. Measure the air velocity and calculate the air volume. Compare volumes determined with the specified volume of auxiliary air and with exhaust volume, to determine if proper ratio exists. Deviations of plus or minus five percent are acceptable. If deviations of more than five percent are noted, corrective measures should be taken. Seal holes in duct with duct tape or suitable sealant.
- (d) With sash(es) in the open position, check airflow into the fume hood using a cotton swab dipped in titanium tetrachloride or other smoke source. A complete traverse of the fume hood face should verify that airflow is into the fume hood over the entire face area. A reverse flow of air indicates unsafe fume hood operation.
- (e) Move a lighted smoke candle throughout the fume hood work area, directing smoke across the work surface and against the sidewalls and baffle. Smoke should be contained within the fume hood and be rapidly exhausted. Fume hoods with horizontal sliding sash(es) will show reverse flow and turbulence behind sash panel, but no outflow of smoke shall be evident.

#### 7.2.6 Evaluation of Low Air Flow Monitor

On fume hoods with low flow warning devices, verify that monitor functions properly and indicates unsafe conditions.

**Specifications – Laboratory Fume Hoods****APPENDIX B – LINER SURFACE FINISH PERFORMANCE REQUIREMENTS**

REAGENT	POLYGLASS	PVC	POLYPROPYLENE	EPOXY RESIN	304 SS	316 SS
HYDROCHLORIC ACID 35%	0	0	0	0	4	4
HYDROFLUORIC ACID	1	0	0	3	4	4
PHOSPHORIC ACID 80%	0	0	0	0	1	1
NITRIC ACID 35%	0	0	0	0	0	0
SULFURIC 70%	0	0	0	0	2	3
ACETIC ACID	1	0	0	0	1	1
SODIUM HYDROXIDE 20%	0	0	0	2	0	0
ACETONE	0	1	1	0	0	0
ETHANOL	0	0	0	0	0	0
METHANOL	0	0	0	0	0	0
MEK	0	1	1	0	0	0
GASOLINE	0	0	0	0	0	0
CARBON TETRACHLORIDE	0	0	1	0	0	0
FORMALIN 35%	0	1	0	0	0	0
XYLENE	1	1	1	0	0	0

0= NO EFFECT    1= EXCELLENT    2=GOOD    3=FAIR    4= FAILURE

No effect: No detectable change in working surface material.

Excellent: Slight detectable change in color or gloss, but no change to the function or life of the working surface material.

Good: A clearly discernable change in color or gloss, but no significant impairment of working surface function or life.

Fair: Objectionable change in appearance due to surface discoloration or etch, possibly resulting in deterioration of function over a period of time.

Failure: Pitting, cratering, or erosion of working surface material. Obvious and significant deterioration.

**APPENDIX C – WORK SURFACE FINISH PERFORMANCE REQUIREMENTS**

**TEST RESULTS OF CHEMICAL RESISTANCE OF EPOXY RESIN WORKTOPS**

	Black	Gray	Lt. Gray
<b>Inorganic Acids - Corrosive</b>			
Chromic Acid - 40% CrO <sub>3</sub>	4	3	3
Hydrochloric Acid - 10% HCL	1	1	1
Hydrochloric Acid - Conc -37% HCL	1	1	1
Nitric Acid - 40% HNO <sub>3</sub>	1	1	1
Nitric Acid - Conc - 70% NHO <sub>3</sub>	1	1	1
Sulfuric Acid - 60% H <sub>2</sub> SO <sub>4</sub>	1	1	1
Sulfuric Acid - Conc - 96% H <sub>2</sub> SO <sub>4</sub>	5	5	5
<b>Organic Acids - Corrosive</b>			
Acetic Acid - 5% CH <sub>3</sub> CO <sub>2</sub> H	1	1	1
Acetic Acid - Glacial CH <sub>3</sub> CO <sub>2</sub> H	1	1	1
Citric Acid - 1% C <sub>6</sub> H <sub>8</sub> O <sub>7</sub>	1	1	1
Oleic Acid - C <sub>18</sub> H <sub>34</sub> O <sub>2</sub>	1	1	1
Phenol Solution - 5% C <sub>6</sub> H <sub>5</sub> OH	1	1	1
<b>Alkaline Solutions - Corrosive</b>			
Ammonium Hydroxide - 10% NH <sub>4</sub> OH	1	1	1
Sodium Carbonate Sol - 20% NA <sub>2</sub> CO <sub>3</sub>	1	1	1
Sodium Hydroxide Sol - 60% NAOH	1	1	1
Sodium Hypochlorite Sol - 4% NAOCL	1	1	1
<b>Organic Solvents</b>			
Acetone CH <sub>3</sub> COCH <sub>3</sub>	2	2	2
Benzene C <sub>6</sub> H <sub>6</sub>	2	2	2
Carbon Tetrachloride CCL <sub>4</sub>	2	2	1
Diethyl Ether CH <sub>3</sub> CH <sub>2</sub> OCH <sub>2</sub> CH <sub>3</sub>	1	1	2
Dimethyl Formamide HCON(CH <sub>3</sub> ) <sub>2</sub>	1	1	1
Ethyl Acetate CH <sub>3</sub> CO <sub>2</sub> C <sub>2</sub> H <sub>5</sub>	1	2	2
Ethyl Alcohol - 95% CH <sub>3</sub> CH <sub>2</sub> OH	1	1	1
Ethylene Dichloride C <sub>2</sub> H <sub>4</sub> Cl <sub>2</sub>	1	1	1
Heptane CH <sub>3</sub> (CH <sub>2</sub> ) <sub>5</sub> CH <sub>3</sub>	1	1	2
Isooctane C <sub>8</sub> H <sub>18</sub>	1	1	1
Kerosene	1	1	1
Methyl Alcohol CH <sub>3</sub> OH	1	1	1
Toluene C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub>	1	1	1
<b>Organic Compounds</b>			
Aniline C <sub>6</sub> H <sub>5</sub> NH <sub>2</sub>	1	1	1
Mineral Oil	1	1	1
Olive Oil	1	1	1
Soap Solution - 1%	1	1	1
Transformer Oil	1	1	1
Turpentine	1	1	1

- 1 - No Effect: No detectable change in the material surface.
- 2 - Excellent: Slight detectable change in color or gloss, but no change in function or life of the surface.
- 3 - Good: A clearly discernable change in color or gloss, but no significant impairment of surface life or function.
- 4 - Fair: Objectionable change in appearance due to discoloration or etch, possibly resulting in deterioration of function over an extended period of time.
- 5 - Failure: Pitting, cratering, or erosion of the surface. Obvious and significant deterioration.

Copies of independent laboratory's analytical report are available upon request.

## Specifications – Laboratory Fume Hoods

### APPENDIX D – PAINTED SURFACE FINISH PERFORMANCE REQUIREMENTS

#### TESTING METHOD FOR DETERMINING CHEMICAL RESISTANCE OF PAINTED FINISH

##### GENERAL

Forty-nine (49) sample panels measuring 4" x 6" were submitted for testing. The received samples to be tested for chemical resistance as described herein.

##### TEST PROCEDURE

The received panel was placed on a flat surface, cleaned with soap and water and blotted dry. The panel was then conditioned for 48 hours at 73.3° F and 50.5% relative humidity. The panel was then tested for chemical resistance using forty-nine (49) different chemical reagents by one of the following methods:

Method A – Volatile chemicals were tested by placing a cotton ball saturated with reagent in the mouth of a 1 oz. bottle and inverting the bottle on the surface of the panel.

Method B – Non-volatile chemicals was tested by placing five (5) drops of the reagent on the surface of the panel and covering with a 25-mm watch glass.

For both of the above methods, the reagents were left on the panel for a period of 24 hours. The panel was then washed off with water, cleaned with detergent and naphtha, and rinsed with deionized water. The panel was then dried with a towel and evaluated after 24 hours at 73.3° F and 50.5% relative humidity using the following rating system.

No Effect: No detectable change in working surface material.

Excellent: Slight detectable change in color or gloss, but no change to the function or life of the working surface material.

Good: A clearly discernable change in color or gloss, but no significant impairment of working surface function or life.

Fair: Objectionable change in appearance due to surface discoloration or etch, possibly resulting in deterioration of function over a period of time.

Failure: Pitting, cratering, or erosion of working surface material. Obvious and significant deterioration.

Test results are duplicated on next page. Copies of independent laboratory's analytical report are available upon request.

**TEST RESULTS OF CHEMICAL RESISTANCE OF PAINTED FINISH**

<u>REAGANT</u>		<u>RESULTS</u>
Acetate, Amyl		Excellent
Acetate, Ethyl		Excellent
Acetic Acid	98%	Excellent
Acetone		Excellent
Acid Dichromate	5%	No Effect
Alcohol, Butyl		No Effect
Alcohol, Ethyl		Excellent
Alcohol, Methyl		Excellent
Ammonium Hydroxide	28%	No Effect
Benzene		No Effect
Carbon Tetrachloride		No Effect
Chloroform		Excellent
Chromic Acid	60%	No Effect
Cresol		Good
Dichlor Acetic Acid		Failure
Dimethylformamide		No Effect
Dioxane		Good
Ethyl Ether		No Effect
Formaldehyde	37%	No Effect
Furfural		Fair
Gasoline		No Effect
Hydrochloric Acid	37%	Good
Hydrochloric Acid	48%	No Effect
Hydrofluoric Acid	48%	Failure
Hydrogen Peroxide	3%	No Effect
Iodine, Tincture of		Good
Methyl Ethyl Ketone		Excellent
Methylene Chloride		Excellent
Mono Chlorobenzene		Excellent
Naphthalene		No Effect
Nitric Acid	20%	No Effect
Nitric Acid	30%	No Effect
Nitric Acid	70%	Good

**Specifications - Laboratory Fume Hoods**

Phenol	90%	Good
Phosphoric Acid	85%	No Effect
Potassium Hydroxide	40%	No Effect
Silver Nitrate, Saturated		Good
Sodium Carbonate		No Effect
Sodium Chloride		No Effect
Sodium Hydroxide	10%	No Effect
Sodium Hydroxide	20%	No Effect
Sodium Hydroxide	40%	No Effect
Sodium Hydroxide, Flake		No Effect
Sodium Sulfide, Saturated		No Effect
Sulfuric Acid	33%	No Effect
Sulfuric Acid	77%	Good
Sulfuric Acid	85%	Good
Sulfuric Acid	96%	Fair
Sulfuric Acid (77%) and Nitric Acid (70%), equal parts		Good
Toluene		No Effect
Trichloroethylene		No Effect
Xylene		No Effect
Zinc Chloride, Saturated		No Effect

**END OF SECTION**