PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Metal Laboratory Casework and Tables

B. Cabinet Hardware

C. Laboratory Work Surfaces

D. Mobile Workstation

E. Electronics Bench

F. Wall Hung Benchtop

G. Shelving Assemblies

H. Cylinder Restraint Assembly

I. Overhead Service Carriers

J. Utility Ceiling Tile

K. Cable Tray System

L. Wall-Mounted Attachment Channel

M. Pipe Drop Enclosure

N. Drying Rack

O. Cable / Vacuum Line Through Port

P. Grommets and Accessories

Q. Pegboards

R. Task Light Fixtures

S. Air Control Curtain

T. Finish for Miscellaneous Wood Items

U. Metal Fabrications

V. Stainless Steel Fabrications

1. Work Surfaces

2. Laboratory Sinks

3. Scullery Sinks

4. Autoclave/Equipment Enclosure Panels

W. Gowning Bench

X. Slotted Channel Framing (Strut)

Y. Sealant

1.2 RELATED SECTIONS

A. Division 01 - Mockups

B. Division 09 – Flooring (wall base)

C. Section 115313 – Fume Hoods and Other Air Containment Units

D. Section 115343 – Laboratory Service Fittings and Fixtures

E. Section 132129 – Controlled Environment Rooms

F. Division 22 – Plumbing

G. Division 23 – Heating, Ventilated, and Air-Conditioning

H. Division 26 – Electrical

I. Division 27 - Communications

1.3 REFERENCES

A. Architectural Woodwork Institute (AWI), Woodwork Institute (WI), and Architectural Woodwork Manufacturers Association of Canada (AWMAC): Architectural Woodwork Standards (AWS), Edition 1, October 2009.

B. Builders Hardware Manufacturers Association: ANSI/BHMA A156.18-2006 American National Standard for Materials and Finishes, 2006.

C. California Code of Regulations: Title 17, Section 93120: Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products.

D. Hardwood Plywood & Veneer Association: ANSI/HPVA HP-1-2004 Standard for Hardwood and Decorative Plywood, 2004.

E. National Hardwood Lumber Association: NHLA Rules for the Measurement & Inspection of Hardwood & Cypress, 2007.

F. Scientific Equipment and Furniture Association: SEFA 2-2010 SEFA Recommended Practices for the Installation of Scientific Laboratory Furniture and Equipment.

G. Scientific Equipment and Furniture Association: SEFA 3-2010 SEFA Recommended Practices for Work Surfaces.

H. Scientific Equipment and Furniture Association: SEFA 8-W-2010 Recommended Practices for Laboratory Grade Wood Casework.

I. Scientific Equipment and Furniture Association: SEFA 8-M-2010 Recommended Practices for Laboratory Grade Metal Casework.

J. Scientific Equipment and Furniture Association: SEFA 10-2013 Adaptable Laboratory Furniture Systems Recommended Practices.

K. Underwriters Laboratory: UL61010A-1 Electrical Equipment for Laboratory Use.

L. Underwriters Laboratory: UL962A Furniture Power Distribution Units.

M. United States Green Building Council: USGBC, LEED Reference Guide for Green Building Design and Construction For the Design, Construction, and Major Renovations of Commercial and Institutional Buildings Including Core & Shell and K-12 School Projects 2009 Edition.

1.4 BID SUBMITTALS

A. Certification of Compliance: All bidders (including those listed in 2.01-A) must submit a compliance certification statement indicating that their bid includes products and installation which comply with every requirement of the project specifications and drawings (accounting for any RFI responses received during the bidding phase).

B. Certification of Qualifications: All bidders must submit a certification of compliance with the Qualifications requirements outlined below. List specific project experience as evidence of compliance.

C. Substitution Requests: All substitution requests for this scope of work in this section must be made during the bidding phase. No substitution requests will be considered post-bid.

1.5 SUBMITTALS

A. Refer to General Conditions and Division 1 “Submittal Procedures” for submittal requirements. In addition to these requirements, provide submittal requirements specified herein.

B. Submittal requirements:

1. Submittal shall be prepared individually for this specification section. Arrange product data, drawings and information for submission in a complete set for this specification section.

   a. Shop drawings and product data as applicable for required mockups may be submitted separately and should be expedited for submittal as soon as the contract is awarded.

   b. Shop drawings may be submitted on a floor-by-floor basis. However, product data and details shall not be submitted redundantly with each submission.

2. Submittal shall contain complete data for all items of this specification section. Periodic or partial submittals of individual components within this specification section will be returned as incomplete and rejected.

3. Submittals shall be organized by specification sequence with section and paragraph number identified.

4. Equipment and components being proposed shall be clearly labeled with all options and accessories indicated and shall be for this specific project. All non-applicable items shall be deleted or struck.

5. Product data submittals provided in PDF format shall consist of fully collated PDF files allowing for collated printing from a single file.

6. Shop drawings shall meet the requirements of the Architectural Woorworking Standards (AWS), except in cases where stricter requirements are identified in this section.

C. Materials List/Product Data: Submit complete materials list, including catalogue data, of all materials, equipment, and products for work in this section.

1. Product data shall not be duplicative or redundant with shop drawings. Do not include drawings in the product data submittal that are included in the shop drawings.

D. Shop Drawings: Submit complete shop fabrication and installation drawings, including plans, elevations, sections, details and schedules.

1. Show relationship to adjoining materials and construction.

2. Show seaming pattern layout of all joints in work surfaces.

3. Shop Drawings shall be in the form of reproducible, PDF files, or photocopies, to scale, sheet size not to exceed 11 inches x 17 inches (A3).

4. Shop drawing submittals provided in PDF format shall consist of fully collated files allowing for collated printing from a single file. Blueline prints are not acceptable.

E. Approved Substitution/Approved Equal: In addition to the items required in Division 1, all substitution requests shall include item-by-item comparison of the proposed substitution to this project specification. A copy of the project specification shall be submitted, with each item and subsection of the project specification marked as “Comply” or “Not Comply.” In any cases where “Not Comply” is indicated, an explanation of the relative advantages of the proposed design shall be provided.

F. LEED Submissions: Provide documentation and certification as required relative to the work of this section to support the project’s submission to the USGBC for the credits indicated below.

G. Submit detailed anchorage and attachment drawings and calculations provided by a licensed Structural Engineer complying with the Uniform Building Code Earthquake Regulations and the California Administrative Code, Title 24 Seismic Restraint requirements.

H. Samples: Accompanying Materials List, submit for Architect's approval two (2) samples of each type of specified finish and color range available for casework, laboratory work surfaces, painted steel fabrications, cabinet hardware, and shelving.

I. Certifications/ Test Data: Submit certifications and test data as required elsewhere in this section, including SEFA structural performance test reports, and finish performance test reports.

J. Operations/Maintenance Manuals: At project close-out, submit for Architect's review and Owner's use, complete operating and maintenance manuals that describe proper operating procedures, maintenance and replacement schedules, components parts list, and closest factory representative for components and service.

K. Warranty: Submit manufacturer’s warranty including any additional certifications as needed to meet the requirements specified.

1.6 MOCKUP

A. Provide and install products within this scope of work as part of the laboratory mockup, as indicated on the drawings.

B. Location of mockup can be one of the following:

1. In final location as shown on drawings. Note that products installed may require correction and/or replacement relative to issues of non-compliance with the contract documents.

2. In of-site location in the vicinity of the project, provided by the Owner.

3. At location provided by the laboratory subcontractor, such as the factory.

C. Disposition of mockup:

1. Mockup items may be incorporated into the final project subject to approval and/or corrections as identified in the mockup review.

2. Mockup items will remain the property of the laboratory subcontractor.

D. The mockup will be reviewed and appropriate comments documented. The mockup – and the associated comments - will become a quality sample against which the remainder of the product installation will be compared.

E. Coordinate delivery, installation, and review of the mockup with the contractor. The mockup should be complete and reviewed prior to fabrication of the remainder of the project. To the extent that the subcontractor elects to fabricate the project prior to review and approval of the mockup, it is understood that this is “at risk” and items may require re-fabrication to address issues that arise from the mockup review.

1.7 PRODUCT HANDLING

A. Protection: Use all means necessary to protect work of this section before, during and after installation including installed work and materials of other trades.

B. Replacement: Any damaged work shall be replaced, repaired and restored to original condition to the approval of the Architect at no additional cost or inconvenience to the Owner.

1.8 ENVIRONMENTAL CONDITIONS

A. It is the responsibility of the general contractor or construction manager to provide appropriate environmental conditions within the laboratory spaces throughout the period of installation of wood and composite wood casework products until substantial completion of the project and turnover to the owner. The relative humidity standards as delineated by the Architectural Woodwork Standards should be followed.

1. Humidity must be controlled between 25% and 55% in all areas where laboratory casework is stored and/or installed.

2. The range of relative humidity change should not exceed 30 percentage points.

B. It is the responsibility of the laboratory furniture subcontractor to assess building environmental conditions prior to the delivery and installation of laboratory casework. Wood laboratory casework shall not, under any circumstances, be installed in spaces which do not comply with the requirements outlined above.

1.9 QUALIFICATIONS

A. Work in this section shall be manufactured by and installed by a company/companies having a minimum of eight years documented experience providing and installing products similar to those specified in laboratory applications; an established organization; and production facilities including all tools, equipment and special machinery necessary for specializing in the fabrication and installation of the type of products specified, with skilled personnel, factory trained workmen and an experienced engineering department. Each shall have the demonstrated knowledge, ability and the proven capability to produce the specified work of the required quality and the proven capacity to complete an installation of this size and type within the required time limits.

1.10 ENVIRONMENTAL COMPLIANCE

A. All steel used in the product fabrication shall comply with the recycled steel content requirements to contribute towards achievement of the USGBC LEED Green Building Rating System MR Credits 4.1 and/or 4.2.

1. All steel used in the fabrication of laboratory cabinets, fume hoods and modular laboratory systems shall have a minimum of 25%recycled steel content, as defined by ISO 14021-1999, calculated as follows:

2. (% of Post Consumer Recycled Steel Content by Weight) + 0.5 x (% of Pre-Consumer Recycled Content by Weight) >/= 20% (30%) (40%)

3. Documentation:

a. The manufacturer shall submit documentation (i.e. “Source of Materials”, Invoices, Third Party Validation, etc.) for steel purchased for this project providing recycled content.

b. Provide documentation of the cost of each component which contains recycled steel.

c. Provide percentages (by weight) and costs of post-consumer recycled material and pre-consumer recycled material within each component.

1.11 WARRANTY

A. All products will be warranted to be free from defects in materials and workmanship for a period of one year following substantial completion. The manufacturer/dealer/subcontractor shall repair or replace any products (or parts thereof) that are found to be defective. Replacement will include any parts, labor, shipping, and travel expenses involved. Warranty replacement work must be scheduled in coordination with the client’s academic/research schedule and may therefore require evening and/or weekend work.

PART 2 - PRODUCTS

2.1 METAL LABORATORY CASEWORK, TABLES AND CASEWORK SYSTEMS

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer. Corrosive and flammable liquid/solvent storage cabinets may also be provided by the manufacturers listed with their descriptions.

1. Laboratory Casework:

   a. Air Master Systems, 6480 Norton Center Drive, Muskegon, MI 49441 Tel 231 798-1111.

   b. Bedcolab Ltd, 2305 Francis Hughes Avenue, Laval, Quebec, Canada H7S 1H5 Tel 514 384-2820.

   c. CiF Lab Solutions, 53 Courtland Avenue, Vaughan, Ontario, Canada L4K 3T2 Tel: 905 738-5821.

   d. Jamestown Metal Products, Inc., 178 Blackstone Avenue, Jamestown, NY 14701 Tel: 716 665-5313.

   e. Kewaunee Scientific Corporation, P O Box 1842, Statesville, NC 28687 Tel: 704 873-7202.

   f. Mott Manufacturing Ltd., 452 Hardy Road, P. O. Box 1120, Brantford, ON, Canada N3T 5T3 Tel: 519 752-7825

   g. Approved substitution.

B. Metal Laboratory Casework

1. Design Requirements:

   a. Door and drawer front design: Square edged inset metal construction with all front surfaces above the toe space in the same plane.

   b. Pulls on doors shall be mounted vertically and on drawers horizontally.

   c. All tall cases shall be provided with toe space to match base units.

   d. All cabinets shall be constructed and finished to be suitable for use as stand-alone units and to permit future rearrangement without the need for additional parts or finish.

   e. Widths of drawers in knee opening rails shall not be less than 24 inches (600 mm) or the width of the rail whichever is the lesser.

   f. Cabinets below fume hoods that conflict with ductwork, cup sinks, or waste connections shall be 19 inches deep to accommodate any obstructions.

   g. Glass: Framed glass doors:

1). 1/8 inch (3mm) to 7/32 inch (5.5 mm) nominal tempered glass.

2). Without imperfections or marred surfaces.

3). All glass should have etched safety information, readable from outside the cabinet.

2. Base, Wall, Upper, and Tall Cabinets:

a. General:

1). Exterior corners: shall be spot and arc welded with heavy back up reinforcement at exterior corners. All face joints shall be arc welded and ground smooth to provide a continuous flat plane.

2). All units shall have a cleanable smooth interior. Front and rear posts, reinforcing members or channel uprights shall be enclosed full heights on all cabinet openings.

3). End Uprights shall be formed into not less than a channel formation at top, bottom, back and front.

4). The edge of the vertical uprights shall be formed to provide a strike for doors and drawers, and shall be perforated for the support of drawer channels, intermediate rails and hinge screws.

5). An upright filler shall be screwed in place in all cupboard units to close the back of the channel at front of the upright and to provide a smooth interior for the cupboard to facilitate cleaning.

6). The upright filler shall be perforated with shelf adjustment holes at no more than ½ inch (12.7 mm) centers.

7). The inside front of the upright shall be further reinforced with a full height 14 gauge (2.0 mm thick) hinge reinforcement angle.

8). Die Formed Gussets: shall be furnished in each bottom corner of base units to insure rigidity, and a 3/8 inch (10 mm) -16 leveling bolt, 3 inches (75 mm) long, shall engage a clinch nut in each gusset. Each leveling bolt and gusset shall be capable of supporting 500 lbs (225 kg). (Each unit shall support 2000 lbs. (900 kg) uniformly distributed on a work top.) Provide caps at all penetrations provided to access leveling devices.

b. Cabinet Base:

1). Case bottom and bottom rail shall be formed of one piece of metal except in corner units and shall have both sides and back formed up or down and shall be offset in front to provide a door and drawer recess rabbet.

2). Toe Space Rail: shall extend up and forward to engage bottom rail to form a smooth surfaced toe space, 3 inches (75 mm) deep and 4 inches (100 mm) high. Whenever the base is omitted for units to be set on building bases or separate metal bases, the toe space rail shall extend back 4½ inches (115 mm).

c. Cabinet Back, Unexposed: Cabinet back shall consist of a top and bottom rail, channel formed for maximum strength and welded to back and top flange of end uprights, with space between left open for access to plumbing lines. All units shall be provided with removable back panels.

1). Sink units shall be provided with fixed half-height backs to allow plumbing lines to enter and exit the cabinet through the open area.

d. Shelves: shall be full depth formed down ¾ inch (19 mm), back 7/8 inch (22 mm) and up ¼ inch (6 mm) at front and rear and formed down at ends ¾ inch (19 mm). Shelves over 36 inches (914 mm) in length shall be additionally reinforced by a flanged channel shaped member electro-welded to underside of shelf. Shelves shall be adjustable. Full-depth is defined as a shelf whose front edge is within ½ inch (13mm) of the face of the cabinet when the shelf is fully back in the cabinet.

1). Restraint: At open shelf units, provide retainer rail as specified elsewhere in this section and detailed on drawings.

e. Doors: shall be readily removable and hinges easily replaceable. Hinges shall be applied to the case and door with screws. Welding of hinges to either case or door will not be acceptable.

f. Door and Drawer Heads:

1). Metal, Flush Inset: shall be a two-piece sheet steel assembly of ¾ inch (19 mm) overall thickness to consist of an inner pan formed as an extension of the drawer body, an outer pan having a channel formation on all four sides, and the interior space filled with a non-

organic sound deadening material at the time of assembly. Door Pans and Drawer Heads shall be painted inside and out prior to assembly.

a). All four corners of door and drawer heads shall be welded closed and ground smooth to eliminate exposure of raw edges and open gaps.

b). Glazed Hinged Door Contruction: Glazed swinging doors shall be 3/4” thick and consist of an inner and outer door pan welded to form a single unit. Outer door pan shall be 18 gauge steel, formed into a channel or flanged shape at all four sides. It shall be pierced and formed to create a 3” wide frame with a beveled edge around the glass opening in the center of the door. Inner door pan shall be 18 gauge steel, flanged at all four sides, pierced for a glass opening in center of the door, with 16 gauge hinge reinforcements welded in place. Glazing shall be held in place by a rubber or vinyl gasket around the entire edge of the glass. Outer door pan shall be prepared as necessary to accept attachment of pulls as specified elsewherein this section.

g. Drawer Construction:

1). Drawer bodies shall be made in one-piece construction including the bottom, two sides, back and inner front. They shall be fully coved at interior bottom on all four sides for easy cleaning. Sides shall be full height with ½ inch (13 mm) clearance to frame opening. Drawers shall be a minimum of 18 inches front to back.

2). Drawer Suspension: Refer to Drawer Slides under Hardware section.

3). Drawer stops: shall be provided to insure smooth, quiet operation at point of contact with cabinet front.

h. Top Horizontal Rail: Provide on base cabinets such that rail shall interlock within the flange at top of end panels for strength. Reinforcements shall be provided at all front corners for additional welded strength between vertical and horizontal case members.

i. Intermediate Rails: Provide on base cabinets such that rails shall be provided between doors and drawers, but shall not be provided between drawers unless made necessary by locks in drawers. When required, intermediate

rails shall be recessed behind doors and drawer fronts, and designed so that security panels may be added as required.

j. Intermediate Vertical Uprights: shall be furnished to enclose cupboards when used in a unit in combination with a half width bank of drawers. However, to allow storage of large or bulky objects, no upright of any type shall be used at the center of double door cupboard units.

k. Security Panels: Provide security panels in frames between drawers and cabinets within a cabinet where keyed different locks are indicated.

l. Knee Space Service Strip Cover Panels where specified, shall be 18 gauge (1.3 mm thick) steel, of the same finish as cabinets, and shall be furnished at open spaces under counter top where no cabinets occur. They shall be easily removable and shall cover piping from underside of top of service ledge to floor.

m. Provide filler panels where required between cabinets, at corner intersections of cabinets, between cabinets and walls and wherever else required for a complete finished installation. For tall cabinets, filler panels shall be provided for vertical face and top. For wall cabinets, filler panels shall be provided for vertical face, top and bottom. Filler panels shall follow the profile of toe kicks.

3. Metal-Framed Laboratory Tables

a. Tops: Refer to Laboratory Furnishing drawings for worktop materials, described in the Laboratory Work Surfaces section of this specification.

b. Electrical receptacles: Tables shown with electrical receptacles shall be pre-wired including cutouts for electrical receptacles, black cord, 90-degree NEMA 5-20P plug, back boxes, gray NEMA 5-20R decora-style electrical receptacles, stainless-steel faceplates, wiring, and junction boxes as required for a complete functional assembly.

1). The first electrical device wired from the main cord shall be a 20-amp GFCI outlet with downstream protection capability.

2). Ensure wiring to downstream receptacles is connected to the downstream outlets such that GFCI protection is provided to downstream outlets.

3). Cover plates of downstream outlets to be engraved to note that GFCI protection is provided via upstream receptacle.

a). The table assembly shall be UL962A tested and labeled.

c. Leveling Glides and Leg Shoes:

1). Each leg other than those fitted with casters shall have leveling glides: (2 inch) (48 mm) diameter, two-piece pivot construction, steel housing, nonmarring, phenolic or translucent plastic insert, (1/2 inch) (12 mm) diameter, minimum (1 1/2 inch) (36 mm) long zinc plated stems. Each glide shall have a load bearing capacity of 150 lbs.

2). Each leg other than those fitted with casters and adjustable-height legs, shall have leg shoes: Black coved vinyl or rubber leg shoe, 2 inches (50 mm) in height.

d. Casters: Where indicated on Laboratory Furnishing drawings, provide sets of 3 ½ inch (89 mm) diameter wheels with self-lubricating bearing, rated to carry 250 pounds (113 kg) minimum each. Each caster must swivel and have a locking brake at front wheels. Wheel shall be of molded polyurethane tread mechanically locked to a polyolefin core. Movable tables to have all 4 casters swivel and the 2 front casters lockable.

a. Adjustable-Height Legs: Where indicated on Laboratory Furnishing drawings, provide a stainless-steel insert at the bottom of each leg. Height of each insert shall be adjustable in 2 inch (50mm) increments using stainless-steel pins. This shall result in a work-surface top height range between 30 inches (750mm) and 38 inches (1000mm). Include leveling glide at bottom of each insert.

b. Construction:

1). Table rails, legs, and spreader rails shall be fully welded into a single-piece table frame structure. No mechanical joints between members are permitted.

c. Rails: Not less than 1½ inch x 4½ inch 16 gauge (38 x 114 x 1.6 mm) channel steel sections, reinforced as necessary for leg attachment.

d. Legs: Not less than 2 inch x 2 inch 16 gauge (50 x 50 x 1.6 mm) square tubular steel sections.

e. Leg rails and spreader rail: Not less than 1¼ inch x 2½ inch 16 gauge (32 x 63 x 1.6 mm) steel sections, reinforced as necessary for leg attachment.

f. Materials and Finish: Refer to Metal Fabrications specifications in this Section for material and finish requirements.

4. Aprons and leg assemblies:

a. Apron: Not less than 1½ inch (38 mm) x 4 inch (114 mm) 16 gauge (x 1.6 mm thick) channel steel sections, reinforced as necessary for leg attachment.

b. Legs: Not less than 2 inch (50 mm) x 2 inch (50 mm) 16 gauge (x 1.6 mm thick) square tubular steel sections.

c. Leg rails: Not less than 1¼ inch (32 mm) x 2½ inch (63 mm) 16 gauge (x 1.6 mm thick) steel sections, reinforced as necessary for leg attachment. Each leg shall have a recessed leveling screw and a black, coved vinyl or rubber leg shoe, 2 inches (50 mm) in height.

5. Fume Hood Cabinets:

a. Purpose-designed metal cabinet with fixed panel above door to conceal cup sink and plumbing.

b. Provide metal fume hood cabinets where adjacent cabinetry below a fume hood is also metal.

6. Corrosives Storage Cabinets:

a. Manufacturers:

1). Justrite Manufacturing Company, 2454 Dempster St., Suite 300, Des Plaines, IL 60016 Tel: 800 798-9250.

2). Approved substitution.

b. Purpose-designed lined metal cabinet.

c. Lining: All interior surfaces of the cabinet shall be coated with a 100% seamless non-porous flame-coated thermoplastic liner. Liner shall be applied to all interior walls, ceiling, sump, door interiors, and shelving. Basis of design: Justrite Chemcor. No known equal.

1). Shelf: Removable adjustable full-depth metal shelf coated with lining material. Full-depth is defined as a shelf whose front edge is within ½

inch (13mm) of the face of the cabinet when the shelf is fully back in the cabinet.

d. Label: "CORROSIVES" in conspicuous silk-screened lettering. Stick-on decals are not acceptable. Size and style of lettering shall match the Flammable Liquid/Solvent Storage Cabinet label. Lettering shall be 2 ½ inches tall. Color of lettering shall be red. If cabinet color is red, lettering shall be yellow.

e. Locks: Cabinet doors shall be lockable. Lock shall have not metal parts exposed within the lined interior.

f. Venting:

1). Cabinets below or adjacent to fume hoods: Provide and install 2 inch (50 mm) diameter schedule 40 PVC vent pipe and PVC fittings. Termination of vent pipe maybe one of the following:

a). Extend vent pipe 4 inches (100 mm) above dished worktop, behind the baffle in the hood, as shown on the drawings. Provide hole through fume hood work surface above the corrosive storage cabinet to accommodate 2 inch (50 mm) diameter vent pipe. Seal gap around penetration with clear silicone sealant.

b). Extend vent pipe up within the fume hood side wall and vent through the hood side wall liner behind the upper portion of the fume hood baffle.

2). Cabinets not below or adjacent to fume hoods: Vent connection to exhaust duct system shall be by Division 23. Provide hole in back of cabinet to accept exhaust connection.

g. Seismic Anchor: Provide seismic anchor for freestanding cabinets and cabinets located below fume hoods designated to be removable for access for persons with disabilities. Seismic anchors may be floor or wall attachments, but shall not attach to adjacent casework or work surfaces. Seismic anchors shall be accessible without removal of laboratory casework, furnishings, or equipment.

7. Flammable Liquid/Solvent Storage Cabinets:

a. Manufacturers:

1). Manufacturers of metal laboratory casework.

2). Eagle Manufacturing Company, 2400 Charles St., Wellsburg, WV 26070 Tel: 304 737-3171.

3). Justrite Manufacturing Company, 2454 Dempster St., Suite 300, Des Plaines, IL 60016 Tel: 800 798-9250.

4). Approved substitution.

b. Purpose-designed double-walled metal cabinet for the storage of flammable, combustible and solvent liquids.

c. Cabinet doors: Well-fitting, metal, self-closing and self-latching with fusible lead links and door sequencer.

d. Label: "FLAMMABLE - KEEP FIRE AWAY" in conspicuous silk-screened lettering. Stick-on decals are not acceptable. Size and style of lettering shall match that of the Corrosive Storage Cabinet label. “FLAMMABLE” lettering shall be 2 ½ inches tall. “KEEP FIRE AWAY” lettering shall be 2 inches tall. Color of lettering shall be red. If cabinet color is red, lettering shall be yellow.

e. Locks: Cabinet doors shall be lockable.

f. Floor pan: Provide a 2 inch (50 mm) deep liquid tight pan to cover the entire bottom of the cabinet to contain liquid leaks and spills.

g. Shelves: Provide heavy-duty full-depth metal shelves using pan-type construction to create a liquid-tight containment tray.

h. Casters: Provide cabinets with lockable casters where indicated on the Laboratory Furnishing drawings.

i. Standards:

1). Comply with the requirements of OSHA and NFPA 30.

2). Comply with the requirements of Uniform Fire Code and the International Fire Code with with UL 1275 and FM 6050 labels.

j. Flammable liquid/solvent storage (base) cabinets shall not be vented. Seal vent openings with bungs as provided by manufacturer.

k. Venting of tall cabinets:

1). Vents from multiple cabinets shall not be manifolded prior to connection to the building system.

l. Electrical grounding:

1). Provide each flammable liquid / solvent storage cabinet with an externally mounted grounding conductor screw terminal for up to #8 AWG conductor, mounted at the top of the cabinet.

2). Connection from the equipment grounding bus at the lab branch circuit panel to the storage cabinet terminal shall be by Division 26.

m. Seismic Anchor: Provide seismic anchor for freestanding cabinets and cabinets located below fume hoods designated to be removable for access for persons with disabilities. Seismic anchors may be floor or wall attachments, but shall not attach to adjacent casework or work surfaces. Seismic anchors shall be accessible without removal of laboratory casework, furnishings, or equipment. Anchor attachment shall not void UL listing.

8. Vacuum Pump Cabinets:

a. Provide metal vacuum pump cabinets at:

1). Locations where vacuum pump cabinets are located below fume hoods, and adjacent cabinets below fume hoods are also metal.

2). At other locations where adjacent cabinets are metal.

b. Label: "VACUUM PUMP" in conspicuous silk-screened lettering. Stick-on decals are not acceptable. Size and style of lettering shall match the Flammable Liquid/Solvent Storage Cabinet lettering. Lettering shall be 2 ½ inches tall. Color of lettering shall be red. If cabinet color is red, lettering shall be yellow.

c. Venting:

1). Exhaust connection will be by mechanical contractor. Provide flange for interface with exhaust duct.

2). Provide air intake grille as specified elsewhere in this section.

d. Acoustical Lining: Cabinet shall be provided with sound absorption and thermal heat reflecting quilted liner on door back, interior cabinet top, and interior cabinet sides, and interior cabinet back.

1). Acoustical Solutions product ABBC-13, no known equal.

2). Attach along perimeter at 6” on center, typical.

e. Cable/ vacuum line through port: Provide as specified elsewhere in this section.

f. Pump Support: Stainless-steel pull out tray supported by 150 pound full extension drawer slides, with a watertight polypropylene pan insert. Vibration isolation shall be provided between tray and watertight pan insert.

g. Electrical: Provide NEMA 5-20R receptacle mounted to inside back of cabinet installed by Division 11 with final connection by Division 26.

1). Provide lit switch at inside top front of cabinet to control receptacle.

9. Metal Casework Construction Performance: Base cabinets shall be constructed to support a uniformly distributed load of 200 lbs. minimum per square foot (1000 kg/m²) of cabinet top area (total maximum of 2000 lbs. (900 kg)), including working surface without objectionable distortion or interference with door and drawer operation.

a. Base cabinet corner gussets with leveling bolts shall support 500 lbs. (225 kg) per corner, at 1½ inch (38 mm) projection of the leveling bolt below the gusset.

b. Each adjustable and fixed shelf 4 feet (1219 mm) or shorter in length shall support an evenly distributed load of 40 lbs. per square foot (200 kgf/m²) up to a maximum of 200 lbs. (90 kg), with nominal temporary deflection, but no permanent set.

c. Drawer assemblies shall automatically maintain alignment in cabinet opening and shall not bind during opening or closing of the drawer so as to minimize glass breakage and damage to fragile parts.

d. Swinging doors mounted on base units shall support a 250 lb. (113 kg) load located at a test point 14 inches (356 mm) measured horizontally from hinge along the top edge of door through a swing of 180 degrees. Weight test shall allow nominal temporary deflection, but no permanent distortion. Door assembly shall be twist- resistant and rigid, and shall close in a flat plane against the cabinet to permit the door catch at top of door to function properly.

C. Hardware: As specified elsewhere in this Section.

D. Metal Casework Color: As selected by the Architect from manufacturer's full color line and complying with finish requirements described below.

E. Metal Casework Finish Requirements:

1. Paint finish for steel laboratory products shall utilize a dry coating process with minimal waste generation. Liquid-applied coatings shall not be acceptable. Manufacturer shall supply documentation that waste generated during the painting process, is a solid, non-hazardous material.

   a. Pretreatment: Finish process shall incorporate a phosphate conversion coating during the pretreatment/cleaning operation.

   b. Operator Protection: The painting process shall be cleanly contained, have no solvent odor and be performed in an air-conditioned room.

   c. VOC (Volatile Organic Compounds) emissions shall not exceed 0.29 lbs per gallon (35 g/L).

   d. Offgasing: No further emissions or “Offgasing/Decomposition” vapors shall occur at room temperature from installed finished parts.

2. Preparation: After the units have been completely welded together and before finishing, they shall be given a pre-paint treatment to provide excellent adhesion of the finish to the metal and to aid in the prevention of corrosion. Physical and chemical cleaning of the metal shall be accomplished by washing with an alkaline cleaner, followed by a spray treatment with a heated cleaner/phosphate solution and pretreated with iron phosphate spray followed by a neutral final seal prior to application of final finish. The strength of each solution shall be monitored by filtration to insure consistent quality. All treated parts shall be immediately dried in heated ovens and gradually cooled before application of the finish. Treated metal parts shall be clean and properly prepared to provide optimum adhesion of finish and resistance to corrosion.

3. Application: Electrostatically apply 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:

a. All surfaces, exterior or interior, exposed to view, shall receive sufficient powder coat to achieve an average 1.5 mil (38 µm) film thickness with a minimum 1.2 mil (30 µm) film thickness and shall have smooth satin luster.

b. Backs of cabinets and other surfaces not exposed to view shall have sufficient powder coat to achieve an average 1.0 mil (25 µm) film thickness.

4. All drawer bodies to be finished in matching color or in a uniform neutral color.

5. Concealed interior parts shall receive corrosion-resistant treatment.

6. Finish must be UV stable.

F. Metal Finish Performance Requirements:

1. Manufacturer shall submit metal finish performance testing results. Testing to be performed by independent testing agency.

2. Chemical resistance:

a. Test procedure: Place samples on a flat surface, clean with soap and water and blot dry. Condition the panel for 48-hours at 73+ 3F (23(+ 2(C) and 50+ 5% relative humidity, or the currently accepted guideline set by ASTM. Test the samples for chemical resistance using forty-nine different chemical reagents by one of the following methods. For both methods, leave the reagents on the sample for a period of one hour. Wash off the sample with water, clean with detergent and naptha, and rinse with deionized water. Dry with a towel and evaluate after 24-hours at 73± 3°F (23°± 2°C) and 50± 5% relative humidity, or the currently accepted guideline set by ASTM

1). Method A: Test volatile chemicals by placing a cotton ball saturated with reagent in the mouth of a 1-oz. (29.574cc) bottle and inverting the bottle on the surface of the sample. The cotton ball shall remain in contact with the sample for the duration of the test.

2). Method B: Test non-volatile chemicals by placing five drops of the reagent on the surface of the sample and covering with a 24mm watch glass, convex side down.

b. Rating System: Evaluations shall use the following rating system:

Level 0	No detectable change.

Level 1	Slight change in color or gloss.
Level 2	Slight surface etching or severe staining.
Level 3	Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration.

c. Acceptance Level:

1). Individual test results for the specified 49 reagents shall be within the Range for that reagent as specified on the table below.

2). There shall be no more than four (4) Level 3 conditions.

d. Table of reagents:

Test No.	Chemical Reagent	Test Method	Range
1.	Acetate, Amyl	A	0-1
2.	Acetate, Ethyl	A	0-2
3.	Acetic Acid, 98%	B	0-3
4.	Acetone	A	0-1
5.	Acid Dichromate, 5%	B	0-1
6.	Alcohol, Butyl	A	0-1
7.	Alcohol, Ethyl	A	0-1
8.	Alcohol, Methyl	A	0-1
9.	Ammonium Hydroxide, 28%	B	0
10.	Benzene	A	0-2
11.	Carbon Tetrachloride	A	0-1
12.	Chloroform	A	0-2
13.	Chromic Acid, 60%	B	0-2
14.	Cresol	A	0-2

Test No.	Chemical Reagent	Test Method	Range
15.	Dichloroacetic Acid	A	0-3
16.	Dimethylformamide	A	0-2
17.	Dioxane	A	0-2
18.	Ethyl Ether	A	0-1
19.	Formaldehyde, 37%	A	0-1
20.	Formic Acid, 90%	B	0-3
21.	Furfural	A	0-3
22.	Gasoline	A	0
23.	Hydrofluoric Acid, 37%	B	0-2
24.	Hydrofluoric Acid, 48%	B	0-3
25.	Hydrogen Peroxide, 30%	B	0-1
26.	Iodine, Tincture of	B	0-2
27.	Methyl Ethyl Ketone	A	0-2
28.	Methylene Chloride	A	0-2
29.	Monochlorobenzene	A	0-2
30.	Naphthalene	A	0-1
31.	Nitric Acid, 20%	B	0-1
32.	Nitric Acid, 30%	B	0-1
33.	Nitric Acid, 70%	B	0-3
34.	Phenol, 90%	A	0-2
35.	Phosphoric Acid, 85%	B	0-1
36.	Silver Nitrate Saturated	B	0

Test No.	Chemical Reagent	Test Method	Range
37.	Sodium Hydroxide 10%	B	0
38.	Sodium Hydroxide 20%	B	0
39.	Sodium Hydroxide 40%	B	0-1
40.	Sodium Hydroxide Flake	B	0
41.	Sodium Sulfide Saturated	B	0
42.	Sulfuric Acid, 33%	B	0
43.	Sulfuric Acid, 77%	B	0
44.	Sulfuric Acid, 96%	B	2-3
45.	Sulfuric Acid 77% & Nitric Acid 70% equal parts	B	1-3
46.	Toluene	A	0-1
47.	Trichloroethylene	A	0-1
48.	Xylene	A	0-1
49.	Zinc Chloride, Saturated	B	0

3. Hot Water Test

   a. Test Procedure: 190°F to 205°F (88°C to 96°C) hot water shall be allowed to trickle (with a steady stream and at a rate of not less than 6 ounces (177.5 cc) per minute) on the finished surface, which shall be set at an angle of 45°, for a period of 5 minutes.

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

4. Paint Adhesion on Steel Test

   a. Test Procedure: Test shall be based on ASTM D2197-86 “Standard Method of Test for Adhesion of Organic Coating.” Two sets of eleven parallel lines 1/16 inch (1.587 mm) apart shall be cut with a razor blade to intersect at right angles thus forming a grid to 100 squares. The cuts shall be made just deep

enough to go through the coating, but not into the substrate. Brush surface lightly with a soft brush for one minute. Examine under 100 fc (1076 lux) of illumination.

b. Acceptance Level: Ninety or more of the squares shall show finish intact.

5. Impact Test

a. Test Procedure: Drop a 1 lb (0.4536 kg) ball (approximately 2 inch (50.8 mm) diameter from a distance of 12 inches (305 mm) onto a flat horizontal surface, coated to manufacturer's standard manufacturing method.

b. Acceptance Level: No visual evidence to the naked eye of cracks in the finish due to impact.

6. Paint Hardness on Steel Test

a. Test Procedure: Paint film shall be tested with pencils of various hardnesses. Pencils shall have a wide, sharp edge. Pencils shall be pushed across surface in a chisel-like manner.

b. Acceptance Level: Finish film shall not rupture from a sharpened 4H pencil.

2.2 CABINET HARDWARE

A. General: Special cabinets, such as corrosives storage, flammable liquid and solvent storage, rock storage, map storage, museum storage, radioisotope storage, and narcotics lockers, may be provided with the manufacturer's standard hardware.

1. All door and drawer pulls shall match, regardless of type of casework, except for:

a. Flammable liquid/ solvent storage cabinets, which should use manufacturer's standard latch handles as required to satisfy requirements of regulatory approvals.

2. All hardware shall be compliant with the ADA Standards for Accessible Design (28 CFR Part 36) and 2013 California Building Code.

B. Drawer and Hinged Door Pulls:

1. Drawer and door pulls shall attach to door or drawer with machine screws. Two (2) pulls shall be furnished on drawers wider than 28 inches (711 mm). Plastic pulls or other types subject to breakage are not acceptable.

2. Type: Pulls shall be round “wire.”

a. Material and Finish:

1). Stainless steel with finish as follows:

2). BHMA 630 Satin (Previously US32D).

b. Size:

1). Length: 4 inches (100 mm) center to center of screw holes.

2). Diameter: ¼ inch (6 mm).

C. Hinges:

1. General: Hinges shall be attached to both door and case with three screws through each leaf. Provide two hinges for doors up to 48 inches (1219 mm) high; three hinges for doors over 48 inches (1219 mm) high.

2. Type: Institutional with a five-knuckle bullet-type barrel. Characteristics:

a. Height: 2½ inches (63 mm), nominal.

b. Material: Stainless steel with stainless steel screws.

1). Finish:

a). BHMA 630 Satin (Previously US32D).

2). Manufacturers:

a). Rockford Process Control, Inc. 202 Seventh St., Rockford, IL 61104 Tel: 815 966-2000.

b). Approved substitution.

D. Shelf Hardware:

1. Shelf Supports:

a. Adjustable shelf supports: Adjustable plastic shelf support with lockdown clips.

2. Manufacturers:

a. Bainbridge Manufacturing, Inc., P. O. Box 487, 237 W 3rd, Waterville, WA 98858 Tel: 800 255-4702.

b. The Engineered Products Company (Epco), P. O. Box 108, Flint, MI 48501 Tel: 313 767-2050.

c. Knape & Vogt Manufacturing CO., 2700 Oak Industrial Dr. NE, Grand Rapids, MI 49505 Tel: 616 459-7620.

d. Sugatsune America, Inc. 221 East Selandia Lane, Carson, CA 90746 Tel: 310 329-6373.

e. Approved substitution.

E. Catches:

1. Roller Catches:

a. Types and Materials: Roller catches shall be one of the following types. All-plastic or knuckle-type catches are not acceptable, except at corrosive storage cabinets.

1). Tension ball catches consisting of a case with an adjustable-tension ball catch and a martching strike. Components shall be either stainless steel, chrome plated zinc alloy, or chrome-plated brass.

2). Nylon roller housed in a steel case, which catches on a steel strike plate. Steel components shall be zinc finished.

3). At metal casework base cupboard, catches may consist of a two-piece heavy-duty cam action positive catch positioned near the pivoting edge of door which provides a clean unobstructed opening. Main body of the catch shall be confined within an integral cabinet divider rail, while latching post shall be mounted on the hinge side of door.

4). At corrosive storage cabinets, catches shall be non-metallic.

b. Application: Provide roller catches at top of all non-locked cabinet doors.

c. Manufacturers:

1). The Engineered Products Company (Epco), P. O. Box 108, Flint, MI 48501 Tel: 313 767-2050.

2). Sugatsune America, Inc. 221 East Selandia Lane, Carson, CA 90746 Tel: 310 329-6373.

3). Approved substitution.

2. Elbow catches: Heavy-duty, adjustable, spring-type elbow catch and strike plate.

a. Material: Brass or steel with bright chromium plated finish.

b. Application: Elbow catches shall be used on left hand doors of locked double door cabinets, including tall cabinets.

1). At tall cabinets, elbow catch shall latch to fixed center shelf. Latching devices using chains or strings are not acceptable.

c. Manufacturers:

1). The Engineered Products Company (Epco), P. O. Box 108, Flint, MI 48501 Tel: 313 767-2050.

2). Approved substitution.

F. Drawer slides:

1. Typical: Ball bearing slides:

a. Material:

1). Clear, zinc-coated steel.

b. Full extension, 100 lb/pr. (45 kg/pr.) capacity: Accuride 3832, Fulterer FR5000, or equal.

c. File drawers shall be equipped with rail mounted with overtravel, 150 lb/pr. (68 kg/pr.) capacity: Accuride 4034, Fulterer 5755, or equal.

d. Pull-out shelf suspension: 100 lb/pr. (45 kg/pr.) capacity pull-out shelf slide: Accuride 322, or equal.

e. Pull-out writing boards: 110 lb/pr. Capacity lock-out slide with 20” of travel: Accuride 340-247, or equal.

f. Manufacturers:

1). Accuride, 12311 Shoemaker Ave., Santa Fe Springs, CA 90670 Tel: 562 903-0200.

2). Hettich America LLP, 6225 Shiloh Road, Alpharetta, Georgia 30005 Tel: 770 887-3733.

3). Fulterer USA, 542 Townsend Ave., High Point, NC 27263 Tel: 800 395-4646.

4). Waterloo Furniture Components Inc., 501 Manitou Dr., Kitchener, Ontario, Canada N2C 1L2 Tel: 519 748-5060.

5). Approved substitution.

2. Typical: Stainless steel ball bearing slides:

a. Typical drawers shall be equipped with full extension, 100 lb/pr. (45 kg/pr.) capacity: Sugatsune ESR-7, or equal.

b. File drawers shall be equipped with rail mounted with overtravel, 150 lb/pr. (68 kg/pr.) minimum capacity: Sugatsune ESR-10, or equal.

c. Provide matching slides at pull-out writing boards, pull-out keyboard trays, pull-out shelves, and other similar conditions.

d. Manufacturers:

1). Sugatsune America, Inc. 221 East Selandia Lane, Carson, CA 90746 Tel: 310 329-6373.

2). Standard-Keil, Route 34 and Allenwood Rd., Allenwood, NJ 08720 Tel: 908 449-3700.

3). Approved substitution.

G. Special Hardware Requirements for Mobile Cabinets:

1. Mobile cabinets shall be engineered by the manufacturer to avoid overturning (tipping) when drawers are loaded to their design load, and opened to the specified glide opening.

2. The top drawer of mobile cabinets shall have an opening restricted to ¾ full open.

3. Mobile cabinets shall be provided with a rod-based drawer interlock glide system to prevent multiple drawers from being opened simultaneously. Accuride 3641 with companion slides Accuride 3642, Fulterer FR5218 with companion slides FR5019, or similar.

4. Mobile cabinets may additionally be provided with a counter weight system, consisting of galvanized steel plates securely attached to the cabinet bottom or inside the cabinet back. The weights shall not be visible when the cabinet is in the normal, upright position.

H. Drawer Stops: All regular drawers shall be equipped with integral stops to prevent drawer head impact with cabinet body.

I. Door Stops: Provide door stops for any cabinet door, which will strike an obstruction when opened between 90° and 135°.

1. Stop to be either:

a. Sash chain, #30 zinc-plated steel.

1). Terminations: Zinc chromate wire screw eyes. Open eye as required to attach stop with screws. Through-bolting not allowed.

b. Coated cable.

1). Seven-strand, 7-wire-per-strand, stainless steel cable with clear nylon coating.

2). Wire diameter: 0.047 inches.

3). Composite diameter with coating: 0.063 inches.

4). Terminations: Number 10 stake eye on both ends. Attach to door/cabinet with screws. Through-bolting not allowed.

5). McMaster Carr part number 30345T3 or equivalent.

2. Engineer stop to length to allow door to open 1 ½ inch (40 mm) from obstruction.

J. Hanging File Suspension System: Hangers shall be fastened and secured to drawer construction and shall not be freestanding units set inside the drawer. Provide in all file drawers.

1. Basis of Design: Blum Metafile Hanging File Frame Kit.

2. Manufacturers:

a. Julius Blum, Inc. 7733 Old Plank Rd., Stanley, NC 28164 Tel: 800 438-6788.

b. Hettich America L. P., 6225 Shiloh Rd., Alparetta, GA 30005 Tel: 800 438-8424.

c. Approved substitution.

K. Locks:

1. General: Provide locks on all file cabinet drawers. Provide locks at other locations as indicated on the drawings.

2. Lock type: Deadbolt-type lock.

a. Disc-tumbler-type locks and/or cam-type locks will not be accepted.

b. Framed sliding door locks shall be plunger type.

c. Refer to Elbow Catches section, above, for requirements at two-swinging-door cabinets.

3. Testing requirements:

a. Locks shall comply with ANSI/BHMA standard E07121.

b. Lock shall be cycle tested per ANSI/BHMA A156.11 Grade 1.

4. Include spacers, adapters, fasteners, and strikes.

a. All locks shall strike into metal material. Striking directly into wood is not acceptable.

5. Barrel length shall be coordinated with specific conditions.

6. Finish: Locks shall have satin nickel or satin chrome finish.

7. Keying:

a. Key quantities: Provide two keys per lock. Provide four copies of any master/ grand master keys.

b. Key system:

1). Key system shall support a minimum of 2000 different keys.

2). Key system shall support up to three levels of master keys (grand-master keys, master keys, and sub-master keys) in addition to individual keys.

c. Key cylinder type:

1). Coordinate key type with owner.

d. Key schedule: Coordinate key schedule with Owner.

8. Key engraving:

a. Keys to be engraved with an identification number corresponding to the layout of unique keys on the project. All identical keys shall be engraved with the same number.

9. Manufacturers:

a. Swinging Doors and Drawers:

1). Illinois Lock Company, 301 West Hintz Rd., Wheeling, IL 60090 Tel: 847 537-1800.

2). National Cabinet Lock, 200 Old Mill Rd., P. O. Box 200, Mauldin, South Carolina 29662 Tel: 864-297-6655.

3). Olympus Lock, Inc. 18424 Highway 99, Lynnwood, Washington 98037 Tel: 206 362-3290.

4). Approved substitution.

b. Sliding Doors:

1). National Cabinet Lock, 200 Old Mill Rd., P. O. Box 200, Mauldin, South Carolina 29662 Tel: 864 297-6655.

2). Olympus Lock, Inc. 18424 Highway 99, Lynnwood, Washington 98037 Tel: 206 362-3290.

3). Sugatsune America, Inc. 221 East Selandia Lane, Carson, CA 90746 Tel: 310 329-6373.

4). The Engineered Products Company (Epco), P. O. Box 108, Flint, MI 48501 Tel: 313 767-2050.

5). Approved substitution.

L. Glides: Non-marring material, 1 inch (25 mm) diameter, minimum, with at least 5/8 (16 mm) vertical adjustment. Provide on movable tables, unless otherwise indicated.

M. Leveling devices: Provide each table leg with 3/8 inch (10 mm) minimum diameter leveling bolt and floor clip.

N. Leg shoes: Leg shoes shall be provided on all legs and table legs to conceal leveling devices, except for tables with casters. Shoes shall be 2 ½ (63 mm) inch high and of black rubber or pliable black vinyl material. Use of a leg shoe which does not conceal leveling device is not acceptable.

O. Floor clips: Provide leg assemblies and fixed table legs with floor clips securely fastened to the floor after shimming.

P. Casters: Where indicated on Laboratory Furnishing drawings, provide sets of 3 ½ inch (89 mm) diameter wheels with self-lubricating bearing, rated to carry 250 pounds (113 kg) minimum each. Each caster must swivel and have a locking brake. Wheel shall be of molded polyurethane tread mechanically locked to a polyolefin core.

1. Material: Caster shall be heavy gauge stainless steel.

2. Manufacturers:

a. Acorn Industrial Products Co., 7 Union Hill Dr., W. Conshohocken, PA 19428 Tel: 800 523-5474.

b. Caster Technology Corporation, 3265 Whipple Rd., Union City, CA 94587, Tel: 510 429-6727.

c. Hamilton Caster & Mfg. Co., 1637 Dixie Highway, Hamilton, OH 45011 Tel: 888 699-7164.

d. Approved substitution.

Q. Support Struts and Service Ledging: Refer to specifications for slotted channel framing in this Section.

2.3 LABORATORY WORK SURFACES

A. Epoxy Resin:

1. Manufacturers: Products complying with this specification may be provided by the following manufacturers.

a. Durcon Laboratory Tops, Inc., 206 Allison Drive, Taylor, TX 76574 Tel: 512-595-8000.

b. Epoxyn Products, 500 E. 16th Street, Mountain Home, AR 72653
Tel: 870 425-4321.

c. Kewaunee Scientific Corporation, P O Box 1842, Statesville, NC 28687
Tel: 704 873-7202.

d. Prime Industries, Inc., 2600 Warrenville Road, Suite 205, Downers Grove, IL 60515 Tel 630-725-9200

e. Approved substitution.

2. Thickness:

a. Typical work surface: 1 inch (25 mm).

b. Fume hood work surfaces: Tops shall be 1¼ (32 mm) inches thick at outer edge, indented minimum ¼ inch (6 mm) to provide a raised rim around all exposed edges 1 inch (25 mm) wide, minimum, or as to allow for the fume hood sash. The front top edge of the raised rim and exposed vertical corners of the top shall be rounded or chamfered to a 1/8 inch (3 mm) radius. The juncture between the raised rim and the top surface shall be coved or chamfered to a ¼ inch (6 mm) radius.

c. Curbs and Splashes: ¾ inch (19 mm).

3. Color:

a. White / Light Gray.

b. Color sample to be approved by Architect before work is put in hand.

4. Description:

a. Monolithic filled epoxy resin work surface consisting of a polymerized cast resin material oven-cured in molds.

b. Drip Grooves: Provide under all work surface exposed edges, unless noted otherwise on the Laboratory Furnishing Drawings. Drip grooves shall be ½ inch (13 mm) from the front edge where the top overhangs 1 inch (25 mm) and ¼ inch (6 mm) from the edge where the edge overhangs ½ inch (13 mm).

c. Edge profile: For all exposed upper edges and corners can be one of the following:

1). Radius eased: 1/4 inch (6 mm) machined radius with blended radius corners.

2). Bevel eased: 1/8 inch (3 mm) machined bevel with blended radius corners.

d. Marine edges: Where indicated on the Laboratory Furnishing Drawings, shall be 1 inch (25 mm) wide and ¼ inch (6 mm) high with chamfered or radiused transition to and be an integral part of the work surface.

e. Indented areas: Where indicated on the Laboratory Furnishing Drawings, shall be ¼ inch (6 mm) deep with chamfered or radiused sides. Internal and external corners shall have ¼ inch to ½ inch (6 to 13 mm) radius. Marine edges formed around indented areas shall not be less than 1 inch (25 mm) wide.

f. Drain grooves: Where indicated on the Laboratory Furnishing Drawings, shall be 3/8 inch (9mm) wide, 2 inches (50mm) on-center, and shall slope at 1/8 inch (3mm) per foot towards the sink.

g. Sink Mounting:

1). Drop-in Sink Cutouts: Cutouts shall be profiled to provide support for the sink, and to ensure that the rim of the installed sink is 1/8 inch (3 mm) below the surrounding work surface level or bottom of drain grooves, if present. The top edge of the cutout shall have 1/8 inch (3 mm) bevel. Ensure that there shall be no gaps between the installed sink rim and work surface.

h. Curbs and Splashes:

1). Height: 4 inches (100 mm), unless noted otherwise on Laboratory Furnishing Drawings.

2). Bonded to the surface of the top to form a square joint.

i. Provide all holes and cutouts as required for built-in equipment and mechanical and electrical service fixtures. Verify size of opening with actual size of equipment to be used prior to making openings. Form inside corners to a radius of not less than 1/8 inch (3 mm). After sawing, rout and file cutouts to ensure smooth, crack-free edges. Seal exposed edges after cutting with a waterproofing material recommended by the manufacturer.

j. Provide full-length, one-piece tops and backsplashes wherever possible, and keep field joints to an absolute minimum.

5. Physical Properties:

a. Chemical resistance:

1). Organic solvents: A cotton ball, saturated with the test chemical, is placed in a one ounce bottle with a reservoir of liquid above the ball. The container is inverted on the test material surface for a period of 24 hours. Test temperature: 23°C ±2°C.

2). Other test chemicals: Five drops (1/4 cc) of the test chemical are placed on the test material surface. The chemical is covered with a 1 inch diameter watch glass for a period of 24 hours. Test temperature: 23°C ±2°C.

3). Evaluation: After 24 hours exposure, exposed areas are washed with water, then a detergent solution, finally with naphtha, then rinsed with distilled water, dried with a cloth, and rated as follows:

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

4). Test results:

Test chemical	Concentration	Black	Dark gray	Light gray	Beige
Chromic acid	40%	3	2	2	2
Hydrochloric acid	10%	0	0	0	0
Hydrochloric acid (conc.)	37%	0	0	0	0
Nitric acid	40%	0	0	0	0
Nitric acid (conc.)	70%	0	0	0	0
Sulfuric acid	60%	0	0	0	0
Sulfuric acid (conc.)	96%	4	4	4	4
Acetic acid	5%	0	0	0	0
Acetic acid (glacial)		0	0	0	0
Citric acid	1%	0	0	0	0
Oleic acid		0	0	0	0
Phenol solution	5%	0	0	0	0
Ammonium hydroxide	10%	0	0	0	0
Sodium carbonate sol.	20%	0	0	0	0
Sodium hydroxide sol.	60%	0	0	0	0
Sodium hypochlorite sol.	4%	0	0	0	0
Acetone		1	1	1	1
Benzene		1	1	1	1
Carbon tetrachloride		1	1	0	0
Diethyl ether		0	0	1	1

Test chemical	Concentration	Black	Dark gray	Light gray	Beige
Dimethyl formamide		0	0	0	0
Ethyl acetate		0	1	1	0
Ethyl alcohol	95%	0	0	0	0
Ethylene dichloride		0	0	0	0
Heptane		0	0	1	0
Isooctane		0	0	0	0
Kerosene		0	0	0	0
Methyl alcohol		0	0	0	0
Toluene		0	0	0	0
Aniline		0	0	0	0
Mineral oil		0	0	0	0
Olive oil		0	0	0	0
Soap solution	1%	0	0	0	0
Transformer oil		0	0	0	0
Turpentine		0	0	0	0

b. Heat resistance:

1). High temperature test: A porcelain crucible is heated to a dull red color, placed on the test material, and allowed to cool to ambient temperature. Result: No observable surface deformation.

2). Flame test: A 3/8 inch (10 mm) Bunsen burner is adjusted to a quiet flame with a 1½ inch (38 mm) inner cone, overturned on the test

material, and allowed to stay for 5 minutes. Result: no observable surface deformation.

c. Physical properties:

Compressive strength	ASTM D695	31,400 psi (216 MPa)
Tensile strength	ASTM D638	8,000 psi (55 MPa)
Flexural strength	ASTM D790	11,700 psi (81 MPa)
Rockwell hardness “M”	ASTM D785	105-110
Specific density	ASTM D792	122.4 lb/ft³ (1960 kg/m³)
Water absorption	ASTM D570	0.01%
Fire Resistance	ASTM D635	ATB (sec)=0
Heat deflection @ 264 psi (1.82 MPa)	ASTM D648	205°F (172°C)

B. Chemical Resistant High-Pressure Decorative (Plastic) Laminate Tops:

1. Manufacturers/Facing material: Products complying with this specification may be provided by the following manufacturers.

a. Nevamar Decorative Surfaces, One Nevamar Place, Hampton, SC 29924 Tel: 800 638-4380.

b. Pionite Decorative Surfaces, One Pionite Road, P.O. Box 1014, Aubern, ME 04211 Tel: 800 746-6483.

c. Wilsonart International, 2400 Wilson Place, P. O. Box 6110, Temple, TX 76503 Tel: 800 433-3222.

d. Approved substitution (no known equal).

2. Approved Products:

a. Nevamar ChemArmor.

b. Pionite ChemGuard.

c. Wilsonart ChemSurf

3. Substrate Thickness:

a. Typical work surface: 1 inch (25 mm).

b. Curbs and Splashes: ¾ inch (19 mm).

4. Color: To be selected by Architect.

5. Description:

a. High-pressure decorative laminate, meeting or exceeding NEMA Standard LD3 2005 Grade HGP, HGL, or HGS requirements, consisting of a resin formulation applied over the decorative surface paper to achieve chemical resistance. The decorative paper shall be treated with melamine resin, and the core shall consist of kraft papers impregnated with phenolic resin. Sheets shall be bonded under high temperature and pressure. Product shall be developed for casework, work surface, and shelving surfaces in laboratories.

b. Finish: Fine pebble-grained “crystal” texture or matte texture with slight sheen to minimize smudges and finger marks, and to provide optimum scratch resistance.

1). Gloss: 15-16 +/- 3 gloss units.

c. Core material: Hardwood veneer core plywood.

1). Description: A one step calibrated core +/- .5mm (to avoid voids) with type 1 waterproof nauf glue. Grade 2 face, and back of mill choice plywood veneer.

2). Thickness/Plies:

a). ¾ inch (19 mm): minimum 7-ply.

b). 1 inch (25 mm): minimum 9-ply.

3). Physical Properties:

a). Average modulus of rupture: 7346 psi (50.65 N/mm2).

b). Face Screw Holding Strength: 355 lbf (1579 N).

d. Backing sheets: High-pressure phenolic meeting or exceeding NEMA Standard LD3-2005 Grade BKL.

e. Plastic laminate adhesive: High-pressure decorative laminate shall be bonded to core with adhesive as recommended by the manufacturer for the application, at temperature above 65°F (18°C) at a pressure no less than 15 pounds per square inch (103 kPa). Laminate core is not to exceed 10% moisture content and is to be laminated and cured in a controlled environment between 45% and 60% RH.

f. Edging: Tops shall be edged with 3 mm PVC edge banding set in hot melt adhesive. Adhesive shall have a minimum softening point of 150°F (65°C). Apply primer to substrate when recommended by adhesive manufacturer.

g. Provide all holes and cutouts as required for built-in equipment and mechanical and electrical service fixtures. Verify size of opening with actual size of equipment to be used prior to making openings. Form inside corners to a radius of not less than 1/8 inch (3 mm). After sawing, rout and file cutouts to ensure smooth, crack-free edges. Seal exposed edges after cutting with a waterproofing material recommended by the manufacturer.

h. Provide full-length, one-piece tops and backsplashes wherever possible, and keep field joints to an absolute minimum.

i. Sinks:

1). Cutouts for top-mounted sinks shall be routed and sanded to form smooth edged openings.

2). Seal exposed edges after cutting with a waterproofing material recommended by the manufacturer.

j. Curbs and Splashes:

1). Height: 4 inches (100 mm), unless noted otherwise on Laboratory Furnishing Drawings.

2). Fabricate similar to top with PVC edge band along exposed ends.

3). Splash shall be set in a thin bead of silicone sealant to prevent moisture migration through the joint.

k. Physical Properties:

1). Reference Standard: Plastic laminates shall meet or exceed ANSI/NEMA Specification LD3-2005 for Type HGP as specified herein, unless otherwise indicated.

2). Minimum Thickness: 0.034 inches ± 0.005 inches (0.97 mm ± 0.13 mm).

3). Cleanability: 10 cycles (NEMA LD3 test method 3.4).

4). Boiling Water Resistance: No effect (NEMA LD3 test method 3.5).

5). High Temperature Resistance: Slight effect (NEMA LD3 test method 3.6).

6). Scratch Resistance: 2.5 Newtons (NEMA LD3 test method 3.7).

7). Ball Impact Resistance: 60 inches (1524 mm) (NEMA LD3 test method 3.8).

8). Radiant Heat Resistance: 200 sec (NEMA LD3 test method 3.10).

9). Dimensional change:

10). Machine direction: 0.50% (NEMA LD3 test method 3.11).

11). Cross direction: 0.80% (NEMA LD3 test method 3.11).

12). Wear resistance: 1,500 cycles, min. (black); 700 cycles, min. (other colors) (NEMA LD3 test method 3.13).

13). Blister Resistance: 70 sec (NEMA LD3 test method 3.15).

14). Stain Resistance Performance Test Results: The surface shall show essentially no effect on Black (Lab grade) plastic laminate when left in contact for 16 hours either when reagents were kept covered or allowed to evaporate.

0	No effect	No detectable change in the material surface.
1	Excellent	Slight detectable change in color or gloss but no change in function or life of the surface.

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

Acids	Concentration	Rating
Acetic acid	All	0
Aqua regia		0
Chromic trioxide (Chromic acid cleaning solution)		1
Glacial acetic acid	99%	0
Hydrochloric acid	All	0
Hydrofluoric acid	48%	0
Formic acid	All	0
Nitric acid	All	3
Sulfuric acid	All	0
Perchloric acid (concentrated)		0
Phosphoric acid	All	0

Acids	Concentration	Rating
Picric acid	1.2%	0
Tannic acid (saturated)		0
Uric acid (saturated)		0

Alkalis		
Ammonium hydroxide	All	0
Sodium hydroxide	All	3
Sodium sulfide	15%	0

Solvents		
Acetone		0
Amyl acetate		0
Amyl alcohol		0
Butyl alcohol		0
Carbon disulfide		0
Carbon tetrachloride		0
Chlorobenzene		0
Chloroform		0
Cresol		0
Dimethylformamide		0

Solvents	
Dioxane	0
EDTA	0
Ethyl acetate	0
Ethyl alcohol	0
Formaldehyde	0
Methanol	0
Methyl ethyl ketone	0
Methylene chloride	0
n-Hexane	0
Naphthalene	0
Phenol	0
Tetrahydrofuran	0
Toluene	0
Trichlorethane	0
Xylene	0

General Reagents	
Alconox (lab detergent)	0
Aluminon	0
Ammonium phosphate	0
Aromatic ammonia	0
Benedicts solution	0

General Reagents		
Calcium hypochlorite (concentrated)		0
Camphorated parachlorophenol		1
Cellosolve		0
Copper sulfate		0
Ethylene glycol		0
Eucalyptol		0
Formalin		0
Gasoline		0
Hydrogen peroxide	3%	0
Iodine		0
Karl Fisher Reagent		0
Kerosene		0
Lactated ringers		0
Lysol		0
Methyl methacrylate		0
Mineral Oil		0
Monsel’s solution (Ferric subsulfate)		0
Naphtha		0
Petroleum jelly		0
Phosphate buffered saline (PBS)		0
Pine oil		0
Potassium permanganate		0
Povidone iodine		0

General Reagents		
Procaine		0
Quaternary ammonia compounds		0
Silver nitrate		0
Sodium azide		0
Sodium chromate		0
Sodium hypochlorite	5%	0
Sodium thiocyanate		0
Sucrose	50%	0
Thymol & Alcohol		0
Tincture of Iodine		0
Tincture of Mercurochrome		0
Tincture of Merthiolate		0
Trisodium phosphate	30%	0
Urea		0
Vegetable oils		0
Water		0
Zephiran chloride		0
Zinc chloride		0
Zinc oxide ointment		0

Stains and Indicators	
Ag Eosin Bluish 5% in Alcohol	0

Stains and Indicators		
Bromothymol Blue		0
Cresol Red		0
Crystal Violet		0
Gentian Violet	1%	0
Gram Stains		0
Malachite Green		0
Methyl Orange		0
Methyl Red		0
Methylene Blue		0
Nigrosine		0
Safranin O		0
Sudan III		0
Thymol Blue		0
Wright's Blood Stain		0

C. Stainless Steel: Refer to Stainless Steel Fabrications section of this specification.

D. Solid Laminated Wood Tops:

1. Edge grain maple laminations with edge grain exposed.

2. Thickness:

a. 1 inch (25 mm)

b. 1¾ inch (44 mm)

c. 2¼ inch (57 mm)

3. Composed of solid hard maple strips 1¾ inches (44 mm) wide, glued with water-resistant resin under heavy pressure side to side and end to end.

4. Curbs and splashes to be ¾ inch (18mm) thick matching material, 4 inches (100mm) high.

5. Round top edges and corners. Plane and sand smooth all surfaces.

6. Provide full-length, one-piece tops and backsplashes wherever possible, and keep field joints to an absolute minimum.

7. Finish:

   a. Finish with two coats of boiled linseed oil, well rubbed into all surfaces.

8. Manufacturers:

   a. Bally Block Co., P.O. Box 188, Bally, Pennsylvania 19503.

   b. Michigan Maple Block Co., P.O. Box 245, Petoskey, Michigan 49770.

   c. Approved equal.

2.4 MOBILE WORKSTATION

A. “h” Frame – (MWS--A)

1. A modular, manufactured, dimensioned system of movable h-frame-style laboratory casework units and matching stand-alone table frames, as shown on the drawings.

2. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

   a. Bedcolab Ltd, 2305 Francis Hughes Avenue, Laval, Quebec, Canada H7S 1H5 Tel 514 384-2820.

   b. CiF Lab Solutions, 53 Courtland Avenue, Vaughan, Ontario, Canada L4K 3T2 Tel: 905 738-5821.

   c. Kewaunee Scientific Corporation, P O Box 1842, Statesville, NC 28687 Tel: 704 873-7202.

   d. Mott Manufacturing Ltd., 452 Hardy Road, P. O. Box 1120, Brantford, ON, Canada N3T 5T3 Tel: 519 752-7825.

3. System requirements:

a. The system shall consist of a fully-welded vertical framework with slotted uprights to support work surface table frames and shelving components; and matching stand-alone table frames.

b. System to be self-supporting and independent of the building structure.

c. All welds shall be continuous and ground smooth.

d. The vertical framework shall be designed to allow for piped utility service fixtures, electrical/data outlets and supply pipwork/cabling lines utilizing the vertical frame system as a utility chase.

e. The vertical height of work surfaces shall be adjustable from 30” high to 37” high, in 1” increments.

f. The upper shelving units shall be adjustable in 1” increments.

g. The bench system shall ship complete with minimal final assembly. Assembly shall be accomplished with simple hand tools.

4. Vertical Framework: Support structure for worksurface table frames and shelves; and service chase for all service lines, data and electrical cables.

a. Vertical framework shall be fabricated as one fully-welded assembly and painted as one piece.

b. Vertical uprights shall allow for internal plumbing, electrical and data cabling.

1). Single frame uprights shall be 11 gauge tubular steel, nominal 2 inch outside diameter.

2). Shared rear frame upright shall be 11 gauge cold-rolled steel formed to a nominal 2 inch X 6 inch member.

3). Gas piping and high/low voltage cabling shall be separated in opposite and separate vertical members.

4). Cabled vertical upright shall have two channels to separate low voltage from high voltage cabling.

5). Uprights shall include removable panels to allow access to piping and electrical services.

6). Removable panel can be on either the inside or the outside of the frame.

c. Frames exceeding 36 inches in width shall have a center top vertical support to accommodate split shelving.

d. Fully welded caps shall be provided at the top and bottom of the vertical support members, with penetrations only as required for levelers and for service connections as indicated.

e. Uprights shall have tapped holes to allow for attachment of worksurface table frames. The uprights shall incorporate machined inserts at these locations for stability and durability.

f. Upright to have slots punched on 1 inch increments starting at nominal 55 inches above the floor to the top of the uprights. Pattern shall match Knape & Vogt 85 ANO series uprights.

g. Upper and lower horizontal cross rails shall be 11 gauge for single frames and 14 gauge for shared frames.

1). Lower horizontal cross rail shall serve as an integral power/data raceway with removable bottom cover. Bottom cover shall be held in place with screws. Provide metal dividers within raceway between power and data cabling compartments.

2). Upper horizontal cross rail may be used for routing of power and electrical cables. Provide metal dividers between power and data cabling compartments. Upper horizontal cross rail shall be provided with a top enclosure panel secured with screws.

h. Provide piped utilities, power, and data services at each unit as shown on the drawings.

1). All utility services (plumbing, power, phone and data) shall terminate at one end of the the top of the vertical framework.

2). Piped services shall comply with the requirements of Division 22.

a). Vertical framework shall be dimensionally able to accommodate up to three piped gas services.

b). Provide service fixtures as scheduled and as specified in section 115343, complete with all gaskets, grommets, and sleeves.

c). Provide gas service fixture mounting penetrations thru frame only for those services shown at each workstation.

d). Unless noted otherwise, internal plumbing lines shall be 3/8 inch OD copper tubing terminating at a quick disconnect attached to the tube with compression fittings at the top of the upright. Refer to section 115343 for quick disconnect valve specifications.

e). All vacuum internal piping shall be ½ inch OD copper tubing.

f). Provide whip or patch cord for each utility. Refer to the drawings and specification section 115343.

3). Electrical power devices shall comply with the requirements of Division 26.

a). The units shall be UL61010A-1 tested and labeled.

b). The units shall be UL962A tested and labeled.

c). Power services shall have a restrained cord and plug extending 4 feet above the top of the upright. Plug end to be twist lock, with a minimum of one circuit per bench.

4). Data devices and wiring shall comply with the requirements of Division 27.

a). Internal data wiring shall extend 4 foot above the upright and terminate with a male connector.

b). Provide a female plug mounted into the top of the workstation. Provide a 4 foot-long patch cord.

5. Worksurface Table Frames: Table framework units that attach to the vertical framework units to support work surfaces.

a. Worksurface table frames shall be fabricated as one fully-welded assembly and painted as one piece.

b. Legs: 2 inch outside diameter 11 gauge cold rolled steel with 1 ¾ inch diameter inner telescoping #304 stainless-steel or cold rolled steel leg to allow for height adjustment.

1). Height adjustment of inner leg shall be accomplished with a hole and pin system.

2). Square telescoping legs of same dimensions and guage are also acceptable.

c. Worksurface frame shall be 11 gauge formed steel. Rear corners shall have 2 ¼ inch diameter x 6 inch high 11 gauge collar. The front half of the collar shall be welded to the worksurface frame with supporting gussets and the back half mechanically fastened to the rear uprights with socket head button cap and bolt.

6. Matching Stand-Alone Table Frames: Stand-alone table frames designed to match the profile and style of the movable metal casework system.
    a. Stand-alone table frames shall be fabricated as one fully-welded assembly and painted as one piece.
    b. Leg design and frame design shall match that of the worksurface table frames.
7. Levelers: Provide levelers at the bottom of each frame member.
    a. Levelers to be 3/8 inch diameter, 2 ½ inch long.
    b. Provide two levelers per shared vertical framework upright.
    c. Provide one leveler per workstation framework table frame leg.
    d. Provide one leveler per single vertical framework upright.
    e. Provide one leveler per movable table frame leg.
8. Load rating:
    a. 100 lbs per linear foot of width to maximum of 800 lbs.
    b. With 800 lbs of uniformly distributed load the maximum allowable deflection shall be 0.125 inch measured at the front center rail.
9. Work Surfaces:
    a. As specified elsewhere in this section.
10. Adjustable Shelving
    a. High-Pressure Decorative Plastic Laminate Shelving as specified elsewhere in this section.
    b. Shelf depth: 12”, unless otherwise indicated.
    c. Shelf Brackets: 11 gauge (1.6 mm thick) bookend type, as detailed on drawings.
    d. Safety edging:
        1). Retainer rail.
    e. Load capacity: System shall support a minimum of 35 pounds per square foot applied at all shelves simultaneously. Maximum deflection shall be 0.35 inches (9mm) under load.
11. Privacy Panels:

a. Tackable acoustically-absorptive ¾ inch thick wood fiber panel wrapped in fully-adhered flame-retardant fabric with metal channel perimeter frame.

b. Wood fiber panel to be factory treated for protection against rot, fungus, and moisture absoption. Density: 30 to 40 pounds per cubic foot.

c. Fabric to be tackable and self-healing. Color to be selected by the Architect.

d. Fire rating: Class C.

e. Frame panel in 14 gauge channel-shaped steel frame, ½ inch tall.

B. Heavy Duty – (MWS--B)

1. Manufacturers: All products specified in this section shall be the furnished by a single manufacturer.

   a. Bedcolab Ltd, 2305 Francis Hughes Avenue, Laval, Quebec, Canada H7S 1H5 Tel 514 384-2820.

   b. CiF Lab Solutions, 53 Courtland Avenue, Vaughan, Ontario, Canada L4K 3T2 Tel: 905 738-5821.

   c. Kewaunee Scientific Corporation, P O Box 1842, Statesville, NC 28687 Tel: 704 873-7202.

   d. Mott Manufacturing Ltd., 452 Hardy Road, P. O. Box 1120, Brantford, ON, Canada N3T 5T3 Tel: 519 752-7825.

   e. Approved substitution.

2. Components

   a. General requirements:

   b. Vertical structural support: 11-gauge cold rolled vertical shall integrate five cable management grommets, in each vertical, for ease running cabling. Capable of vertical adjustment between 82”-88”A.F.F. in two-inch increments.

   c. Equipment rack base: 7-gauge cold rolled horizontal base shall incorporate four bi-directional casters and four levelers that enables the end-user to extended the leveler support foot to prevent any movement from equipment or personnel.

d. Table/shelf support frame: 11-gauge cold rolled steel tubing. Cabinet support channels: 14 gauge cold rolled steel. Weld members using the inert gas process.

e. Support arms:

f. Cantilever support arms: 11 gauge cold rolled steel.

g. Lower shelf support: 11 gauge rolled steel.

h. Cable Management Grommets: Flame resistant ABS plastic, color is black.

i. Finish: Chemical resistant powder paint color to be Fisher Hamilton 1388, SA Sand or equal.

3. Cantilever Table/Shelf Frame:

a. Capable of vertical adjustment between 30”-38”A.F.F. in one-inch increments.

b. Support arm bracket: Support frame of 11 gauge cold rolled steel that incorporates four mechanically fastened machine bolts that interlock into a machine trended welded lock nut.

c. Weight capacity: Total equipment rack plus 2600 pounds. Work surface plus 925 pounds. Shelf unit plus 550 pounds.

4. Support Structures

a. General requirements for mobile workstation:

b. Riser uprights: 11 gauge rolled steel supplied with two parallel rows of machine treaded welded nuts that accept bolts that positively engage the table and shelf frames.

c. Frames: Rolled steel, resistance welded. Frame members and tie rail brackets: 11 gauge; corner gussets: 11 gauge.

d. Bottom shelf rails: 11 gauge cold rolled steel.

e. Base cover: 18 gauge cold rolled steel.

f. Slotted adjustment machined into riser upright: punched for one-inch adjustment of components supported off riser upright.

g. Stainless steel retaining rods at the back and side of work surfaces for loading safety and visual and physical load barriers. Upper shelves to accommodate retaining on both sides, back and front edges,

5. Finishes

a. Metal Finish:

1). Preparation: Spray clean metal with a heated cleaner/phosphate solution, pretreat with iron phosphate spray, water rinse, and neutral final seal. Immediately dry in heated ovens, gradually cooled, prior to application of finish.

2). Application: Electrostatically apply urethane powder coat of selected color and bake in controlled high temperature oven to assure a smooth, hard satin finish. Surfaces shall have a chemical resistant, high grade laboratory furniture quality finish of the following thickness: Liquid dripped, solvent based finishes are not acceptable.

a). Exterior and interior exposed surfaces: 1.5 mil average and 1.2 mil min.

b. Surface Finish Tests:

c. All casework construction and performance characteristics shall be in full compliance with SEFA 8 – 1998 standards.

6. Hardware: As specified elsewhere in this Section.

7. Bench top Material:

a. Epoxy Resin: as specified elsewhere under Laboratory Work Surfaces

b. Wood: as specified elsewhere under Laboratory Work Surfaces

8. Adjustable Shelving Material:

a. Chemical Resistant High Pressure Decorative Plastic Laminate Shelving – At mobile workstations with Epoxy Resin Bench tops Refer to Shelving Assemblies specifications section.

b. Wood – At mobile workstations with wood Bench tops. Refer to Shelving Assemblies specifications section.

2.5 ELECTRONICS BENCH

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

1. Edsal Manufacturing Company, Inc., 4400 South Packers Avenue, Chicago, IL 60609 Tel: 773 254-0600.

2. Production Basics, Inc., 31 Dunham Road, Billerica, MA 01821 Tel: 617 926-8100.

3. Tennsco, P.O. Box 1888, Dickson, TN 37056-1888 Tel: 800 251-8184.

4. Approved substitution.

B. Electronics Bench: Provide heavy duty, steel frame bench as detailed on the Laboratory Furnishing drawings. Basis of design models:

1. Edsal Manufacturing Electronic Tech Bench.

2. Production Basics RTW Table.

3. Tennsco Technical Workstation.

C. Characteristics:

1. Dimensions: As indicated on the Laboratory Furnishing drawings.

2. Materials: Table structure constructed of minimum 16 gauge steel.

a. Finish: Electrostatically applied epoxy powder coating.

b. Color: As selected by the Architect.

3. Work Surface: 1-1/4 inch-thick, electro-static-dissipative (ESD) plastic laminate on industrial-grade particleboard core.

4. Upper Shelf: 1-1/4 inch-thick, electro-static-dissipative (ESD) plastic laminate on industrial-grade particleboard core, supported by risers units at each side, or legs at each corner.

5. Load Capacity of Worksurface and Shelf: 40 pounds per square foot.

6. Electrical:

a. Provide a minimum of (6) 120 V duplex outlets below the shelf and not obstructing the work surface. Outlets can be on the riser units, or within an integrated raceway directly below the upper shelf.

b. Provide master on/off switch.

c. Provide a 96 inch long minimum power cord with NEMA 5-20 plug.

d. Provide ground wire for each ESD surface.

D. Accessories:

1. Drawer unit with one 12-inch-deep drawer, one 6-inch-deep drawer, and one pull-out writing shelf.

2. Casters on each leg.

3. Magnification lamp on articulating arm.

4. Retractable keyboard tray located below the worksurface.

5. Articulating flat-screen monitor arm.

6. CPU Holder

2.6 WALL HUNG BENCHTOP

A. Framing Channel, Fittings, and End Caps: Stainless steel slotted channel framing as specified elsewhere on this Section and as indicated on the drawings.

B. Benchtop material shall be as indicated on the drawings and as specified elsewhere in this Section.

C. Unit shall be designed to support 200 pounds per square foot (10 kPa), completely wall supported with no legs or support members extending to the floor. Coordinate with wall or partition framing for blocking.

2.7 SHELVING ASSEMBLIES

A. High-Pressure Decorative (Plastic) Laminate Shelving:

1. Manufacturers/Facing material: Products complying with this specification may be provided by the following manufacturers.

a. Nevamar Decorative Surfaces, One Nevamar Place, Hampton, SC 29924 Tel: 800 638-4380.

b. Pionite Decorative Surfaces, One Pionite Road, P.O. Box 1014, Aubern, ME 04211 Tel: 800 746-6483.

c. Wilsonart International, 2400 Wilson Place, P. O. Box 6110, Temple, TX 76503 Tel: 800 433-3222.

d. Approved substitution (no known equal).

2. Approved Products:

   a. Nevamar ChemArmor.

   b. Pionite ChemGuard.

   c. Wilsonart ChemSurf

3. Color: To be selected by Architect.

4. Description:

   a. High-pressure decorative laminate, meeting or exceeding NEMA Standard LD3 2005 Grade HGP, HGL, or HGS requirements, consisting of a resin formulation applied over the decorative surface paper to achieve chemical resistance. The decorative paper shall be treated with melamine resin, and the core shall consist of kraft papers impregnated with phenolic resin. Sheets shall be bonded under high temperature and pressure. Product shall be developed for casework, work surface, and shelving surfaces in laboratories.

   b. Laminate shall be applied to top and bottom surfaces.

   c. Finish: Fine pebble-grained “crystal” texture or matte texture with slight sheen to minimize smudges and finger marks, and to provide optimum scratch resistance.

      1). Gloss: 15-16 +/- 3 gloss units.

   d. Physical Properties:

      1). Reference Standard: Plastic laminates shall meet or exceed ANSI/NEMA Specification LD3-2005 as specified herein.

      2). Minimum Thickness: 0.038 inches ± 0.005 inches (0.97 mm ± 0.13 mm).

      3). Cleanability: 10 cycles (NEMA LD3 test method 3.4).

      4). Boiling Water Resistance: No effect (NEMA LD3 test method 3.5).

      5). High Temperature Resistance: Slight effect (NEMA LD3 test method 3.6).

      6). Scratch Resistance: 4.5 Newtons (NEMA LD3 test method 3.7).

7). Ball Impact Resistance: 60 inches (1524 mm) (NEMA LD3 test method 3.8).

8). Radiant Heat Resistance: 200 sec (NEMA LD3 test method 3.10).

9). Dimensional change:

10). Machine direction: 0.50% (NEMA LD3 test method 3.11).

11). Cross direction: 0.80% (NEMA LD3 test method 3.11).

12). Wear resistance: 1,500 cycles, min. (black); 700 cycles, min. (other colors) (NEMA LD3 test method 3.13).

13). Blister Resistance: 70 sec (NEMA LD3 test method 3.15).

14). Stain Resistance Performance Test Results: The surface shall show essentially no effect on Black (Lab grade) plastic laminate when left in contact for 16 hours either when reagents were kept covered or allowed to evaporate.

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

Acids	Concentration	Rating
Acetic acid	All	0
Aqua regia		0
Chromic trioxide (Chromic acid cleaning solution)		1
Glacial acetic acid	99%	0
Hydrochloric acid	All	0
Hydrofluoric acid	48%	0
Formic acid	All	0
Nitric acid	All	3
Sulfuric acid	All	0
Perchloric acid (concentrated)		0
Phosphoric acid	All	0
Picric acid	1.2%	0
Tannic acid (saturated)		0
Uric acid (saturated)		0

Alkalis		
Ammonium hydroxide	All	0
Sodium hydroxide	All	3
Sodium sulfide	15%	0

Solvents	
Acetone	0
Amyl acetate	0
Amyl alcohol	0
Butyl alcohol	0
Carbon disulfide	0
Carbon tetrachloride	0
Chlorobenzene	0
Chloroform	0
Cresol	0
Dimethylformamide	0
Dioxane	0
EDTA	0
Ethyl acetate	0
Ethyl alcohol	0
Formaldehyde	0
Methanol	0
Methyl ethyl ketone	0
Methylene chloride	0
n-Hexane	0
Naphthalene	0
Phenol	0
Tetrahydrofuran	0
Toluene	0

Solvents		
Trichlorethane		0
Xylene		0

General Reagents		
Alconox (lab detergent)		0
Aluminon		0
Ammonium phosphate		0
Aromatic ammonia		0
Benedicts solution		0
Calcium hypochlorite (concentrated)		0
Camphorated parachlorophenol		1
Cellosolve		0
Copper sulfate		0
Ethylene glycol		0
Eucalyptol		0
Formalin		0
Gasoline		0
Hydrogen peroxide	3%	0
Iodine		0
Karl Fisher Reagent		0
Kerosene		0
Lactated ringers		0

General Reagents		
Lysol		0
Methyl methacrylate		0
Mineral Oil		0
Monsel's solution (Ferric subsulfate)		0
Naphtha		0
Petroleum jelly		0
Phosphate buffered saline (PBS)		0
Pine oil		0
Potassium permanganate		0
Povidone iodine		0
Procaine		0
Quaternary ammonia compounds		0
Silver nitrate		0
Sodium azide		0
Sodium chromate		0
Sodium hypochlorite	5%	0
Sodium thiocyanate		0
Sucrose	50%	0
Thymol & Alcohol		0
Tincture of Iodine		0
Tincture of Mercurochrome		0
Tincture of Merthiolate		0
Trisodium phosphate	30%	0

General Reagents		
Urea		0
Vegetable oils		0
Water		0
Zephiran chloride		0
Zinc chloride		0
Zinc oxide ointment		0

Stains and Indicators		
Ag Eosin Bluish 5% in Alcohol		0
Bromothymol Blue		0
Cresol Red		0
Crystal Violet		0
Gentian Violet	1%	0
Gram Stains		0
Malachite Green		0
Methyl Orange		0
Methyl Red		0
Methylene Blue		0
Nigrosine		0
Safranin O		0
Sudan III		0
Thymol Blue		0

Stains and Indicators	
Wright's Blood Stain	0

5. Plastic laminate adhesive: High-pressure decorative laminate shall be bonded to core with thermosetting resorcinol or phenol-resorcinol adhesive, or as recommended by the manufacturer for the application, at temperature above 65°F (18.3°C) at a pressure no less than 15 pounds per square inch. Laminate core is not to exceed 10% moisture content and is to be laminated and cured in a controlled environment between 45% and 60% RH.

6. Core material: Hardwood Veneer Plywood.

   a. Description: A one step calibrated core +/- .5mm (to avoid voids) with type 1 waterproof nauf glue. Grade 2 face, and back of mill choice plywood veneer.

   b. Thickness/Plies:

      1). 1 inch (25 mm): minimum 9-ply.

   c. Physical Properties:

      1). Average modulus of rupture: 7346 psi (50.65 N/mm^2).

      2). Face Screw Holding Strength: 355 lbf (1579 N).

7. Edging:

   a. Unless otherwise indicated, all edges shall be edgebanded with 3 mm PVC edge banding set in hot melt adhesive. Adhesive shall have a minimum softening point of 150°F (65.6°C). Apply primer to substrate when recommended by adhesive manufacturer. Contact cement is not acceptable. Color of edgebanding to be selected by the Architect.

   b. Safety Edges:

      1). Types:

         a). Retainer Rail: ¼ inch (6 mm) diameter stainless steel retainer rail, as indicated on the drawings.

      2). Refer to the description of each system below for locations of each type.

B. Reagent Shelves on a punched steel tube support system.

1. Shelving: High-Pressure Decorative Laminate shelving as specified above.

2. Steel Frame Support System: Provide cold rolled steel tube vertical and horizontal support members with radiused edges. All members shall be welded together. Grind all welds smooth and polish to produce clean smooth appearance with no visual evidence of welds after paint is applied. All vertical members shall be one piece continuous from floor to underside of structure above or to top horizontal member as indicated on the drawings. Horizontal top and intermediate members shall be one piece between vertical members. Provide welded caps at all open ends of tube sections. Secure vertical members to floor slab, underside of benchtop, if indicated on the drawings, and to underside of structure above.

    a. Tube steel dimensions can be either of the following:

        1). 2 inches x 2 inches, 12 gauge (50 x 50 x 2.8 mm).

        2). 2 inches x 3 inches, 12 gauge (50 x 75 x 2.8 mm).

3. Shelf standards:

    a. Steel tubes shall be punched to receive adjustable shelf brackets. Pattern shall match Knape & Vogt 85 ANO series uprights, length in accordance with drawings.

4. Shelf Brackets: 16 gauge (1.6 mm thick) bookend type, as detailed on drawings.

5. Safety edging:

        1). Retainer rail.

    b. Rear edge:

        1). Retainer rail.

6. Load capacity: System shall support a minimum of 35 pounds per square foot applied at all shelves simultaneously. Maximum deflection shall be 0.35 inches (9mm) under load.

7. Finish: Factory-finish steel tube support system, shelf standards, and brackets with epoxy powder coating. Color to be selected by the Architect.

C. Adjustable Wall Shelves:

1. Shelving: High-Pressure Decorative Laminate shelving as specified above.

2. Double Slot Shelf Standards:

   a. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

      1). Knape & Vogt Manufacturing Company, 2700 Oak Industrial Drive NE, Grand Rapids, MI 49505 Tel: 616 459-3311.

      2). Approved substitution.

   b. Basis of Design: Knape & Vogt 85 ANO series uprights, or equal. Length as indicated on the drawings.

3. Shelf Brackets: 16 gauge (1.6 mm) bookend type, as detailed on drawings.

4. Safety edging:

   a. Retainer rail.

5. Load capacity: System shall support a minimum of 35 pounds per square foot applied at all shelves simultaneously. Maximum deflection shall be 0.35 inches (9mm) under load.

6. Finish: Factory finish standards and brackets with epoxy powder coating. Color to be selected by the Architect.

D. Heavy Duty Wall Shelves:

1. Shelving: High-Pressure Decorative Laminate shelving as specified above. All shelves to be one piece continuous full length of assembly.

2. Heavy duty shelf standards: Slotted channel framing type. Refer to slotted channel framing specifications elsewhere in this Section.

3. Heavy duty shelf brackets:

   a. Shelf Brackets: Cold-formed steel, slotted channel framing type. Refer to slotted channel framing specifications elsewhere in this Section.

4. Other components, hardware, and fasteners, as required for a complete assembly and as indicated on the drawings.

5. Safety edging:

a. Extended height PVC band.

6. Load capacity: System shall support a minimum of 50 pounds per square foot applied at all shelves simultaneously. Maximum deflection shall be 0.35 inches (9mm) under load.

E. Stainless Steel Shelving System

1. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

a. InterMetro Industries Corporation, 651 North Washington St., Wilkes-Barre, PA 18705 Tel: 800 992-1776. Manufacturer of Metro product range.

b. Eagle Group, 100 Industrial Blvd., Clayton, DE 19938 Tel: 302 653-3000.

c. Nexel Industries Inc., March Equipment Inc., US Highway 206, Box 18, Flanders, NJ 07836 Tel: 973 584-4269.

d. Approved substitution.

2. Floor Mounted Stainless Steel Shelving Systems

a. Basis of Design: Metro Super-Erecta stainless steel shelf system, floor mounted post supported, or equivalent.

b. Posts: floor mounted stainless steel posts, grooved at 1 inch (25 mm) increments and numbered at 2 inch (50 mm) increments for shelf adjustment, length as shown on drawings, Metro PS series or equal.

c. Shelves:

1). Open Wire: stainless steel wire.

2). Solid: 18 gauge, Type 304 flat stainless steel sheet with 1/8 inch raised edge and aluminum corner castings for post attachment.

d. Provide diagonal bracing for lateral stability at freestanding applications.

e. Accessories:

1). Foot Plate: stainless steel with adjustable leveling bolt, Metro No. 9993S or equal.

2). Post Clamps: Zinc-plated, to join adjacent posts, Metro No. 9994Z or equal.

3). Shelf Ledges:

a). 1 inch (25 mm) high stainless steel wire, Metro No. LxxN-1S or equal, sized to match shelf.

F. Open Industrial Metal Shelf Units:

1. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

a. Lyon Metal Products, P. O. Box 671, Aurora, IL 60507 Tel: 800 323-0096.

b. Penco Products, Inc., P. O. Box 378, 99 Brower Ave., Oaks, PA 19456 Tel: 800 562-1000.

c. Hallowell, Division of List Industries Inc., 5711 Distribution Dr., Memphis, TN 38141 Tel: 901 375-0022.

d. Approved substitution.

2. Type: Premium grade 16 gauge (1.0 mm thick) steel shelf units comprised of 5 shelves adjustable on 1 ½ inch (38 mm), maximum, increments, and 85 inches (2159 mm) high 14 gauge (2.0 mm thick) angle post supports. Size in accordance with Laboratory Furnishings plans.

3. Provide side and rear cross bracing for lateral stability at freestanding applications.

2.8 CYLINDER RACKS AND RESTRAINT ASSEMBLIES

A. Cylinder Rack Assembly:

1. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

a. Kumar Industries, 4775 Chino Avenue, Chino, CA 91710 Tel: 909 591-0722.

a. Matheson Tri·Gas, 166 Keystone Drive, Montgomeryville, PA 18936 Tel: 215 648-4000.

b. Safe-T-Rack Systems, Inc., 4325 Domingeuz Rd., Suite A, Rocklin, CA 95677 Tel: 800 344-0619.

a. Scott Specialty Gases, Inc., 6141 Easton Road Box 310, Plumsteadville, PA 18949 Tel: 215 766-8861.

b. Spectra Gases, Inc., 3434 Route 22 West, Branchburg, NJ 08876 Tel: 800 932-0624.

c. Approved substitution.

2. Frame members: As shown on Laboratory Furnishings drawings.

3. Construction: Refer to the Laboratory Furnishings drawings for details. Construction to be fully welded. Weld cover plates to close exposed tube ends. Grind and polish all welds to produce smooth surface with no visible evidence of welding when painted. Sizing:

a. Size typical units to accomodate standard-size laboratory gas cylinders.

b. Where shown on drawings, size units to accomodate liquefied gas dewars.

4. Chain: Provide restrainers of 5/16 inch diameter, Type 304 stainless steel welded chain fitted with stainless steel snap shackle with swivel clevis and split ring for each bracket; McMaster-Carr Supply Company, Suncor Marine & Industrial, Inc., or approved substitution.

5. Cylinder rack steel components shall be factory-finished to match the casework metal color as selected for the project.

B. Cylinder Restraint Assembly:

1. Framing channel, Fittings, Swivel Hangers, and End Caps: Slotted channel framing as specified elsewhere on this Section.

2. Provide two swivel hangers per cylinder or dewar per wall bracket

3. Sizing:

a. Size typical units to accomodate standard-size laboratory gas cylinders.

b. Where shown on drawings, size units to accomodate liquefied gas dewars.

4. Chain: Provide restrainers of 5/16 inch diameter, Type 304 stainless steel welded chain fitted with stainless steel snap shackle with swivel clevis and split ring for

each bracket; McMaster-Carr Supply Company, Suncor Marine & Industrial, Inc., or approved substitution.

5. Cylinder restraint steel components shall be factory-finished to match the casework metal color as selected for the project.

2.9 OVERHEAD SERVICE CARRIER CABLE TRAY SYSTEM

A. Manufacturers: All products specified in this section shall be the furnished by a single manufacturer.

1. Chalfant Cable Trays, 11525 Madison Avenue, Cleveland, OH 44102
Tel: 216 521-7922.
2. Or equal

B. Material shall be extruded Anodized Aluminum Alloy Type 6063-T6, NEMA VE-1 Class 12B

C. Furnish a series 6 Cable Tray system, complete with straight and curved sections, fittings, connectors, hardware and miscellaneous devices required for a complete installation.

D. Cable Tray shall be suspended from Overhead Service Carrier specified above and located in laboratories as shown on the Laboratory Furnishings Drawings.

E. Construction shall be Trough Type stainless steel Type 304. Maximum spacing between transverse members shall be 3 inches (76.5 mm) measured parallel to side members. Cable bearing members shall be a minimum of 1 inch (25 mm) and shall be welded to side rail to insure integrity of the ground fault path.

F. Cable Tray shall be 12 inches (305 mm) wide except as otherwise noted. Side rails shall be 4 inches (102 mm) high. Curved section radius shall be 12 inches (305 mm).

G. Connectors: High pressure, rigid type connectors attached by ribbed neck hardened steel screws and locking type nut which does not require a washer. Hardware shall be cadmium plated. Ribbed neck portion of screw shall prevent screw from rotating during tightening of nut.

H. Grounding Continuity: Cable tray systems and all components shall be furnished and installed per their listings and per manufacturer’s instructions so that the completed system is electrically continuous and furnishes an approved equipment grounding path in accordance with NEC Article 392. Where cable tray components are not mechanically and electrically continuous, the system shall be furnished with approved bonding jumpers and

connections in accordance with NEC Article # 392 and Article # 250.96. Where bonding jumpers are utilized they shall be a minimum of #2 AWG copper with suitable, listed fittings. All system testing shall be in accordance with NEMA requirements.

I. Install all cable tray and support systems components in accordance with NEMA VE-1, applicable code requirements and with manufacturer's written instructions.

J. Vertically support as detailed on LF drawings.

K. Listings:

1. National Electrical Code, currently enforced edition, including all State and local amendments applicable to this project.
2. ASTM A123 and ASTM A525.
3. NEMA VE-1: Metallic Cable Tray Systems.
4. Underwriters Laboratories: All tray systems shall be UL listed as an assembly.

L. Refer to Laboratory Furnishings Drawings for locations and details.

2.10 CEILING UTILITY TILES

A. Ceiling utility tilesproviding a means to mount and connect electrical outlets, data outlets and quick connect service fixtures.

B. Provide services at each panel as shown on the drawings.

C. Cut-outs for utilities shall be made in the factory using laser-cutting or other method to produce accurate and clean edges.

D. Provide tiles with electrical and data junction boxes factory attached.

E. Electrical outlets, data outlets, and cover plates shall be by Divisions 26 and 27.

F. Piped service quick-connect fittings shall be as specified in section 115343.

G. Material:

1. Utility panel shall be minimum 16-gauge cold rolled steel with finish as specified for metal fabrications.

a. Color: To be selected by architect from manufacturer’s full color line.

H. Nominal Dimensions:

1. Size: 24 inches x 24 inches. Exact size of tile shall be coordinated with architectural reflected ceiling plan and the ceiling grid system profile as specified in Division 09 and as submitted.

2. Height (including junction boxes): 3 inches.

I. Hold-Down Clips: Coordinate with Division 09 contractor to provide a minimum of six hold-down clips at each utility ceiling tile.

J. Provide service identification as shown on drawings.

1. Engrave identification into stainless-steel panel and fill with black paint.

2. Service identification to be silk-screened onto painted metal panel. Stick-on labels are not compliant with this requirement.

2.11 WALL-MOUNTED ATTACHMENT CHANNEL

A. Product Characteristics: Wall-mounted framing channel, designed to support 200 lb point (0.89 kN) load at any position and 50 lb/lf (0.73 kN/m) uniformly distributed load. All brackets, channels, etc. shall be provided for a complete installation.

B. Materials: Slotted channel framing as specified elsewhere on this Section.

C. Fabrication: Fabricate and assemble components as detailed on the drawings.

D. Coordination: Carefully coordinate location of supports with the work of other Sections.

2.12 PIPE DROP ENCLOSURE

A. Fabricate pipe drop enclosures from minimum 18 gauge (1.3 mm thick) galvanized steel, per details shown on the Laboratory Furnishing drawings, except as noted.

1. Pipe drop enclosures at the following locations shall be fabricated of 18 gauge, Type 304 stainless steel with a #4 finish:

a. At scullery sinks.

b. At stainless steel counters.

B. Seal all joints between dissimilar metals and at all panel seams with clear silicone sealant.

C. Materials and finish shall be as specified under Metals Fabrications in this Section.

2.13 DRYING RACK

A. Epoxy Drying Rack:

1. Comply with requirements for molded epoxy resin specified under Laboratory Tops in this Section and as described herein.

2. Drying rack bodies shall be of one inch (25 mm) thick black epoxy with a 3/16 inch to ¼ inch (5 to 6 mm) radius on all edges and corners. Each rack shall be of the size and with the peg arrangement shown on the Laboratory Furnishing drawings.

3. Pegs shall be of injection molded white polypropylene. Pegs shall not be bonded into the body, but shall be held in position by mechanical design.

4. Provide a drip trough of Type 304 stainless steel with a 16 gauge (1.6 mm thick), Type 304 stainless steel screen of 14 x 14 (1.8 x 1.8 mm) mesh, .02 (0.05 mm) wire.

5. Provide stainless steel fixing screws of appropriate type for attachment to support structure.

6. Provide clear, tight-fitting hose to drain from drip tray into sink.

B. Stainless Steel Drying Rack with White Polypropylene Pegs:

1. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

a. Inter Dyne Systems, Inc., 676 Ellis Road, Norton Shores, MI 49441 Tel: 231 799-8760.

b. Approved substitution (no known equal).

2. Basis of Design: Inter Dyne Systems “V” Victoria Series, modified as indicated on the drawings.

a. Drying rack bodies shall be of one-piece design and of not less than 20 gauge (1.0 mm thick) Type 304 stainless steel with a No. 4 finish. The top shall have two 90-degree bends, and sides to have one 90 degree bend.

b. Each rack shall have an integral full-width 20 gauge (1.0 mm thick), Type 304 stainless steel drip trough with stainless steel drain tube. Drip trough shall be continuously welded.

c. The trough shall have a full-length, Type 304 stainless steel wire mesh screen insert. Screen insert shall be turned down on all four sides to provide a clean and finished appearance.

d. Each rack front shall be dimensioned and punched with T-shaped holes to accommodate the peg arrangement shown on the drawings.

3. Pegs shall fit into the punched holes in the rack front. A T-shaped protrusion on the base of the pegs shall allow easy removal and replacement without the need for tools. The T-shaped holes shall be designed to fit the protrusion on support pegs for holding single or multiple utensil drip trays, drain shelves, funnel racks or pipette holders. Pegs shall be of injection-molded white polypropylene.

4. Provide wall hangers for each rack, designed to enable the removal and replacement of the entire rack for cleaning without the need for tools.

5. Provide stainless steel fixing screws of appropriate type for attachment to support structure.

6. Provide clear, tight-fitting hose to drain from drip trough drain tube into sink.

7. Provide finished stainless steel back panel when any portion of the back of drying rack is exposed.

2.14 CABLE / VACUUM LINE THROUGH PORT

A. Provide 3 inch (75 mm) diameter wire or cable access through ports of Type 304 stainless steel with No. 4 finish at bench tops as located and detailed on the Laboratory Furnishings drawings.

2.15 GROMMETS AND ACCESSORIES

A. Round Grommets:

1. Size: 2-3/8 inch (60 mm) O.D.

2. Material: Plastic

3. Accessories: Removable slotted plastic cover

4. Color: To be selected by Architect.

5. Basis of Design Model: Doug Mockett & Co., Inc. Model No. TG-3.

6. Refer to plans for location.

7. Manufacturers: Products complying with this specification may be provided by the following manufacturers.

   a. Doug Mockett & Company, Inc., Box 3333, Manhattan Beach, CA 90266 Tel: 800 523-1269.

   b. Häfele America Inc., 3901 Cheyenne Dr., P. O. Box 4000, Archdale, NC 27263 Tel: 336 889-2322.

   c. Approved equal.

B. Utility Management Hook

1. Type 303 stainless steel hook with polished finish.

2. Size: 4 23/32 inch tall, 2 43/64 inch wide.

3. Load capacity: 22 pounds.

4. Basis of Design Model: McMaster-Carr Model No. 19075A12.

5. Manufacturer: McMaster Carr, P.O. Box 54960, Los Angeles, CA 90054-0960 Tel: (562) 692-5911, or approved equal.

C. Grilles

1. Air intake grilles: Perforated metal mesh in a metal frame.

2. Sizes: As shown on drawings.

3. Mesh Pattern: Mesh 1.

4. Color: Factory-applied light grey paint.

5. Basis of Design Model: Doug Mockett & Co., Inc. GT Series Grilles.

6. Manufacturer: Doug Mockett & Co., Inc. P.O. Box 3333, Manhattan Beach, CA 90266 Tel 800 523-1269 or approved equal.

2.16 TASK LIGHT FIXTURES

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

1. Alkco, 11500 Melrose Ave., Franklin Park, IL 60131-8139 Tel: 847 451-0700

2. Peerless Lighting Corporation, Box 2556, Berkeley, CA 94702-0556 Tel: 510 845-2760.

3. Approved substitution.

B. Basis for Design: Alkco SFHP-139/BW/RSW/CS-3W/CO-W, or equal, as specified herein.

C. Description: Fluorescent fixture for undershelf mounting. Provide task lights at locations indicated on the drawings.

D. Construction:

1. Dimensions: Fixture shall nominally cover the entire underside of the length of shelf.

2. Housing: 20 gauge cold rolled steel with neatly formed corners and de-burred exposed edges. No exposed fasteners.

3. Finish: Baked-on polyester resin powder coat finish in color selected by the Architect.

4. Diffuser/Lens: Prismatic acrylic lens specifically designed to reduce glare in front of fixture.

5. Electrical: Pre-wired with a single circuit. Fixture shall be controlled by fixture-mounted rocker switch. Fixture shall be furnished with 36 inch (900 mm), maximum, grounded cord and NEMA 5-15P or 5-20P plug. Fixture shall be provided with white, ground convenience receptacle to enable task lights to be “daisy chained.”

6. Ballast: Electronic, high power factor, thermally protected, Class P.

7. Lamps: 25W, T-5 lamps, 3500K.

8. Labels: Fixture shall be U.L. listed and bear an IBEW label.

2.17 AIR CONTROL CURTAIN

A. Provide clear vinyl strip door distributed by McMaster Carr Supply Co., Los Angeles, California, or equal, complete with all hangers and miscellaneous hardware for complete installation to perform intended function.

B. Self sealing heavy duty clear vinyl strips 16 in. wide, .160 in. thick with nylon cord reinforcing and beveled edges for safety. Maintain 4 in. clear opening between bottom of strip door and floor.

C. USDA approved.

2.18 FINISH FOR MISCELLANEOUS WOOD ITEMS

A. Applicability: This section applies to wood fabrications, including, but not limited to, wood laboratory tables, wood-framed balance tables, wood-framed pegboards, and wood filler panels.

B. Finish:

1. Manufacturer may uses either of the following finish systems:

a. Customized, high-solids, cross-linked, ultraviolet light (UV)-cured coating developed for durability, including abrasion, chemical, impact, and scratch resistance, for flat-line applications. Coatings shall have little or no VOCs. Chemical-resistant modified acrylic urethane finish with built-in UV blocker, or equal, applied over permanent wood stain.

2. Stain Color:

a. To be selected by Architect from manufacturer's full published color range.

3. Application:

a. Finish application and sequence shall be as recommended and designed by the manufacturer for a high quality, laboratory-grade wood casework finish.

b. Preparation: Sand exposed surfaces smooth, free from dirt and defects.

c. Stain application: Apply stain of color selected to all exposed casework surfaces. Apply in a manner to achieve a match with the selected color sample upon completion of application of the finish.

d. Finish application: Apply top finish to all stained surfaces. Finished surfaces shall be even, water-clear and bright. Cloudy or muddy finishes carrying tinting pigments will not be acceptable.

C. Wood Finish Chemical Resistance Performance Requirements:

1. Manufacturer shall submit wood finish chemical resistance performance test results. Testing to be performed by independent testing agency.

2. Procedure: Place panel on a flat surface, clean with soap and water and blot dry. Condition the panel for 48-hours at 73º +/- 3ºF (23º +/- 2ºC) and 50 +/- 5% relative humidity or the currently accepted guideline set by ASTM. Test the panel for chemical resistance using forty-nine different chemical reagents by one of the following methods. For both methods, leave the reagents on the panel for a period of one hour. Wash off the panel with water, clean with detergent and naptha, and rinse with deionized water. Dry with a towel and evaluate after 24-hours at 73º +/- 3ºF (23º +/- 2ºC) and 50 +/- 5% relative humidity, or the currently accepted guideline set by ASTM.

   a. Method A: Test volatile chemicals by placing a cotton ball saturated with reagent in the mouth of a 1-oz. (29.574cc) bottle and inverting the bottle on the surface of the panel.

   b. Method B: Test non-volatile chemicals by placing five drops of the reagent on the surface of the panel and covering with a 24mm watch glass, concave side down.

3. Rating System: Evaluations shall use the following rating system:

Level 0	No detectable change.
Level 1	Slight change in color or gloss.
Level 2	Slight surface etching or severe staining.
Level 3	Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration.

4. Acceptance Level:

   a. Individual test results for the specified 49 reagents shall be within the Range for that reagent as specified on the table below.

   b. There shall be no more than four (4) Level 3 conditions.

5. Table of reagents:

Test No.	Chemical Reagent	Test Method	Range
1.	Acetate, Amyl	A	0-1
2.	Acetate, Ethyl	A	0-1
3.	Acetic Acid, 98%	B	0-1
4.	Acetone	A	0
5.	Acid Dichromate, 5%	B	0-1
6.	Alcohol, Butyl	A	0-1
7.	Alcohol, Ethyl	A	0
8.	Alcohol, Methyl	A	0-1
9.	Ammonium Hydroxide, 28%	B	0-2
10.	Benzene	A	0-1
11.	Carbon Tetrachloride	A	0-1
12.	Chloroform	A	0
13.	Chromic Acid, 60%	B	0-1
14.	Cresol	A	0-2
15.	Dichloroacetic Acid	A	0-3
16.	Dimethylformamide	A	0-2
17.	Dioxane	A	0-1
18.	Ethyl Ether	A	0-1
19.	Formaldehyde, 37%	A	0
20.	Formic Acid, 90%	B	0-1
21.	Furfural	A	0-1
22.	Gasoline	A	0

Test No.	Chemical Reagent	Test Method	Range
23.	Hydrofluoric Acid, 37%	B	0-2
24.	Hydrofluoric Acid, 48%	B	0-2
25.	Hydrogen Peroxide, 30%	B	0-1
26.	Iodine, Tincture of	B	0-2
27.	Methyl Ethyl Ketone	A	0
28.	Methylene Chloride	A	0-1
29.	Monochlorobenzene	A	0-1
30.	Naphthalene	A	0
31.	Nitric Acid, 20%	B	0
32.	Nitric Acid, 30%	B	0-2
33.	Nitric Acid, 70%	B	2-3
34.	Phenol, 90%	A	0-2
35.	Phosphoric Acid, 85%	B	0-1
36.	Silver Nitrate Saturated	B	0-1
37.	Sodium Hydroxide 10%	B	0-2
38.	Sodium Hydroxide 20%	B	0-2
39.	Sodium Hydroxide 40%	B	0-2
40.	Sodium Hydroxide Flake	B	0
41.	Sodium Sulfide Saturated	B	0
42.	Sulfuric Acid, 33%	B	0-1
43.	Sulfuric Acid, 77%	B	0-1
44.	Sulfuric Acid, 96%	B	1-3

Test No.	Chemical Reagent	Test Method	Range
45.	Sulfuric Acid 77% & Nitric Acid 70% equal parts	B	1-3
46.	Toluene	A	0
47.	Trichloroethylene	A	0
48.	Xylene	A	0
49.	Zinc Chloride, Saturated	B	0

2.19 METAL FABRICATIONS

A. Applicability: This section applies to metal fabrications, including, but not limited to, pipe drop enclosures, radioisotope storage cabinets, shelving support systems, metal-framed laboratory tables, metal-framed balance tables, cylinder racks, utility ceiling tiles, and other miscellaneous brake-formed and shop fabricated components and trim, such as required for overhead service carriers.

B. Materials:

1. Steel: Cold-rolled furniture stock sheet steel, prime grade, roller leveled.

a. Steel shall be treated at the mill to be free of scale, ragged edges, deep scratches, or other injurious effects.

b. All gauges indicated are to be U.S. standard.

C. Finish Requirements:

1. Paint finish for steel laboratory products shall utilize a dry coating process with minimal waste generation. Liquid-applied coatings shall not be acceptable. Manufacturer shall supply documentation that waste generated during the painting process, is a solid, non-hazardous material.

a. Pretreatment: Finish process shall incorporate a phosphate conversion coating during the pretreatment/cleaning operation.

b. Operator Protection: The painting process shall be cleanly contained, have no solvent odor and be performed in an air-conditioned room.

c. VOC (Volatile Organic Compounds) emissions shall not exceed 0.29 lbs per gallon (35 g/L).

d. Offgasing: No further emissions or “Offgasing/Decomposition” vapors shall occur at room temperature from installed finished parts.

2. Preparation: After the units have been completely welded together and before finishing, they shall be given a pre-paint treatment to provide excellent adhesion of the finish to the metal and to aid in the prevention of corrosion. Physical and chemical cleaning of the metal shall be accomplished by washing with an alkaline cleaner, followed by a spray treatment with a heated cleaner/phosphate solution and pretreated with iron phosphate spray followed by a neutral final seal prior to application of final finish. The strength of each solution shall be monitored by filtration to insure consistent quality. All treated parts shall be immediately dried in heated ovens and gradually cooled before application of the finish. Treated metal parts shall be clean and properly prepared to provide optimum adhesion of finish and resistance to corrosion.

3. Application: Electrostatically apply 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:

a. All surfaces, exterior or interior, exposed to view, shall receive sufficient powder coat to achieve an average 1.5 mil (38 µm) film thickness with a minimum 1.2 mil (30 µm) film thickness and shall have smooth satin luster.

b. Backs of cabinets and other surfaces not exposed to view shall have sufficient powder coat to achieve an average 1.0 mil (25 µm) film thickness.

4. All drawer bodies to be finished in matching color.

5. Concealed interior parts shall receive corrosion-resistant treatment.

6. Finish must be UV stable.

7. Color: As selected by the Architect.

D. Finish Performance Requirements:

1. Manufacturer shall submit metal finish performance testing results. Testing to be performed by independent testing agency.

2. Chemical Resistance:

a. Test procedure: Place samples on a flat surface, clean with soap and water and blot dry. Condition the panel for 48-hours at 73+ 3F (23(+ 2(C) and 50+ 5% relative humidity, or the currently accepted guideline set by ASTM. Test the samples for chemical resistance using forty-nine different chemical reagents by one of the following methods. For both methods, leave the reagents on the sample for a period of one hour. Wash off the sample with water, clean with detergent and naptha, and rinse with deionized water. Dry with a towel and evaluate after 24-hours at 73± 3°F (23°± 2°C) and 50± 5% relative humidity, or the currently accepted guideline set by ASTM

1). Method A: Test volatile chemicals by placing a cotton ball saturated with reagent in the mouth of a 1-oz. (29.574cc) bottle and inverting the bottle on the surface of the sample. The cotton ball shall remain in contact with the sample for the duration of the test.

2). Method B: Test non-volatile chemicals by placing five drops of the reagent on the surface of the sample and covering with a 24mm watch glass, convex side down.

b. Rating System: Evaluations shall use the following rating system:

Level 0	No detectable change.
Level 1	Slight change in color or gloss.
Level 2	Slight surface etching or severe staining.
Level 3	Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration.

c. Acceptance Level:

1). Individual test results for the specified 49 reagents shall be within the Range for that reagent as specified on the table below.

2). There shall be no more than four (4) Level 3 conditions.

d. Table of reagents:

Test No.	Chemical Reagent	Test Method	Range
1.	Acetate, Amyl	A	0-1
2.	Acetate, Ethyl	A	0-2
3.	Acetic Acid, 98%	B	0-3
4.	Acetone	A	0-1
5.	Acid Dichromate, 5%	B	0-1
6.	Alcohol, Butyl	A	0-1
7.	Alcohol, Ethyl	A	0-1
8.	Alcohol, Methyl	A	0-1
9.	Ammonium Hydroxide, 28%	B	0
10.	Benzene	A	0-2
11.	Carbon Tetrachloride	A	0-1
12.	Chloroform	A	0-2
13.	Chromic Acid, 60%	B	0-2
14.	Cresol	A	0-2
15.	Dichloroacetic Acid	A	0-3
16.	Dimethylformamide	A	0-2
17.	Dioxane	A	0-2
18.	Ethyl Ether	A	0-1
19.	Formaldehyde, 37%	A	0-1
20.	Formic Acid, 90%	B	0-3
21.	Furfural	A	0-3
22.	Gasoline	A	0
23.	Hydrofluoric Acid, 37%	B	0-2

Test No.	Chemical Reagent	Test Method	Range
24.	Hydrofluoric Acid, 48%	B	0-3
25.	Hydrogen Peroxide, 30%	B	0-1
26.	Iodine, Tincture of	B	0-2
27.	Methyl Ethyl Ketone	A	0-2
28.	Methylene Chloride	A	0-2
29.	Monochlorobenzene	A	0-2
30.	Naphthalene	A	0-1
31.	Nitric Acid, 20%	B	0-1
32.	Nitric Acid, 30%	B	0-1
33.	Nitric Acid, 70%	B	0-3
34.	Phenol, 90%	A	0-2
35.	Phosphoric Acid, 85%	B	0-1
36.	Silver Nitrate Saturated	B	0
37.	Sodium Hydroxide 10%	B	0
38.	Sodium Hydroxide 20%	B	0
39.	Sodium Hydroxide 40%	B	0-1
40.	Sodium Hydroxide Flake	B	0
41.	Sodium Sulfide Saturated	B	0
42.	Sulfuric Acid, 33%	B	0
43.	Sulfuric Acid, 77%	B	0
44.	Sulfuric Acid, 96%	B	2-3
45.	Sulfuric Acid 77% & Nitric Acid 70% equal parts	B	1-3

Test No.	Chemical Reagent	Test Method	Range
46.	Toluene	A	0-1
47.	Trichloroethylene	A	0-1
48.	Xylene	A	0-1
49.	Zinc Chloride, Saturated	B	0

3. Hot Water Test

   a. Test Procedure: 190°F to 205°F (88°C to 96°C) hot water shall be allowed to trickle (with a steady stream and at a rate of not less than 6 ounces (177.5 cc) per minute) on the finished surface, which shall be set at an angle of 45°, for a period of 5 minutes.

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

4. Paint Adhesion on Steel Test

   a. Test Procedure: Test shall be based on ASTM D2197-86 “Standard Method of Test for Adhesion of Organic Coating.” Two sets of eleven parallel lines 1/16 inch (1.587 mm) apart shall be cut with a razor blade to intersect at right angles thus forming a grid to 100 squares. The cuts shall be made just deep enough to go through the coating, but not into the substrate. Brush surface lightly with a soft brush for one minute. Examine under 100 fc (1076 lux) of illumination.

   b. Acceptance Level: Ninety or more of the squares shall show finish intact.

5. Impact Test

   a. Test Procedure: Drop a 1 lb (0.4536 kg) ball (approximately 2 inch (50.8 mm) diameter from a distance of 12 inches (305 mm) onto a flat horizontal surface, coated to manufacturer’s standard manufacturing method.

   b. Acceptance Level: No visual evidence to the naked eye of cracks in the finish due to impact.

6. Paint Hardness on Steel Test

a. Test Procedure: Paint film shall be tested with pencils of various hardnesses. Pencils shall have a wide, sharp edge. Pencils shall be pushed across surface in a chisel-like manner.

b. Acceptance Level: Finish film shall not rupture from a sharpened 4H pencil.

2.20 STAINLESS STEEL FABRICATIONS

A. Applicability: This section applies to stainless steel fabrications, including, but not limited to, work surfaces, canopy hoods, low slotted exhaust, drying racks, shelves, autoclave/equipment enclosure walls and panels, utility ceiling tiles, sinks and scullery sinks, stainless steel pipe drop enclosures, and other miscellaneous brake-formed and shop fabricated stainless steel components and trim as shown on the drawings.

B. Manufacturers:

1. Inter Dyne Systems, Inc., 676 Ellis Road, Norton Shores, MI 49441 Tel: 231 799-8760.

2. Kloppenberg & Co., 2627 West Oxford Avenue, Englewood, CO 80110 Tel: 303 761-1615.

3. Approved substitution.

C. Materials and Finishes:

1. Unless otherwise noted stainless steel shall be Type 304 and shall be of gauge indicated on Laboratory Furnishing drawings or this specification.

2. All fabrications shall have exposed surfaces ground and polished to a Number 4 satin finish.

3. All stainless steel nuts, screws, bolts, and rivets, etc., shall be of the same type stainless as in the sheet material and shall have a tumbled finish closely resembling that of a Number 4 finish.

4. All stainless steel welding material shall be of type similar to the sheet material or a richer quality. All welds shall be made without discoloration and shall be ground, polished, and passivated to blend harmoniously with a Number 4 satin finish. All joints in stainless steel tops and work surfaces shall be welded.

D. Work Surfaces:

1. Thickness: 16 gauge (1.6 mm).

2. Fabrication:

   a. Edges: Flanged down the same dimension as the adjacent non-stainless top, with 1 inch (25 mm) being a minimum and returned over a perimeter metal frame to simplify securing top material to cabinet or structural frame.

   b. Reinforcment: Under-surface shall be reinforced with full length 16 gauge (1.6 mm) structural metal channels as required to insure rigidity and prevent buckling, warping, or oil canning. Where bench-mounted fittings are indicated on the drawings, provide top reinforcement to allow for rigid, secure mounting of fittings.

   c. Undercoating: Underside of top shall have a heavy mastic agent coating providing sound deadening.

   d. Stainless steel sides and back-splashes, where indicated, shall be integrally welded to top and finish as indicated above. The back side of exposed backsplashes shall be finished to match front and sides.

   e. Provide all holes and cutouts as required for built-in equipment and mechanical and electrical service fixtures. Verify size of opening with actual size of equipment to be used prior to making openings. Form inside corners to a radius of not less than 1/8 inch (3 mm). After sawing, rout and file cutouts to ensure smooth, crack-free edges with no burrs.

3. Tops with Sinks: Tops and sinks shall be integral, fabricated with a marine edge and shall be pitched to sink bowl for proper drainage. Marine edges shall be seamless die-formed.

4. Flat Stainless Steel Work Surfaces: (Without marine edge or sink) shall have an integrally coved back splash and bull-nose at front of work surface.

5. Wall-Supported Benchtop

   a. Benchtops shall be fabricated as per construction section of this specification with stainless steel wall support and bracket angles all as per Laboratory Furnishings Drawings.

   b. Unit shall be designed to support 200 pounds per square foot, completely wall supported with no legs or support members extending to the floor.

6. Joints: Fabricate work surfaces in the largest sections practical for delivery to the job site. All joints shall be field-welded, ground smooth, and polished on-site to create a continuous work surface.

E. Cup Sink: All cup sinks in stainless steel work surfaces and fume hoods shall be integral one piece construction with top. Cup sinks at fume hoods shall have ¼ inch (6 mm) high lip.

F. Laboratory Sink: Integral one piece construction with stainless steel work surface.

1. Thickness: 18 gauge (1.3 mm thick), unless otherwise noted.

2. Construction: Sink units shall be designed and fabricated with sufficient reinforcement to prevent oil canning. All sink joints shall be butt-welded, ground smooth by the heliarc welding process. Inside radii shall be 1 inch (25 mm). Bottoms shall be pitched to the drain indent. No soldering will be permitted in connection with sink construction. Sink bowl dimensions given are inside dimensions. Underside shall have a heavy mastic agent coating providing sound deadening.

G. Scullery Sink: Stainless steel top with integral sink bowls in sizes as shown. The requirements for stainless steel tops and sinks described above shall govern in its entirety. Backsplash, marine edge and drain boards shall be provided as indicated in Laboratory Furnishings plans.

1. Thickness: 14 gauge.

2. Construction: Front, bottom and back of sink compartments shall be formed of one sheet of material with integral 1 ½ inch (40 mm) roll rim, extending full length at front and ends of compartments and drainboards. Compartment ends and partitions shall be electrically welded into place. Drainboards shall pitch from 2 inches at rolled rim and ends to 2 ½ inches (65 mm) below rim at compartments. Bottoms shall be pitched to the drain indent. Sink units shall be designed and fabricated with sufficient reinforcement to prevent oil canning. All sink joints shall be butt-welded, ground smooth by the heliarc welding process. Inside radii shall be 1 inch (25 mm). No soldering will be permitted in connection with sink construction. Sink bowl dimensions on drawings are inside dimensions. Underside shall have a heavy mastic agent coating providing sound deadening.

3. Legs: Sinks shall be supported on stainless steel square tube legs with stainless steel leveling guides.

4. Accessories: Provide Elkay LK-86-RT, or approved, waste fitting at each compartment of stainless steel construction with strainer, overflow and lever handle. Provide tailpiece compatible with laboratory waste piping system. Refer to Division 22 for piping requirements.

5. Coordination: Coordinate scullery sink design with the requirements of any undercounter equipment (such as dishwashers and glassware washers), as shown on the Laboratory Furnishings drawings. Provide intermediate, end, and trim panels to enclose the undercounter portions of the scullery sink at equipment locations.

H. Autoclave/Equipment Enclosure Panels:

1. Install stainless steel modular wall systems, trim panels, and doors provided by the enclosed equipment manufacturer. Provide all framing and stiffening necessary to complete the installation. Refer to Section 115350.

2.21 GOWNING BENCH

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

1. Terra Universal Inc., Anaheim, CA 92805.

2. Innotech Products Inc., Minneapolis, MN 55414.

3. Approved substitution.

B. Basis of Design: Terra Universal Inc. Model: UltraClean Stainless Steel Gowning Bench, Open-Cage model. Equivalent products may be considered provided they meet the product characteristics listed below.

C. Description: ¼ inch (6.3 mm) solid rod top with bootie racks below.

D. Product characteristics:

1. All stainless steel construction.

2. Class 1 environment design.

2.22 SLOTTED CHANNEL FRAMING

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

1. Unistrut, 35660 Clinton Street, Wayne, MI 48184 Tel: 800 521-7730.

2. Power Engineering Co. (Powerstrut), 420 Boston Turnpike, Shrewsbury, MA Tel: 800 274-1303.

3. Kumar Industries (Nu-Strut), 4881 Chino Ave., Chino, CA 91710 Tel: (909) 591-0722.

4. Cooper B-Line Inc. (B-Line), 509 West Monroe St., Highland, IL 62249 Tel: (618) 654-2184.

5. Approved substitution.

B. Materials: Channel and framing members shall be fabricated from steel conforming to the following requirements:

1. Framing Members:

a. Concealed Framing Members and Fittings: ASTM A570 GR 33.

b. Exposed Framing Members and Fittings: ASTM A446 GR A with zinc coating conforming to ASTM A525.

c. Stainless Steel Framing Members and Fittings: ASTM A240 (Type 304), where indicated.

2. Fittings:

a. Concealed Fittings: Fabricate from steel satisfying the requirements of ASTM A570 GR 33, and conform to the following ASTM specifications: A575, A576, A36, or A635. Nuts shall conform to ASTM A576 GR 1015 and screws shall conform to SAE J429 GR 2 and ASTM A307.

b. Exposed Fittings: Fabricate from steel satisfying the requirements of ASTM A570 GR 33, and conform to the following ASTM specifications: A575, A576, A36, or A635. Nuts shall conform to ASTM A576 GR 1015 and screws shall conform to SAE J429 GR 2 and ASTM A307. Exposed fittings shall receive zinc coating conforming to ASTM A525.

c. Stainless Steel Fittings and Hardware: Sintered Nuts shall be of ASTM B783 (Type 316N2-33) stainless steel and fittings shall be of ASTM A240 (Type 304) stainless steel. Stainless steel fittings and hardware shall be used with stainless steel framing members, or where indicated.

3. Thickness: 12 gauge, unless noted otherwise.

4. Size: 1 5/8 inch x 1 5/8 inch cross-section, unless noted otherwise.

C. Components:

1. The following components shall be provided, unless otherwise noted:

a. Framing Channel: 1 5/8 inch x 1 5/8 inch x 12 gauge: Unistrut P1000, Powerstrut PS 200, Kumar Industries N-200, B-Line Systems, Inc. B22, or equal.

b. Suspended Framing Channel, 3 ¼ inch x 1 5/8 inch x 12 gauge: Unistrut P5000, Powerstrut PS 100, Kumar Industries N-150, B-Line Systems, Inc. B11, or equal.

c. 90° Angle Fitting: 4 1/8 inch x 3½ inch x ¼ inch with two holes, each leg: Unistrut P1325, Powerstrut PS 607, Kumar Industries N-1123, B-Line Systems, Inc. B104, or equal.

d. 135° Angle Fitting: 3 inch x 2 5/16 inch x ¼ inch with one hole, each leg: Unistrut P1546, Powerstrut PS 633-45°, Kumar Industries N-1425, B-Line Systems, Inc. B154, or equal.

e. T-Shaped Flat Plate Fitting: 5 3/8 inch x 3½ inch x ¼ inch plate, T-shaped, with four holes: Unistrut P1031, Powerstrut PS 714, Kumar Industries N-1022, B-Line Systems, Inc. B133, or equal.

f. Wing Shape Fitting, 9 5/32 inch x 3 7/8 inch ten holes, two holes in each wing section and two holes in each of three channel section sides: Unistrut P2347, Powerstrut PS 913, B-Line Systems, Inc. B273.

g. Vertical Posts: 3¼ inch x 1 5/8 inch x 12 gauge, double channel section: Unistrut P1001, Powerstrut PS 200 2T3, Kumar Industries N-200-A, B-Line Systems, Inc. B22A, or equal.

h. Horizontal Support Members: 1 5/8 inch x 1 5/8 inch x 12 gauge framing channel with 13/32 inch x 3 inch slotted holes, 4 inches on center: Unistrut

P1000 SL, Powerstrut P 200 S, Kumar Industries N-200-SL, B-Line Systems, Inc. B22S, or equal.

i. Slotted Hole Framing Channel, 1 5/8 inch x 1 5/8 inch x 12 gauge framing channel with 13/32 inch x 3 inch slotted holes, 4 inches on center: Unistrut P1000 SL, Powerstrut P 200 S, Kumar Industries N-200-SL, B-Line Systems, Inc. B22S.

j. Slotted Framing Channel for installation in Chemical Fume Hoods, 1 5/8 inch x 13/16 inch x 16 gauge Type 316 stainless steel framing channel: Unistrut P4000 SS, Powerstrut PS 560 SS, Kumar Industries, B-Line Systems, Inc.

1). Attach channel to side of fume hood with 2 5/8 inch x 1 7/8 inch x 1/8 inch, 4 hole, stainless steel 90º fitting: Unistrut P6325 SS, Powerstrut, Kumar Industries, B-Line Systems, Inc.

k. Diagonal Brace Supports: Framing Channel, 1 5/8 inch x 1 5/8 inch x 12 gauge: Unistrut P1000, Powerstrut PS 200, Kumar Industries N-200, B-Line Systems, Inc. B22, or equa.

l. Closure Strip: 0.04 inches thick snap-in cover for framing channel: Unistrut P3184, Powerstrut PS 6152, Kumar Industries N-1920, B-Line Systems, Inc. B217-24, or equal. Provide closure strips over all exposed vertical post sections.

m. End Caps: 0.06 inches thick for framing channel: Unistrut P1280, Powerstrut PS 707, Kumar Industries N-2500, B-Line Systems, Inc. B205, or equal. Provide end caps for all exposed horizontal framing channels.

n. Ceiling Escutcheon: Provide 18 gauge steel, finished to match framing members, as indicated on the Laboratory Furnishing drawings, at ceiling penetrations.

o. Other components, hardware, and fasteners, as required for a complete assembly and as indicated on the drawings.

2. Service Struts and Ledging:

a. 16 gauge, 13/16 inch x 1 5/8 inch cold-formed framing uprights: Unistrut P4000, Powerstrut PS 560, Kumar Industries N-400, B-Line Systems, Inc. B56, or equal. Uprights shall be provided at 48 inches, maximum, and fastened top and bottom by two adjustable U-shaped spreaders.

b. U-shaped spreaders: 12 gauge by 1½ inch (45 mm) wide by length required, galvanized steel.

c. Locations:

1). Provide to support tops at pipe service chase space, support drain troughs, under fume hood superstructures, and other abnormal loads.

2). Support struts with U-shaped spreaders shall be provided at 48 inches (1220 mm) on center below island and peninsula benches, as indicated on drawings. Support struts shall be provided along wall 48 inches (1220 mm) on center below island and peninsula benches. Struts will be used to support piped and electrical services installed under Divisions 22, 26, and 27. Provide all bolts, expansion sleeves, and fastening devices for a complete assembly. Pipe and conduit hangers shall be provided by Division 22, 26, and 27 installers.

3. Heavy Duty Wall Shelving:

a. Shelf Standards: Framing channel, spaced equally, 36 inches on center, maximum. Secure to wall. Provide all bolts and fastening devices for a complete assembly.

b. Brackets: Cold-formed framing channel brackets, as required for maximum cover of shelf depth:

1). Shelves at least than 9 inches and less than 11 inches deep: Unistrut P1769, Powerstrut PS 732-8, B-Line Systems, Inc. B187, or equal. Secure to steel uprights and underside of shelf with removable bolt fasteners.

2). Shelves at least than 11 inches and less than 13 inches deep: Unistrut P1771, Powerstrut PS 732-10, B-Line Systems, Inc. B541, or equal. Secure to steel uprights and underside of shelf with removable bolt fasteners.

3). Shelves at least 13 inches and less than 15 inches deep: Unistrut P1773, Powerstrut PS 732-12, B-Line Systems, Inc. B289-12, or equal. Secure to steel uprights and underside of shelf with removable bolt fasteners.

4). Shelves at least 15 inches and less than 17 inches deep: Unistrut P1775, Powerstrut PS 732-14, B-Line Systems, Inc. B289-14, or equal.

Secure to steel uprights and underside of shelf with removable bolt fasteners.

5). Shelves at least 17 inches and not exceeding 20 inches deep: Unistrut P1777, Powerstrut PS 732-16, B-Line Systems, Inc. B290, or equal. Secure to steel uprights and underside of shelf with removable bolt fasteners.

4. Adjustable Wall Shelving:

a. Shelf Standards: Framing channel, spaced equally, 36 inches (915 mm) on center, maximum. Provide all bolts and fastening devices for a complete assembly.

b. Brackets: Cold-formed framing channel brackets, as required for maximum cover of shelf depth:

1). Shelves at least than 9 inches and less than 11 inches deep: Unistrut P1769, Powerstrut PS 732-8, B-Line Systems, Inc. B187, or equal. Secure to steel uprights and underside of shelf with removable bolt fasteners.

2). Shelves at least than 11 inches and less than 13 inches deep: Unistrut P1771, Powerstrut PS 732-10, B-Line Systems, Inc. B541, or equal. Secure to steel uprights and underside of shelf with removable bolt fasteners.

3). Shelves at least 13 inches and less than 15 inches deep: Unistrut P1773, Powerstrut PS 732-12, B-Line Systems, Inc. B289-12, or equal. Secure to steel uprights and underside of shelf with removable bolt fasteners.

4). Shelves at least 15 inches and less than 17 inches deep: Unistrut P1775, Powerstrut PS 732-14, B-Line Systems, Inc. B289-14, or equal. Secure to steel uprights and underside of shelf with removable bolt fasteners.

5). Shelves at least 17 inches and not exceeding 20 inches deep: Unistrut P1777, Powerstrut PS 732-16, B-Line Systems, Inc. B290, or equal. Secure to steel uprights and underside of shelf with removable bolt fasteners.

5. Overhead Service Carrier:

a. Vertical members: Telescoping 12 gauge tube or strut, 1 5/8 inch x 1 5/8 inch and 1 7/8 inch x 1 7/8 inch, with 9/16 inch diameter pre-punched holes at 1 7/8 inch on center: Unistrut "Telestrut System", Allied Tube & Conduit "Square-Fit" telescoping channel, or approved substitution.

b. Provide fittings designed to connect and attach telescoping tubing.

c. Gravity pins shall be used to connect telescoping members.

6. Cylinder and Dewar Restraint:

a. Swivel Hanger: 1 ¾ inch long by 3/8 inch diameter link welded to threaded stud; provide two per cylinder: Unistrut M2350, Powerstrut PS205, Kumar N-2911, B-Line 446B.

7. Overhead Support Grid

a. Exposed horizontal support members for user attachment, 3¼ inch x 1 5/8m inch x ¼ inch framing channel: Unistrut P5000, Powerstrut P 100, Kumar Industries N-150, B-Line Systems, Inc. B11.

8. Finish:

a. Provide finish coating for all cold-formed framing components, except for stainless steel components.

b. Concealed Framing Members and Fittings: Rust inhibiting acrylic enamel paint applied by electrostatic deposition, after cleaning and phosphating, and thoroughly baked. Finish shall withstand a minimum of 400 hours salt spray when tested in accordance with ASTM B117. Color: Green.

c. Exposed Framing Members and Fittings: Factory applied epoxy powder coat. Color: To be selected by the Architect.

2.23 SEALANT

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers.

1. Dow Corning Corporation, P.O. Box 994, Midland, MI 48686 Tel: 989 496-7881.

2. General Electric Company, 260 Hudson River Rd., Waterford, NY 12188 Tel: 800 255-8886.

3. Approved substitution.

B. Basis of Design: Dow Corning 732 Multi-Purpose Sealant, GE Silicones RTV 100 Series, or equal.

C. Characteristics:

1. Type: One-part silicone rubber, MIL-A-46106.

2. Physical form: Non-slumping paste.

3. Cure: Cures at room temperature on exposure to water vapor in the air.

4. Authorizations:

a. FDA Regulation No. 21 CFR 177.2600.

b. USDA Rating P1.

c. NSF Rating C2.

d. UL 150 C Rating, File No. E40195(N).

5. Properties:

a. Tack Free Time: 45 minutes, maximum.

b. Durometer, Shore A Hardness: 20, minimum.

c. Tensile Strength: 220 pounds per square inch, minimum.

d. Elongation: 350 percent, minimum.

e. Extrusion Rate: 220 to 525 grams per minute.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. Inspection:

1. Prior to installation of the work of this Section, carefully inspect the installed work specified in other Sections and verify that all such work is complete to the point where this installation may properly commence.

2. Verify that all work may be installed in complete accordance with the original design, reviewed submittals, and the manufacturer's recommendations.

B. Discrepancy: In the event of discrepancy, immediately notify the Architect.

C. Flooring: Casework will typically be installed on top of finished flooring. Coordinate sequencing, protection, and installation requirements with the contractor to prevent damage of flooring.

3.2 INSTALLATION

A. Coordinate work with any Owner furnished and/or installed components indicated on drawings.

B. General: Assemble units into one integral unit with joints flush, tight, and uniform. Align similar adjoining units to a tolerance of 1/16 inch (1.5 mm).

C. Cabinets:

1. Install cabinets to create a plumb, level, true and straight installation.

2. Installation of metal and stainless-steel casework fixed cabinets shall utilize the internal leveling devices. Do not use shims.

3. Installation of wood casework shall be performed using shims. Shimming shall be minimized as much as possible, yet be sufficient to achieve a level and plumb condition.

4. Installation of wood casework fixed cabinets shall utilize the internal leveling devices. Do not use shims.

5. Installation shall maintain the required height of countertops. ADA-height countertops shall not vary more than ¼” from the heights off the finish floor as indicated.

6. Where floor conditions require shimming or leveling of more than ¾” at any point, do not install casework in those locations. Notify the contractor and design team that remedial measures will be required to bring the floors closer to a level situation.

7. Securely fasten wall units to solid supporting material, not plaster, lath, or wallboard. Anchor, adjust, and align wall cabinets as specified for base cabinets.

Verify that all required backing and reinforcement necessary to support wall-mounted units is in place, secure, and accurately located.

D. Installation materials:

1. Installation of wood, plastic laminate, and solid phenolic casework may involve the use of shims, spacers, cleats, straps and other such items of either metal or wood composition.

2. Installation of metal casework shall use spacers, cleats, and straps of galvanized steel, epoxy-coated steel, or stainless steel. No wood materials of any sort shall be part of the permanent installation of metal casework.

3. Installation of stainless-steel casework, counters, and scullery sinks shall use spacers, cleats, and straps of stainless steel of the stainless steel type specified for the casework construction. No wood or carbon steel materials of any sort shall be part of the permanent installation of stainless steel casework.

4. Installation of polypropylene casework shall use shims, spacers, cleats, straps, and other such items of polypropylene construction only. No wood or metal materials shall be part of the permanent installation of polypropylene casework.

E. Laboratory Tops:

1. Scribe tops as necessary for close and accurate fit.

2. Field Joints: Factory-prepared and identical to factory joints, locate only where indicated on approved Shop Drawings. Field processing of top and edge surfaces is not acceptable, except as described by manufacturer in approved Submittal Data. Provide full length, one-piece tops and backsplashes wherever possible, and keep field joints to an absolute minimum.

3. Abut top and edge surface in one true plane, with internal supports placed to prevent any deflection. Joints in top units shall be flush and the narrowest for the respective materials of construction. Cement joint in accordance with the manufacturers' specifications.

4. All joints in stainless steel work surfaces shall be field-welded, ground smooth, and polished on-site to create a continuous work surface.

F. Sealant:

1. Caulk edges of tops, backsplashes and side splashes to adjacent wall surface with silicone sealant.

3.3 DESTRUCTIVE TESTING

A. The Owner, Architect, and/or Contractor may, at their own cost, elect to perform destructive testing on casework cabinet components (such as fronts, sides, etc.) to confirm compliance with the requirements of this specification. The casework manufacturer/installer should account for the de-installation, repair, and reinstallation, or replacement of one cabinet that may be selected for destructive testing.

3.4 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as approved by the Architect at no additional cost to the Owner.

B. Clean finished units, touch up as required, and remove and refinish damaged or soiled areas.

C. Cover tops with kraft paper or polyethylene sheeting after installation for protection against scratching, soiling, and deterioration during remainder of construction period. Remove protection prior to final cleaning.

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

END OF SECTION