### Introduction
This is a print version of the event. It contains a summary of the event and its contents. The response shown below is the last accepted response. If there is no accepted response, the latest draft response will be shown. Please review this for correctness and mark it up as necessary.

This file was downloaded at: [Tuesday, February 18, 2020 at 1:48 PM]

### Overview
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### Timing Rules
| Publish time       | 2/17/2020 11:18 AM |
| Due date           | 3/5/2020 3:00 PM   |
| Specify how lot bidding will begin and end | Parallel |
| Planned response start date | 2/17/2020 11:18 AM |
| Planned due date   | 3/5/2020 3:00 PM   |
| Set a review period after lot closes | No |
| Allow bidding overtime | No |
| Estimated Award Date |             |

### Bidding Rules
| Enable scoring on participant responses | Yes |
| Default Grading Method                 | Select |
| Must participants improve their bids   | No   |
Can participants submit tie bids | Allow tie bids for all ranks  
Choose Scoring Type | 0  
Require participant to give a reason for declining to bid | No  
Allow Pricing Conditions | No  

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| Allow participants to select bidding currency | No  

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| Show formulas to all participants | No  
| Allow participants to see scoring weights | No  
| Specify how participants view market information | Enable a starting gate for each lot  
| Show calculated value of competitive term before participant submits bid | Yes  
| Indicate to participants that participant-specific initial values have been specified | No  
| Can owner see responses before event closes | Yes  

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<td>1 Welcome to PURDUE UNIVERSITY - WEST LAFAYETTE - RFQ - Laboratory Casework and Fume Hood</td>
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<td>2 OBJECTIVE: Purdue University requests pricing for item(s) listed within this request.</td>
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**PLEASE SEE ATTACHED SPECIFICATIONS AND DRAWINGS BELOW**

*Desired Delivery Date: June 5, 2020*  
*Desired Delivery Address: Whistler Center for Carbohydrate Research, Room 119 745 Agriculture Mall Drive West Lafayette, IN 47907*

3 INSTITUTIONAL CONTACT(S) & COMMUNICATION

The Procurement Services contact person for this RFO is Leanna Zeller at lsandstr@purdue.edu. All communication pertaining to this RFQ should be submitted through the AribaEvent messages board. If there are changes to this request a revised event will be issued to all bidders. Please contact Ariba Support at (866) 218 2155 if you need technical assistance.

4 RESPONSES
Bidders MUST submit their responses through the Ariba system. Insert your response in the appropriate sections below. Include/identify discounts you are offering within your attached detailed company quote.

4.1 PLEASE SEE ATTACHED SPECIFICATIONS AND DRAWINGS
Specifications and Drawings.zip

4.2 Bidders should attach your detailed company quote(s) and response documentation here. When providing multiple documents please use a zip file.

5 Cost
5.1 Total Cost of Casework
Price
Quantity 1 each
Extended Price

5.2 Total Cost of Fume Hood
Price
Quantity 1 each
Extended Price

5.3 Turn-Key Installation
Price
Quantity 1 each
Extended Price

5.4 Shipping and Delivery
Price
Quantity 1 each
Extended Price

6 Purdue’s available payment terms are noted in item 1 of the INFORMATION section. Please identify which of the payment terms you prefer.

7 Please note if shipping from outside U.S and list country of origin.

8 Provide the warranty associated with the product/services offered.

9 Provide your timeline to delivery upon receipt of a PO.

10 Provide the validity period of your quote/offer.

11 CERTIFICATE OF INSURANCE (If Applicable)
Proof of Insurance is required from the Seller and/or its Subcontractor for all work conducted on Purdue’s premises. See Purdue’s standard terms and conditions link in the INFORMATION section for details. If applicable, please attach your COI along with your detailed quote response noted in Section 4.

12 Is the item to be purchased a defense article on the United States Munitions List (USML) or a 600 series item on the Commerce Control List (CCL) that has a specific military purpose?

13 INFORMATION
1. Purdue University’s available payment terms are as follows: ACH Options; (3% 10, Net 45), (2% 20, Net 45), (1% 30, Net 45), (Net 45, no discount) Pay immediately, payment method “Virtual Credit Card”. For more information about the “Virtual Credit Card” accelerated payment program, visit: http://www.purdue.edu/business/procurement/acctpay/sua.html . 2. Purdue University is exempt from Federal Excise Tax and Indiana Sales Tax (#003123723-004-1) 3. Purdue University’s standard terms and condition for all purchases can be found at the following URL:
4. Purdue University accepts no obligation for costs incurred by the supplier in responding to the request or in anticipation of being awarded the contract. 5. Purdue reserves the right to accept all or part, or to decline to buy the whole. THERE IS NO OBLIGATION TO BUY. In determining an award, qualifications of the prospective vendor, conformity with specification for goods and/or services, cost, and delivery of terms will be considered by Purdue University in absolute and sole discretion. 6. Purdue University is a public institution and therefore subject to the Indiana Access to Public Records Act (APRA). 7. To assist us in complying with Federal Guidelines, please verify the following classifications of your company: Minority Owned Business _____ Woman Owned Business ______ Veteran Owned Business ______ The University encourages the participation of MBE/WBE/VBE providers in our procurement activities. Further, the University encourages Firms bidding for major contracts to provide for the participation of small businesses and businesses owned by Minorities, Women, and Veterans through partnerships, joint ventures, and other contractual opportunities. If you are subcontracting with a MBE/WBE/VBE please provide their contact information: Company Name, Contact Name, Company Address, Phone/Fax Number, Email address. Identify the subcontracted products/services portion being offered in your response.

### Scoring

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Specifications and Drawings.zip
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| 5 Cost          | 0 | 0% |
| 5.1 Total Cost of Casework | 0 | 0% |

| 5.2 Total Cost of Fume Hood       | 0 | 0% |
| Price                               | 0 | 0% |
| Quantity                            | 0 | 0% |
| Extended Price                      | 0 | 0% |

| 5.3 Turn-Key Installation          | 0 | 0% |
| Price                               | 0 | 0% |
| Quantity                            | 0 | 0% |
| Extended Price                      | 0 | 0% |

| 5.4 Shipping and Delivery          | 0 | 0% |
| Price                               | 0 | 0% |
| Quantity                            | 0 | 0% |
| Extended Price                      | 0 | 0% |

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary
      Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
   A. Section Includes:
      1. Wood laboratory casework.
      2. Utility-space framing at backs of base cabinets and for shelving at islands.
      3. Filler and closure panels.
      5. Laboratory countertops.
      6. Tables.
      7. Shelves.
      8. Laboratory sinks.
     10. Laboratory accessories.

1.3 DEFINITIONS
   A. Exposed Surfaces of Casework: Surfaces visible when doors and drawers are closed, including
      bottoms of cabinets more than 48 inches (1200 mm) above floor, and visible surfaces in open
      cabinets or behind glass doors.
      1. Ends of cabinets, including those installed directly against walls or other cabinets are
         defined as "exposed."
      2. Ends of cabinets indicated to be installed directly against and completely concealed by
         walls or other cabinets are defined as "concealed."
   B. Semi-exposed Surfaces of Casework: Surfaces behind opaque doors, such as cabinet interiors,
      shelves, and dividers; interiors and sides of drawers; and interior faces of doors. Tops of cases
      78 inches (1980 mm) or more above floor and bottoms of cabinets more than 24 inches (600
      mm) but less than 48 inches (1200 mm) above floor are defined as semi exposed.
   C. Concealed Surfaces of Casework: Include sleepers, web frames, dust panels, and other
      surfaces not usually visible after installation.
   D. MDF: Medium-density fiberboard.
   E. Hardwood Plywood: A panel product composed of layers, or plies, of veneer, or of veneers in
      combination with lumber core, hardboard core, MDF core, or particleboard core, joined with
      adhesive and faced both front and back with hardwood veneers.
1.4 COORDINATION

A. Coordinate layout and installation of framing and reinforcements for support of laboratory casework and services.

B. Coordinate installation of laboratory casework with installation of fume hoods and other laboratory equipment.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For laboratory casework. Include plans, elevations, sections, and attachment details.
   1. Indicate types and sizes of cabinets.
   2. Indicate locations of hardware and keying of locks.
   3. Indicate locations and types of service fittings.
   4. Indicate locations of blocking and reinforcements required for installing laboratory casework.
   5. Include details of utility spaces showing supports for conduits and piping.
   6. Include details of support framing system.
   7. Include details of exposed conduits, if required, for service fittings.
   8. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and other laboratory equipment.
   9. Include coordinated dimensions for laboratory equipment specified in other Sections.

C. Samples for Initial Selection: For cabinet finishes and other materials requiring color selection.

D. Samples for Verification: For each type of cabinet finish and each type of countertop material, in manufacturer's standard sizes.

E. Delegated-Design Submittal: For laboratory casework indicated to comply with seismic performance requirements, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Product Test Reports for Casework: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory casework with requirements of specified product standard.

C. Product Test Reports for Countertop Surface Material: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory countertop surface materials with requirements specified for chemical and physical resistance.
1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish complete touchup kit for each type and color of wood laboratory casework provided. Include scratch fillers, stains, finishes, and other materials necessary to perform permanent repairs to damaged laboratory casework finish.

B. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Cabinet Mounting Clips and Related Hardware: Quantity equal to 5 percent of amount installed, but no fewer than 10 of each type.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that produces casework of types indicated for this Project that has been tested and proven to be compliant with SEFA 8 W.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install laboratory casework until building is enclosed, utility roughing-in and wet work are complete and dry, and temporary HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before being enclosed, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufactures:
   2. Campbell Rhea.
   4. CiF Lab Solutions.
   5. Diversified Casework.

B. Source Limitations: Obtain laboratory casework from single source from single manufacturer unless otherwise indicated.
2.2 PERFORMANCE REQUIREMENTS

A. System Structural Performance: Laboratory casework and support framing system shall withstand the effects of the following gravity loads and stresses without permanent deformation, excessive deflection, or binding of drawers and doors:

1. Support Framing System: 600 lb/ft. (900 kg/m).
3. Wall Cabinets (Upper Cabinets): 160 lb/ft. (240 kg/m) Shelves: 40 lb/sq. ft. (200 kg/sq. m).

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design laboratory casework and support framing system, including attachments to other work.

2.3 CASEWORK, GENERAL

A. Casework Product Standard: Comply with SEFA 8 W, "Laboratory Grade Wood Casework."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Low-Emitting Materials: Fabricate casework, including countertops, with adhesives and composite wood products containing no urea formaldehyde.

2.4 WOOD CASEWORK

A. Design: Square-edged full overlay.

1. Provide 1/8-inch (3.2-mm) reveals between doors and drawers that are adjacent.

B. Wood Species: Red oak.

C. Cut: Plain sliced/sawn.

D. Matching:

1. None required; select and arrange components for compatible grain and color.

   a. Provide continuous matching of adjacent drawer fronts within each cabinet.

   b. Provide continuous matching of adjacent drawer fronts within each cabinet and end matching between drawer fronts of adjacent cabinets.

E. Grain Direction:

1. Vertical on both doors and drawer fronts, with continuous vertical matching.
2. Vertical on end panels.
3. Vertical on knee-space panels.
F. Exposed Materials:

1. General: Provide materials that are selected and arranged for compatible grain and color. Do not use materials adjacent to one another that are noticeably dissimilar in color, grain, figure, or natural character markings.

2. Plywood: Hardwood plywood, either veneer core or particleboard core, made without urea formaldehyde with face veneer of species indicated. Grade A exposed faces, at least 1/50 inch (0.5 mm) thick, and Grade J crossbands. Provide backs of same species as faces.


G. Semi exposed Materials:

1. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects, of any species similar in color and grain to same species as exposed solid wood.

2. Plywood: Hardwood plywood of any species similar in color and grain to exposed plywood. Grade B faces and Grade J crossbands. Provide backs of same species as faces.

3. Provide solid wood or hardwood plywood for semi exposed surfaces unless otherwise indicated.

H. Concealed Materials:

1. Solid Wood: Any species, with no defects affecting strength or utility.


3. Particleboard.

4. MDF.

5. Hardboard.

I. Finish:

1. Basis-of-Design: Kewaunee #103 Sherwood Oak.

2.5 WOOD CABINET AND TABLE MATERIALS

A. General:

1. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.

B. Hardwood Plywood: HPVA HP-1, particleboard core except where veneer core is indicated, and made without urea formaldehyde.

C. MDF: ANSI A208.2, Grade 130; made with binder containing no urea formaldehyde.

D. Particleboard: ANSI A208.1, Grade M-2; made with binder containing no urea formaldehyde.

E. Hardboard: ANSI A135.4, Class 1 Tempered.

F. Edge banding for Wood-Veneered Construction: Minimum 1/8-inch- (3-mm-) thick, solid wood of same species as face veneer.
1. Select wood edge banding for grain and color compatible with face veneers.

2.6 AUXILIARY CABINET MATERIALS

A. Glass for Glazed Doors: Clear float glass complying with ASTM C 1036, Type I, Class 1, Quality-Q3; not less than 4.0 mm or 1/8" thick.

2.7 COUNTERTOP, TABLETOP, AND SINK MATERIALS


1. Manufacturers:
   a. Durcon.
   b. Kewaunee.
   c. Epoxyn.

2. Physical Properties:
   a. Flexural Strength: Not less than 10,000 psi (70 MPa).
   b. Modulus of Elasticity: Not less than 2,000,000 psi (1400 MPa).
   c. Hardness (Rockwell M): Not less than 100.
   d. Water Absorption (24 Hours): Not more than 0.02 percent.
   e. Heat Distortion Point: Not less than 260 deg F (127 deg C).

3. Chemical Resistance: Epoxy-resin material has the following ratings when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.4.5:
   a. No Effect: Acetic acid (98 percent), acetone, ammonium hydroxide (28 percent), benzene, carbon tetrachloride, dimethyl formamide, ethyl acetate, ethyl alcohol, ethyl ether, methyl alcohol, nitric acid (70 percent), phenol, sulfuric acid (60 percent), and toluene.
   b. Slight Effect: Chromic acid (60 percent) and sodium hydroxide (50 percent).


5. Sizes as noted on the documents.

B. Phenolic Composite for lab countertops, back, and side splashes: Solid, high-pressure decorative laminate, complying with NEMA LD 3, Grade CGS.


2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Trespa North America.

3. Chemical Resistance: Composite countertop material has the following ratings when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.4.5:
a. No Effect: Acetic acid (98 percent), acetone, ammonium hydroxide (28 percent), benzene, carbon tetrachloride, dimethyl formamide, ethyl acetate, ethyl alcohol, formaldehyde (37 percent), furfural, [hydrochloric acid (37 percent), hydrofluoric acid (48 percent), nitric acid (30 percent), phosphoric acid (85 percent), sodium hydroxide (20 percent), sulfuric acid (33 percent), toluene, and zinc chloride].


C. Stainless-Steel Countertops: Made from stainless-steel sheet, not less than 0.062-inch (1.59-mm) nominal thickness, with No. 4 satin finish.

1. Extend top down 1-inch (25 mm) at edges with a 1/2-inch (13-mm) return flange under frame. Apply heavy coating of heat-resistant, sound-deadening mastic to undersurface.
2. Form backsplash coved to and integral with top surface.
3. Provide raised (marine) edge around perimeter of countertops containing sinks.
4. Pitch countertops that contain sinks towards the sink as indicated in Drawings. Provide countertop drain channels, 18 inches long, at each side of sink.
5. Factory punch holes for service fittings.
6. Reinforce underside of countertop with channels or use thicker metal sheet where necessary to ensure rigidity without deflection.
7. Weld shop-made joints.
8. Where field-made joints are required, provide hairline butt joints mechanically bolted through continuous channels welded to underside at edges of joined ends. Keep field jointing to a minimum.
9. Where stainless-steel sinks occur in stainless-steel countertops, factory weld into one integral unit.
10. After fabricating and welding, grind surfaces smooth and polish to produce uniform, directionally textured finish with no cross scratches or evidence of welds. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean.

D. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

2.8 FABRICATION

A. Construction: Provide wood-faced laboratory casework complying with SEFA 8 W and of the following minimum construction:

1. Bottoms of Base Cabinets and Tall Cabinets: 3/4-inch- (19-mm-) thick, veneer-core hardwood plywood.
2. Tops and Bottoms of Wall Cabinets and Tops of Tall Cabinets: 1-inch- (25-mm-) thick, veneer-core hardwood plywood.
3. Ends of Cabinets: 3/4-inch- (19-mm-) thick, hardwood plywood.
5. Base Cabinet Top Frames: 3/4-by-2-inch (19-by-50-mm) solid wood with mortise and tenon or dovealed connections, glued and pinned or screwed or Base Cabinet Stretchers: 3/4-by-4-1/2-inch (19-by-114-mm) panel product strips or solid-wood boards at front and back of cabinet, glued and pinned or screwed.
6. Exposed Backs of Cabinets: 3/4-inch- (19-mm-) thick, particleboard- or MDF-core hardwood plywood.
7. Unexposed Backs of Cabinets: 1/4-inch- thick, hardwood plywood dadoed into sides, bottoms, and tops, unless otherwise indicated.
8. Drawer Fronts: 3/4-inch- (19-mm-) thick, particleboard- or MDF-core hardwood plywood or solid hardwood.
9. Drawer Sides and Backs: 1/2-inch- (12.7-mm-) thick, solid hardwood or veneer-core hardwood plywood, with glued dovetail or multiple-dowel joints.

10. Drawer Bottoms: 1/4-inch- (6.4-mm-) thick, veneer-core hardwood plywood glued and dadoed into front, back, and sides of drawers. Use 1/2-inch- (12.7-mm-) thick material for drawers more than 24 inches (600 mm) wide.

11. Doors: 3/4 inch (19 mm) thick, with particleboard or MDF cores and hardwood face veneers and crossbands.

B. Tables: Solid-hardwood legs, not less than 2 inches (50 mm) square with solid-hardwood stretchers as needed to comply with product standard. Bolt stretchers to legs and cross-stretchers, and bolt legs to table aprons. Provide leveling device at bottom of each leg.

1. Leg Shoes: Black vinyl or rubber, open-bottom, slip-on type.

A. Utility-Space Framing: Steel framing units consisting of two steel slotted channels complying with MFMA-4, not less than 1-5/8 inches (41 mm) square by 0.105-inch (2.66-mm) nominal thickness, and connected at top and bottom by U-shaped brackets made from 1-1/4-by-1/4-inch (32-by-6-mm) steel flat bars. Framing units may be made by welding specified channel material into rectangular frames instead of using U-shaped brackets.

B. Island shelf Framing: Steel framing units consisting of two steel slotted channels complying with MFMA-4, not less than 1-5/8 inches (41 mm) square by 0.105-inch (2.66-mm) nominal thickness, and connected at top and bottom by U-shaped brackets made from 1-1/4-by-1/4-inch (32-by-6-mm) steel flat bars. Framing units may be made by welding specified channel material into rectangular frames instead of using U-shaped brackets.

1. Painted to match lower wall color.

C. Removable Backs: Provide backs that can be removed from within cabinets at all sink locations.

D. Filler and Closure Panels: Provide where indicated and as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as adjacent exposed cabinet surfaces unless otherwise indicated.

1. Provide knee-space panels (modesty panels) at spaces between base cabinets, where cabinets are not installed against a wall or where space is not otherwise closed.
2. Provide utility-space closure panels at spaces between base cabinets where utility space would otherwise be exposed, including spaces below countertops.
3. Provide closure panels at ends of utility spaces where utility space would otherwise be exposed.

2.9 WOOD FINISH

A. Preparation: Sand lumber and plywood before assembling. Sand edges of doors, drawer fronts, and molded shapes with profile-edge sander. Sand after assembling for uniform smoothness at least equivalent to that produced by 220-grit sanding and without machine marks, cross sanding, or other surface blemishes.

B. Staining: Remove fibers and dust and apply stain to exposed and semi-exposed surfaces as necessary to match approved Samples. Apply stain in a manner that produces a consistent appearance. Apply wash-coat sealer before applying stain to closed-grain wood species.
C. Chemical-Resistant Finish: Apply laboratory casework manufacturer's standard two-coat, chemical-resistant, transparent finish. Sand and wipe clean between coats. Topcoat(s) may be omitted on concealed surfaces.

1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8 W. Acceptance level for chemical spot test shall be no more than four Level 3 conditions.

2.10 HARDWARE

A. General: Provide laboratory casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.

B. Butt Hinges: Stainless-steel, five-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide two for doors 48 inches (1200 mm) high or less and three for doors more than 48 inches (1200 mm) high.

C. Hinged Door and Drawer Pulls: Solid-aluminum back-mounted pulls. Provide two pulls for drawers more than 24 inches (600 mm) wide.

1. Design: Wire pulls.
2. Overall Size: 1 by 4-1/2 inches (25 by 114 mm).

D. Sliding Door Pulls: Stainless-steel recessed flush pulls.

1. Design and Size: Oval, 1 by 3 inches (25 by 76 mm), 3/8 inch (10 mm) deep.

E. Door Catches: Nylon-roller spring catches. Provide two catches on doors more than 48 inches (1200 mm) high.

F. Drawer Slides: Side mounted, epoxy-coated steel, self-closing; designed to prevent rebound when drawers are closed; complying with BHMA A156.9, Type B05091.

1. Provide Grade 1HD-100; for drawers, not more than 6 inches (150 mm) high and 24 inches (600 mm) wide.
2. Provide Grade 1HD-200; for drawers, more than 6 inches (150 mm) high or 24 inches (600 mm) wide.
3. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Full-extension, ball-bearing type.

G. Adjustable Shelf Supports: powder-coated steel standards and shelf rests complying with BHMA A156.9, similar to Unistrut P2500 – P2053.

H. Standards for tops and shelving, similar to Unistrut P1000, lengths as indicated on the elevations.

2.11 COUNTERTOPS, TABLETOPS, AND SINKS

A. Countertops, General: Provide units with smooth surfaces in uniform plane, free of defects. Make exposed edges and corners straight and uniformly beveled. Provide front and end overhang of 1 inch (25 mm), with continuous drip groove on underside 1/2 inch (13 mm) from edge.
B. Sinks, General: Provide sizes indicated or laboratory casework manufacturer's closest standard size of equal or greater volume, as approved by Architect.

   1. Outlets: Provide with strainers and tailpieces, NPS 1-1/2 (DN 40), unless otherwise indicated.
   2. Overflows: For each sink except cup sinks, provide overflow of standard beehive or open-top design with separate strainer. Height 2 inches (50 mm) less than sink depth. Provide in same material as strainer.

C. Epoxy Sinks:

   1. Sink Fabrication: Molded in one piece with smooth surfaces, coved corners, and bottom sloped to outlet; 1/2-inch (13-mm) minimum thickness.
      a. Provide with polypropylene strainers and tailpieces.
      b. Provide sinks for drop-in installation with 1/4-inch- (6-mm-) thick lip around perimeter of sink.
      c. Provide integral sinks in epoxy countertops, bonded to countertops with invisible joint line.
      d. Provide manufacturer's recommended adjustable support system for table- and cabinet-type installations.

D. Phenolic-Composite Countertops, Tabletops, and Shelves:

   1. Countertop Fabrication: Fabricate with cutouts for sinks, holes for service fittings and accessories, and butt joints assembled with epoxy adhesive and concealed metal splines.
      a. Countertop Configuration: Flat, 3/4 inch (19 mm) thick, with beveled edge and corners, and with drip groove and integral coved backsplash.
   2. Tabletop Fabrication:
      a. Tabletop Configuration: Flat, 3/4 inch (19 mm) thick, with beveled edge and corners, and with drip groove at perimeter.
   3. Shelf Configuration: Flat, 3/4 inch (19 mm) thick, with beveled edge and corners.

E. Stainless-Steel Countertops: Made from stainless-steel sheet, not less than 0.062-inch (1.59-mm) nominal thickness, with No. 4 satin finish.

   1. Extend top down 1-inch (25 mm) at edges with a 1/2-inch (13-mm) return flange under frame. Apply heavy coating of heat-resistant, sound-deadening mastic to undersurface.
   2. Form backsplash coved to and integral with top surface.
   3. Provide raised (marine) edge around perimeter of countertops containing sinks.
   4. Pitch countertops containing sinks two ways to sink without channeling or grooving.
   5. Factory punch holes for service fittings.
   6. Reinforce underside of countertop with channels or use thicker metal sheet where necessary to ensure rigidity without deflection.
   7. Weld shop-made joints.
   8. Where field-made joints are required, provide hairline butt joints mechanically bolted through continuous channels welded to underside at edges of joined ends. Keep field jointing to a minimum.
9. Where stainless-steel sinks or cup sinks occur in stainless-steel countertops, factory weld into one integral unit.

10. After fabricating and welding, grind surfaces smooth, and polish as needed to produce uniform, directionally textured finish with no cross scratches or evidence of welds. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean.

2.12 LABORATORY ACCESSORIES

A. Pegboards: Polypropylene, epoxy, or phenolic-composite pegboards with removable polypropylene pegs and stainless-steel drip troughs with drain outlet. Sizes as noted on the drawings.

B. Vertical Utility Chase:
   1. Constructed of a Unistrut frame, supported from the structure, with steel removable side panels for accessibility.
   2. Panels to extend to approximately 9’ A.F.F. (not to deck).
   3. Structure to sit on 2” high curb of the same material as the lab countertop.
   4. Exact details can be manufacturer’s standard details which follow this design intent.
   5. Color to match upright shelving system.

2.13 WATER AND LABORATORY GAS SERVICE FITTINGS

A. Manufacturers:
   1. Water Saver.
   2. Chicago Faucet.

B. Service Fittings: Provide units that comply with SEFA 7, "Laboratory and Hospital Fixtures - Recommended Practices." Provide fittings complete with washers, locknuts, nipples, and other installation accessories. Include wall and deck flanges, escutcheons, handle extension rods, and similar items.

C. Materials: Fabricated from cast or forged red brass unless otherwise indicated.
   1. Reagent-Grade Water Service Fittings: Polypropylene, PVC, or PVDF for parts in contact with water.

D. Finish: Polished chromium plated.

E. Water Valves and Faucets: Provide units complying with ASME A112.18.1, with renewable seats, designed for working pressure up to 80 psig (550 kPa).
   1. Vacuum Breakers: Provide ASSE 1035 vacuum breakers on water fittings with serrated outlets.
   2. Aerators: Provide aerators on water fittings that do not have serrated outlets.
F. Ball Valves: Chrome-plated ball and PTFE seals. Handle requires no more than 5 lbf (22 N) to operate. Provide units designed for working pressure up to 75 psig (520 kPa), with serrated outlets.

G. Ground-Key Cocks: Tapered core and handle of one-piece forged brass, ground and lapped, and held in place under constant spring pressure. Provide units designed for working pressure up to 40 psig (280 kPa), with serrated outlets.

H. Needle Valves: Provide units with renewable, self-centering, floating cones and renewable seats of stainless steel or Monel metal, with removable serrated outlets.

I. Remote-Control Valves: Provide needle valves, straight-through or angle type as indicated for fume hoods and where indicated.

J. Handles: Provide three or four-arm, forged-brass handles for valves unless otherwise indicated.
   1. Provide lever-type handles for ground-key cocks. Lever handle aligns with outlet when valve is closed and is perpendicular to outlet when valve is fully open.
   2. Provide lever-type handles for ball valves unless otherwise indicated. Lever handle aligns with outlet when valve is closed and is perpendicular to outlet when valve is fully open.

K. Service-Outlet Identification: Provide color-coded plastic discs with embossed identification, secured to each service-fitting handle to be tamper resistant. Comply with SEFA 7 for colors and embossed identification.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Comply with installation requirements in SEFA 2.3. Install level, plumb, and true; shim as required, using concealed shims. Where laboratory casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF CABINETS

A. Comply with installation requirements in SEFA 2.3. Install level, plumb, and true; shim as required, using concealed shims. Where laboratory casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

B. Utility-Space Framing: Secure to floor with two fasteners at each frame. Fasten to partition framing, wood blocking, or metal reinforcements in partitions and to base cabinets.

C. Base Cabinets: Fasten cabinets to utility-space framing, partition framing, wood blocking, or reinforcements in partitions, with fasteners spaced not more than 16 inches (400 mm) o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.
1. Where base cabinets are installed away from walls, fasten to floor at toe space at not more than 24 inches (600 mm) o.c. and at sides of cabinets with not less than two fasteners per side.

D. Wall Cabinets: Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than 16 inches (400 mm) o.c.

E. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.

F. Adjust laboratory casework and hardware so doors and drawers align and operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF COUNTERTOPS

A. Comply with installation requirements in SEFA 2.3. Abut top and edge surfaces in one true plane with flush hairline joints and with internal supports placed to prevent deflection. Locate joints only where indicated on Shop Drawings.

B. Field Jointing: Where possible, make in same manner as shop-made joints using dowels, splines, fasteners, adhesives, and sealants recommended by manufacturer. Shop prepare edges for field-made joints.

1. Use concealed clamping devices for field-made joints in plastic-laminate countertops. Locate clamping devices within 6 inches (150 mm) of front and back edges and at intervals not exceeding 24 inches (600 mm). Tighten according to manufacturer's written instructions to exert a uniform heavy pressure at joints.

C. Fastening:

1. Secure countertops, except for epoxy countertops, to cabinets with Z-type fasteners or equivalent, using two or more fasteners at each cabinet front, end, and back.

2. Where necessary to penetrate countertops with fasteners, countersink heads approximately 1/8 inch (3 mm,) and plug hole flush with material equal to countertop in chemical resistance, hardness, and appearance.

D. Provide required holes and cutouts for service fittings.

E. Provide scribe moldings for closures at junctures of countertop, curb, and splash with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent laboratory casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.

F. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

G. Provide clear sealant between edges of countertop, splashes, and wall, or adjacent surfaces.

3.4 INSTALLATION OF SINKS

A. Comply with installation requirements in SEFA 2.3.
B. Drop-in Installation of Epoxy Sinks: Rout groove in countertop to receive sink rim if not shop prepared. Set sink in adhesive and fill remainder of groove with sealant or adhesive. Use procedures and products recommended by sink and countertop manufacturers. Remove excess adhesive and sealant while still wet and finish joint for neat appearance.

3.5 INSTALLATION OF LABORATORY ACCESSORIES

A. Install accessories according to Shop Drawings, installation requirements in SEFA 2.3, and manufacturer’s written instructions.

B. Securely fasten adjustable shelving supports, phenolic resin shelves, and pegboards to partition framing, wood blocking, or reinforcements in partitions.

C. Install shelf standards plumb and at heights to align shelf brackets for level shelves. Install shelving level and straight, closely fitted to other work where indicated.

D. Securely fasten pegboards to partition framing, wood blocking, or reinforcements in partitions.

3.6 SERVICE-FITTING SCHEDULE

A. Water Service Fitting, Type: HWCW

2. Fitting Type: Swing, gooseneck mixing faucet.
3. Outlet: Removable Aerator and Vacuum breaker.
5. Wrist blades.

B. Water Service Fitting, Type: PW

2. Forged brass valve body, polypropylene lined.

C. Laboratory Service Fitting, Type: A-1

2. Service: Air.
3. Fitting Type: Deck-Mounted Turret.
4. Outlets: One.
5. Outlet Type: Straight.
6. Valve Type: Needle valve.

D. Laboratory Service Fitting, Type: A-2

2. Service: Air.
3. Fitting Type: Wall Mounted.
5. Outlet Type: Straight.
6. Valve Type: Needle valve.
E. Laboratory Service Fitting, Type: NG-1

2. Service: Natural Gas.
3. Fitting Type: Deck-Mounted Turret.
4. Outlets: One.
5. Outlet Type: Straight.
6. Valve Type: Needle valve.
F. Laboratory Service Fitting, Type: NG-2
   2. Service: Natural Gas.
   3. Fitting Type: Wall Mounted.
   5. Outlet Type: Straight.
   6. Valve Type: Needle valve.

G. Laboratory Service Fitting, Type: V-1
   2. Service: Vacuum.
   3. Fitting Type: Deck-Mounted Turret.
   4. Outlets: One.
   5. Outlet Type: Straight.
   6. Valve Type: Needle valve.

H. Laboratory Service Fitting, Type: V-2
   2. Service: Vacuum.
   3. Fitting Type: Wall Mounted.
   5. Outlet Type: Straight.
   6. Valve Type: Needle valve.

I. Electrical Service Fitting, for vertical uprights in benchtop upright system.
   2. Fitting Type: Pedestal, single faced and Pedestal, double faced.
   3. Device: Pedestal Manufacturer to provide devices/ receptacles pre-installed. Devices shall meet the requirements of Section 262726 – Wiring Devices. Refer to Electrical drawings additional requirements. Install with lab casework. Final electrical connections by Electrical contractor.
   4. #6063-T5 aluminum alloy, Satin anodized finish.
   5. Mounted vertically.

J. Emergency Shower and Eye Wash Station, ESEW
   1. Reference standard: Water Saver SS996 Safety Station with Eye/Face Wash.
   2. ABS plastic, Orange.

3.7 INSTALLATION OF SERVICE FITTINGS

A. Comply with requirements in other Sections for installing water and laboratory gas service fittings and electrical devices.
B. Install fittings according to Shop Drawings, installation requirements in SEFA 2.3, and manufacturer's written instructions. Set bases and flanges of sink- and countertop-mounted fittings in sealant recommended by manufacturer of sink or countertop material. Securely anchor fittings to laboratory casework unless otherwise indicated.

3.8 CLEANING AND PROTECTING

A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

B. Protect countertop surfaces during construction with 6-mil (0.15-mm) plastic or other suitable water-resistant covering. Tape to underside of countertop at a minimum of 48 inches (1200 mm) o.c.

END OF SECTION 123553.19
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

2. Fume base cabinets: flammable/ solvents storage cabinets, and acid storage cabinets and as indicated on the documents.
3. Service fixtures (ie. water, gas, etc.) and electrical service fittings in fume hoods.
4. Piping and wiring within service fittings, light fixtures, switches, and other electrical devices.
5. Fume hood base support as required for a complete installation.
6. Work Surfaces within fume hoods.
7. Laboratory sinks and cup sinks in fume hoods as indicated on the documents or in the schedule.
8. Filler panels as required for a complete installation.

B. Related Documents

1. Drawings and General Provisions of the Contract, including General and Supplemental Conditions and Division 01 Specifications sections.

C. Products whose installation must be coordinated with but not provided under this section:

1. Laboratory fume hood certification and testing to be by Owner.

D. Coordination

1. Coordinate layout and installation of framing and reinforcements for lateral support of fume hoods.
2. Coordinate installation of fume hoods with laboratory casework and other laboratory fixtures required by other sections of the specifications.

1.3 SCOPE AND CLASSIFICATION

A. This specification covers the requirements for the purchase of bench mounted laboratory fume hoods for use with remote exhaust blower systems.

B. Bench-mounted laboratory fume hoods in widths as indicated on the documents.

C. This specification sets the intent for quality, performance and appearance.
1.4 REFERENCES

A. The laboratory hoods must conform to the following regulations and standards:

2. SEFA 8-2010, Recommended Practices for Laboratory Grade Metal Casework, 8.0 Cabinet Surface Finish Tests.
6. ANSI/AIHA Z9.5-2011, American Industrial Hygiene Association, Laboratory Ventilation.
7. OSHA, Federal Register 29 CFR part 1910, Occupational Safety & Health Administration, U.S. Department of Labor, Occupational exposures to hazardous chemicals in laboratories.

B. The laboratory fume hoods must carry the listed mark for the following:

1. UL 61010-1 (formerly 3101-1), Underwriters Laboratories Inc, Electrical Equipment for Laboratory Use.
2. UL 1805, Underwriters Laboratories Inc., Standard for Laboratory Hoods and Cabinets.

1.5 PERFORMANCE REQUIREMENTS

A. General Design Requirements (See Part 2 for details).

1. Fume hoods shall function as ventilated, enclosed workspaces, designed to capture, contain and exhaust fumes, vapors and particulate matter produced or generated within the enclosure.
2. Fume hood shall be factory designed to function as a constant air volume open bypass fume hood prepped for future field modifications to variable air volume.
3. Structure and Materials of construction:
   a. Hoods are of double-wall construction.
   b. Powder-coated, cold rolled steel exterior.
   c. Galvanized steel support members.
   d. Sheet molded composite panel internal liner.

4. Baffles:
   a. Baffle designed to pull air in horizontal streams to minimize the air roll pattern associated with traditional fume hoods.
   b. Baffle slot pattern designed to optimize face velocity profile.
   c. Baffle designed to counteract upward air streams that produce roll.
   d. Moving or adjustable baffles are not acceptable.
5. Sash:
   a. Maximum opening is 28”.
   b. Unobstructed viewing height is 35.5”.
   c. Hood incorporates a profiled sash handle to direct fume concentrations away from the user's breathing zone.

6. Flush Airfoil:
   a. Hoods are provided with a flush air foil across the bottom of the sash area to allow airflow into the hood regardless of user's position.

7. Hoods are provided with an upper dilution air supply for by-pass air to bathe the sash interior and upper interior and to provide 5-10% of the hood’s air volume requirements.

8. Besides the exhaust blower, no additional blowers are required for specified containment.

9. Access for maintenance is from both interior, and exterior sides of the hood.

10. Services:
    a. Furnishing and delivering all service outlets, accessory fittings, electrical receptacles and switches, as listed in these specifications equipment schedules or as shown on drawings.
    b. Plumbing fittings mounted on the fume hood superstructures shall be pre-plumbed per section 2.3.L.
    c. Final plumbing and electrical connections are the responsibility of those contractors fulfilling requirements of Divisions 22, 23, and 26.
    d. All electrical services are pre-wired to a single point internal junction box at the top right of the hood.

B. Containment.

1. The purpose of this section is to set a standard of performance for the bidder’s laboratory fume hood before award of contract and may not necessarily represent the operating conditions of the hoods after installation. Before or after award of contract, Owners may require representative witness to said testing at their option, with failure to meet passing criteria as grounds for rejection of the bidder. Test data shall be provided at no cost to the Owner.

2. Evaluation of manufacturer’s standard product shall take place in manufacturer’s test facility meeting the following criteria:
   a. Lab to be located at manufacturer’s place of business for the testing of bench-mounted laboratory hoods in accordance with ASHRAE Standard 110 with National Institutes of Health (NIH) challenges, including cross draft, box loaded work area, and chest height measuring port for tracer gas.
   b. Room shall accommodate hoods up to 16’ wide, while maintaining sufficient area so that a minimum of 15 feet of clear space is available in front of and 5’ on both sides of hoods for viewing tests.
   c. One hundred percent non-recirculated air to ensure removal of contaminants that could interfere with containment testing before entering the lab.
d. Make-up air to the test room shall be ceiling-supplied through any combination of multiple diffusers to either minimize adverse airflow, or increase it depending on test objectives.

e. Room pressurization must be digitally monitored, and variable depending on test objectives.

f. All equipment must be properly calibrated.

g. Qualified personnel familiar with the laboratory and its operation shall be available to perform the test.

h. Include the following instrumentation and test equipment:

1) Properly calibrated hot wire thermal anemometer capable of measuring air velocities from 10 to 600 ft/minute; correlate with computer data acquisition format to provide simultaneous readings at all points.

2) Theatrical smoke generator or other source of high-volume smoke.

3) Smoke tubes or other source of localized smoke.

4) Leakmeter with traceable calibration, calibrated just before test, to indicated concentration of sulfur hexafluoride.

5) Tracer gas: Sulfur hexafluoride supplied from a cylinder with two stage regulator.

6) Adjustable mannequin, 5' 0'' to 5'8'' in height, with reasonable human proportions, clothed in a smock.

7) Inclined manometer with graduations no greater than 0.2 inch of water.

8) Ejector system: Tracer gas ejector built to specific ASHRAE-110 requirements.

9) Critical orifice: Sized to provide tracer gas at four or eight liters per minute at an upstream pressure sufficient to maintain release rate.

10) Data acquisition software.

3. Hood shall be tested to ASHRAE 110 modified test method as detailed below.

4. Fume hood sashes shall be placed in their fully open position, at least 28'' from the work surface, unless noted otherwise.

5. Ambient Temperature: 68 to 74 degrees F.

a. An imaginary grid is formed comprised of equal 12'' by 12'' squares, or smaller, across the face opening of the laboratory hood. Airflow velocity readings are taken at the intersections of these grids with calibrated hot wire anemometer over a twenty second period of time. Probes shall communicate readings to a computer data acquisition package, which will provide an average of each reading over the one-minute period and an overall average upon completion of data acquisition. Face velocity shall be determined by averaging readings at the hood face.

b. Average face velocity must be achieved without exceeding the CFM noted in part C.

6. Tracer Gas Detection: Hood shall achieve a rating of 4.0AM0.01 maximum average and 4.0AM0.01 maximum spike (unless specifically otherwise noted), wherein:

a. 4.0 = tracer gas release in liters/minute, AM = as manufactured, 0.01 = tracer gas in parts per million (PPM)

b. With the ejector body 6'' from the rear of the sash plane, the test shall be conducted for each ejector position noted.

1) Left position with ejector 12'' from the left interior wall.
2) Center position with ejector equidistant from the sidewalls.
3) Right position with ejector 12" from the right interior wall.

c. Install mannequin positioned in front of the hood, centered on the ejector.

d. Detector probes shall be placed 3" in front of the sash plane. The test shall be conducted for each detector probe position and corresponding face velocity.

1) Detector probe in the region of the nose and mouth of the mannequin. Test with average face velocity of 55 fpm.
2) With the mannequin height reduced 4", place detector probe in the chest of the mannequin, and even with the height of the ejector. Test with average face velocity of 55 fpm.

e. Open tracer gas valve, and collect readings with a computer data acquisition package, which is capable of monitoring and visually recording a minimum of one reading per second for a minimal five-minute time period for each position.

f. The single control rating of the fume hood shall be the results of the test position yielding the highest average levels of tracer gas in any of the six mannequin/ejector configurations.

g. With the ejector and mannequin in the center position, detector probe in the region of the nose and mouth of the mannequin, average face velocity of 55 fpm, tracer gas released, and concentration recorded, open and close the sash in a smooth motion. Test to be repeated three times, with peak values of 0.01 PPM or less.

h. With the mannequin removed, the periphery of the hood is traversed by the probe at 1" in front of the hood opening at a rate of 3 inches per second. The hood shall have a maximum perimeter reading of 0.01 PPM or less.

7. Flow Visualization:

a. Test the operation of the lower air bypass airflow opening and hood periphery by introducing light smoke under the air foil, and around the perimeter of the sash opening. If any smoke that enters the hood reverses directions and escapes from any of these locations, the hood fails this portion of the test and receives no rating.

b. Introduce smoke along both walls and the hood floor in a line parallel to the hood face and 6 inches (152 mm) back into the hood. Define air movement toward the face of the hood as reverse airflow and define lack of movement as dead air space. All smoke should be carried to the back of the hood and out.

c. Introduce a large volume of smoke at the work surface in the center of the hood, and 6" inside the plane of the sash. The smoke shall not get entrained in an interior vortex and shall clear in a single pass.

8. All data on the above, including instrumentation and equipment, and test conditions shall be provided on a report, including the average face velocities, and a separate graph-type performance curve on all tracer gas tests for all required fume hood widths. Performance test data for a 6’ representative hood shall be conducted by an independent testing agency.

C. Efficiencies.

1. The fume hood shall maintain constant volumetric rate (+/- 5 CFM) and static pressure losses (+/- 0.01” H2O) across all sash positions. Without any modifications, the hood
shall also maintain a sufficiently restricted by-pass for use with a variable air volume (VAV) system.

2. The fume hood shall demonstrate a minimization of the volumetric rate of air (CFM) requirement at any given face velocity. Required CFM to achieve desired face velocity shall not exceed that which is noted in the chart below.

3. The fume hood shall demonstrate a minimization of static pressure loss (inches of H2O) at any given CFM.

D. Noise Criterion: The hood shall have a Noise Criterion (NC) rating of less than 50; measured 36” in front of the hood with full open sash, at 100 fpm face velocity. NC is a factor of sound pressure level (dB) and frequency.

E. Illumination: Shall be a minimum average of 80 foot-candles inside the work area. Work area is defined as the area inside the lined portion of the fume hood, from the face of baffle to sash plane, from interior left to interior right, and from the work surface to a height of 28 inches.

F. Materials of Construction: Interior and Exterior materials of construction and finishes shall meet the requirements in Part 2 of this specification.

1.6 QUALITY ASSURANCE

A. Manufacturer’s Qualifications.

1. Ten installations of equal or larger size and requirements. Provide contact at each.

B. Supply equipment in accordance with this specification. Offering a product differing in materials, construction, or performance from this specification requires written approval obtained seven days or more before the proposal deadline.

C. The owner/architect reserves the right to reject qualified or alternate proposals and to award based on product value where such action assures the owner greater integrity of product.

D. Manufacturer’s warranty against defects in material or workmanship on its fume hoods will be for 1 year from date of installation or 2 years from date of purchase, whichever is sooner, and includes replacement of parts (except lamps) and labor.

1.7 SUBMITTALS

A. Action Submittals.

1. Laboratory hood specification sheets and product manuals shall be submitted by the hood manufacturer upon request and include safe and proper operation and maintenance information.

2. Shop Drawings: Include plans, elevations, sections, and details.
   a. Indicate details for anchoring fume hoods to permanent building construction including locations of blocking and other supports.
   b. Indicate locations and types of service fittings together with associated service supply connection required.
   c. Indicate duct connections, electrical.
d. Include roughing-in information for mechanical, plumbing, and electrical connections.
e. Provide face opening, volumetric rates, and static pressure drop data.

B. Informational Submittals.

1. Product Test Reports: Showing compliance with specified performance requirements, including test report as defined previously.

2. Independent validation:
   a. Written verification that the laboratory fume hoods carry the listed mark for the following:
      1) UL 61010-1 (formerly 3101-1), Underwriters Laboratories Inc., Electrical Equipment for Laboratory Use.
      2) UL 1805, Underwriters Laboratories Inc., Standard for Laboratory Hoods and Cabinets.
   b. Written verification from an outside testing agency confirming coating compliance to SEFA 8-2010, Recommended Practices for Laboratory Grade Metal Casework, 8.0 Cabinet Surface Finish Tests.

3. Source quality-control reports.
4. Field quality-control reports.

C. Material Submittals.

1. Samples for Verification of the hood exterior wall material.
2. Furnish complete touchup kit for each type and color of fume hood finish provided. Include fillers, primers, paints and other materials necessary to perform permanent repairs to damaged fume hood finish.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or another suitable material.

B. Schedule delivery of equipment so that spaces are sufficiently complete that equipment can be installed immediately following delivery.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install fume hoods until building is enclosed, wet work and utility roughing-in are complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Locate concealed framing, blocking, and reinforcements that support fume hoods by field measurements before being enclosed, and indicate measurements on Shop Drawings.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Kewaunee Scientific LV05.

B. Acceptable Manufacturers:

1. Labconco Corporation, Protector XL.
2. Kewaunee Scientific, Supreme Air Venturi V05.
3. Waldner, Low Level fume hood or equal.

2.2 MATERIALS

A. Hood Interior Liner and Baffle.

1. Liner material must comply with UL 1805, and be listed within NRTL test report as proof of compliance.

2. General Material Properties:

   a. Nonflammable, corrosion and chemical-resistant
   b. Sheet molded homogenous polyester panels
   c. Minimum thickness is 3/16”
   d. Smooth, white finish

3. Flame and Smoke Characteristics:

   a. Flame retardant, self-extinguishing, with a flame spread rating of 25 or less in accordance with ASTM-E84
   b. Oxygen Index: 35%
   c. Smoke Density: 115

4. Chemical Resistance:

   a. Splash and Spill Resistance:

      1) Suspend sample panel in a vertical plane.
      2) Apply five drops of each reagent listed with an eyedropper.
      3) Apply liquid reagents at top of panel and allow to flow down full panel height.

   b. Fume Resistance:

      1) Place 25 milliliters of reagent into 100 milliliters beakers and position panel over beaker tops in the proper sequence. Ensure beaker pouring lip permits air to enter the interior atmosphere.
      2) After 24 hours remove panel, flush with water, clean with detergent, rinse, wipe dry and evaluate.
c. Evaluation ratings: Change in surface finish and function shall be described by the following numerical ratings:

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

d. Required minimum results for each reagent (Reagent: Fume Resistance Rating, Splash and Spill Resistance Rating) and must pass SEFA-8 with fewer than ten (10) ratings of 3 or 4.

B. Sheet Steel.

1. Side panels and access panels 20-gauge (or heavier) sheet steel.
2. Hood corner posts are 16-gauge sheet steel.
3. Ceiling enclosure panels are 18-gauge sheet steel.
4. Cold-rolled, commercial steel (CS) sheet, complying with ASTM A 1008/A 1008M.

C. Chemical Resistant Finish.

1. General: Prepare, treat, and finish welded assemblies after welding. Prepare, treat, and finish components that are to be assembled with mechanical fasteners before assembling.
2. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8. Third party validation required.
3. Powder-coat process required. Paint processes that release Volatile Organic Compounds (VOC) are not acceptable.
4. Color for Fume Hood Finish: As selected from Manufacturer’s full range.

D. Safety Glass.

1. Tempered or laminated are acceptable.
   b. Surface and interior visible quality to be as specified per ASTM C 1036, Standard Specification for Flat Glass, Table 4, Quality level Q3.

2.3 FABRICATION

A. Superstructure.

1. Self-supporting, rigid structural assembly, to support inner wall consisting of fume hood liner and outer wall of sheet metal exterior.
2. Fabricated from galvanized steel.
3. Space shall accommodate fume hood wiring and plumbing components for service fixtures.
4. Access to fixture valves concealed in wall provided by exterior removable access panels, gasket access panels on the inside liner walls, or through removable access panels on the front posts.

B. Exterior.

1. Fabricate from steel sheet with component parts screwed together.
2. Apply chemical-resistant finish to interior and exterior surfaces of component parts before assembly.
3. Interchangeable side panels shall lift off without the use of tools to allow access to plumbing lines, service fittings, electrical wiring, counterbalance sash weights, and light fixtures. Exposed fasteners or hardware, and Velcro type fasteners, are not acceptable.
4. Corner posts
   a. Pre-punched and plugged to accommodate up to 4 service fixtures per side.
   b. All services are accessible from the front of the hood.
   c. Accommodate two electrical duplexes per side.
   d. Right hand corner post includes electrical switches and airflow monitor.
   e. Un-used penetrations shall be plugged.
5. Panel above header shall be removable without the use of tools to allow access to mechanical connection, electrical wiring, counterbalance sash weights, and light fixtures. Exposed fasteners or hardware, and Velcro type fasteners, are not acceptable.

C. Dimensions.

1. Exterior dimensions are indicated on the documents.

D. Hood Liner.

1. Adhere interior liner components to superstructure.
2. Stainless steel fasteners shall be used on the interior ceiling for structural integrity.
3. Fasteners exposed to chemical environment are not acceptable.
4. Punch fume hood lining side panels to receive four service fittings, for use with remote controls, per side. Provide removable plug buttons for holes not used for indicated fittings.
5. Each side wall shall include an oval interior access panel to provide access to the side wall of the fume hood for plumbing service access. Access panel material shall be that of the liner, and gasketed to form a vapor proof seal.

E. Hood Baffle.

1. Baffle system shall be designed to optimize the face velocity profile, and to capture a wide range of gaseous densities without adjustment or moving components.
2. Primary baffle: Shall provide a continuous horizontal slot at the work surface. Baffle panels shall have multiple horizontal slots. Slot pattern shall be proven to optimize face velocity profile, and direct air in a non-turbulent/laminar flow stream from the hood face into the baffle in a single pass.
3. The baffle system shall be constructed with the same material as the fume hood liner.
4. The baffles shall be removable for cleaning.
5. Exposed components to be non-metallic. Metal components exposed to chemical environment are not acceptable.

6. Moving parts or adjustment of any kind is not acceptable.

F. Exhaust Connection.

1. 316 stainless steel.
2. 12" nominal duct without the need for a transition adapter. 4, 5, and 6-foot hoods have one exhaust connection, and 8-foot hoods have two exhaust connections. Additional components required to accommodate 12" nominal mechanical system is not acceptable.

G. Flush Airfoil.

1. Cold Rolled Steel or 316 stainless steel.
2. Airfoil shall have an aerodynamic radius to sweep the air into the hood with minimal turbulence. Airfoil directs airflow across work top to remove heavier-than-air gases.

H. Sash Assembly.

2. Dimensions: The full sash opening height is 28", the total unobstructed viewing height is 35.5" measured from the work surface.
3. Sash Tracks: Steel with Chemical Resistant Finish. Shall include bump stops for opening and closing.
4. Sash Handle: extruded aluminum with Chemical Resistant Finish. Sash handle shall direct chemical fumes away from the user's breathing zone. The handle is ergonomic in design and is easy to grasp when operating
5. Sash guides: Corrosion resistant extruded poly-vinyl chloride.

6. Sash System:
   a. Vertical Sash (Chain and Sprocket)
      1) Hoods have a sash counterbalanced by a single weight.
      2) Sash and weight to be connected via #35 chains.
      3) Rear sprockets shall be connected via timing shaft to prevent sash tilting and permit one finger operation at any point along full width sash handle. Maximum 7 pounds pull required to raise or lower sash throughout its full length of travel.
      4) Design system to hold sash at any position without creep and to prevent sash drop in the event of chain failure.
      5) Include a defeatable and automatically resetting sash stop positioned for an 18" sash height.

I. Electrical Components.

1. Lighting.
   a. Provide UL Listed, high-efficiency, quick-start, T8 fluorescent lighting systems, including bulbs.
      1) 4 Foot Hoods - 2 each, 3-foot 25-watt fluorescent lamps.
2) 5 Foot Hoods - 2 each, 4-foot 32-watt fluorescent lamps.
3) 6 Foot Hoods - 2 each, 4-foot 32-watt fluorescent lamps.
4) 8 Foot Hoods - 4 each, 3-foot 25-watt fluorescent lamps.

b. Vapor-Proof: All electrical components shall be outside of the contaminated air space. Lighting shall be located behind a laminated safety glass shield, sealed to the top of the hood liner.

c. The fluorescent light assemblies shall be serviceable from outside the fume hood cavity, without the use of tools.

d. Light switch to be included on the lower right corner post, at heights compliant with the Americans with Disabilities Act (ADA).

2. Blower Switch.

a. Hoods shall be provided without a blower switch, as they will share a single mechanical system with other hoods.

3. Electrical Receptacles.

a. The hoods shall accommodate up to four (two per corner post) electrical receptacles as indicated in schedule or drawings. Options to include:

   1) 120-volt, 60 Hz, three-wire polarized and grounded electrical duplex, with Ground Fault Circuit Interruption (GFCI) as indicated on the drawings or fume hood schedule.

b. Receptacles shall be individually wired to field wiring box, and each rated at 20 Amperes.

c. Cover plates shall be acid resistant thermoplastic.

4. Wiring.

a. Every electrical component shall be individually wired to a single point internal field wiring box (including individual duplexes/receptacles).

b. Final wiring and circuit dedication are to be by others.

c. Each receptacle circuit shall accommodate being wired to a dedicated building circuit rated at 20A, or the receptacles ganged together on a building circuit with the total load not exceeding 20 Amperes.

5. Fume hood to have third party validation of compliance to UL 1805 and UL 61010-1 by a Nationally Recognized Testing Laboratory (NRTL).

J. Upper Dilution Air Supply.

1. Located behind and above the sash to introduce between 5 and 10% of the required hood air volume and maintain sufficient exhaust air volume through hood to adequately dilute hazardous fumes regardless of sash position.

2. This device bathes the sash interior above the work area to eliminate chemical fumes along the sash plane near the operator's critical breathing zone.

3. Shall act as a by-pass opening controlled by sash position. If on a constant volume mechanical system, the hood shall not have a change in static pressure or exhaust volume across all sash positions.
4. Shall offer a significant restriction to the by-pass opening to allow the use of a VAV mechanical system without modification to the by-pass opening.

K. Hood Safety Practices Label: Corrosion resistant plate attached to the left corner post of the fume hood. Coordinate hood safety practices with Owner.

L. Fume Hood Accessories.

1. Service Fixtures: Color-coded hose nozzle outlets and valves mounted inside the fume hood and controlled from the exterior with color-coded index handles. Type as indicated on the documents.
   a. Hoods equipped without service fixtures or will be provided with a total of up to 8 service fixtures as indicated in schedule.
   b. Hose connectors located inside the fume hood cavity are chemically resistant, glass-filled polypropylene with 6 serrations.
   c. Service lines shall be factory installed from valve to outlet.
      1) Copper tubing unless otherwise noted.
      2) PVC or Polypropylene service lines for Deionized Water.
      3) Services to be pre-piped to the top of the hood.
      4) Black iron piping for natural gas.
      5) Water lines to be factory insulated.
   d. Valves.
      1) Extruded brass valve and rotating seat, TFE-coated silicone bronze stem and TFE packing.
      2) Fixture handles are plastic, and color coded as well as labeled for the designated type of service.
      3) Fixtures are rated at maximum pressure of 200 psi.
      4) Coefficient of flow for the valve, \( CV = 0.43 \).
      5) Valves are front loaded, located on the fume hood corner post for remote use.

2. Tissue Screen: Provide epoxy-coated, stainless-steel screen at bottom baffle opening to prevent paper from being drawn into the exhaust plenum behind baffles.

3. Rear Finish Panel: Shall be the same materials and coating as the hood exterior.

4. Face Velocity Monitor/Alarm: sim. to TEL AFA 500 Audio-visual air flow monitor.

5. Constant Air Volume (CAV) Prepared for future conversion to VAV.

M. Work Surface.

1. 1.25" thick, molded from solid modified epoxy resin, with smooth, non-specular, black finish.
2. One-inch radius front edge for optimal fume hood performance.
3. 3/8" dished area to match the fume hood interior workspace and form a watertight pan for spill containment.
4. Include a 2.5" diameter hole on each side for service pass-through and piping. Hole to be covered by hood superstructure upon installation.
5. Include two 1.5" diameter penetrations to accommodate base cabinet venting. Holes to be located outside of dished area and under the fume hood baffles. Include plugs.
6. Physical Properties:
   a. Flexural Strength: Not less than 10,000 psi (70 MPa).
   b. Modulus of Elasticity: Not less than 2,000,000 psi (1400 MPa).
   c. Hardness (Rockwell M): Not less than 100.
   d. Water Absorption (24 Hours): Not more than 0.02 percent.
   e. Heat Distortion Point: Not less than 260 deg F (127 deg C).
   f. Flame-Spread Index: 25 or less per ASTM E 84.

7. Cupsink:
   a. 3 x 6" dimension, polypropylene construction.
   b. Provide with strainers and tailpieces, NPS 1-1/2 (DN 40).
   c. To sit flush with dished area of work surface.

N. Supporting Base Cabinets.

1. Acid Storage.
   a. Dimensions: As indicated on the documents.
   b. Completely lined with a polyethylene corrosion resistant liner. The liner is 3/16" thick. Each door has a 3/16" sheet polyethylene liner.
   c. The cabinet is labeled: "ACID".
   d. Each cabinet is vented into the fume hood with a 1 1/2" vent pipe. It should provide a positive airflow directly into the fume hood exhaust system.

2. Solvent Storage.
   a. Dimensions: As indicated on the documents.
   b. Solvent storage cabinets are specifically designed for the storage of flammable and combustible liquids.
   c. Solvent Storage Cabinet must be compliant with NFPA 30 “Flammability and Combustible Liquids Code.”
   d. Cabinets shall be tested and approved to meet either UL or FM standards.
   e. The bottoms, top, sides, and doors are fabricated of 18-gauge steel and are all double panel construction with a 1 1/2" air space between panels.
   f. All joints are welded or screwed to provide a rigid enclosure. A 2" deep liquid tight pan that covers the entire bottom of the cabinet is furnished to contain liquid leaks and spills.
   g. A full-depth, 18-gauge steel, adjustable shelf is also provided. Shelves are sealed leak tight.
   h. Two diametrically opposed flame arrestor vents with spark screens are provided in the back of the cabinet, as well as a grounding screw.
   i. The cabinet has an interior finish same as the exterior.
   j. The cabinet is labeled: "FLAMMABLE KEEP FIRE AWAY".
   k. The right-hand door shall have a three-point latching device.
   l. Door handles include a key lock. Solvent storage handles are locking lever handles with bright chrome finish.
   m. Self-closing/self-latching and shall be provided with a fusible link feature to ensure the doors will close if the temperature outside the cabinet exceeds 165 degrees Fahrenheit. The doors are synchronized so that both doors will fully close.
O. Airflow Indicator and Alarm: Provide each fume hood with manufacturer's standard airflow indicator with audible and visual alarm that activates when airflow sensor reading is outside of preset range.

P. Sash Alarm: Provide laminar flow hoods with audible and visual alarm that activates when sash is opened beyond preset position.
   1. Provide with silence and test switches.

Q. Sash Stops: Provide laminar flow hoods with sash stops to limit hood opening to 50 percent of sash height. Sash stops can be manually released to open sash fully for cleaning laminar flow hood and for placing large apparatus within laminar flow hood.

2.4 FUME HOOD SCHEDULE

A. Fume Hood, 5'-0".
   1. Width: 5'-0" (60 inches).
   2. Worksurface Depth: 2'-6" (30 inches).
   3. Total Depth: 3'-0" (36" inches).
   4. One (1) 24" Acid storage cabinet.
   5. One (1) 36" Solvent storage cabinet.
   6. One (1) Cup sink.
   7. One (1) Natural Gas, (1) air, (1) vacuum, and (1) cold water.
   8. One (1) GFCI 120V receptacle, each side.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fume hoods.

B. Coordinate with other trades for the proper and correct installation of plumbing and electrical rough-in and for rough opening dimensions required for the installation of the hood.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fume hoods according to shop drawings and manufacturer's written instructions.

B. Install level, plumb and true; shim as required, using concealed shims, and securely anchor to building and adjacent laboratory casework.

C. Securely attach access panels but provide for easy removal and secure reattachment. Where fume hoods abut other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
D. Neighboring splash blocks shall not be attached directly to the hood.

E. Install according to standards required by authority having jurisdiction.

F. Sequence installations to ensure utility connections are achieved in an orderly and expeditious manner.

G. Touch up minor damaged surfaces caused by installation. Replace damaged components as directed by Architect.

3.3 ADJUSTING AND CLEANING

A. Adjust moving parts for smooth, near silent, accurate sash operation with one hand. Adjust sashes for uniform contact of rubber bumpers. Verify that counterbalances operate without interference.

B. Clean finished surfaces, including both sides of glass; touch up as required; and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

C. Clean adjacent construction and surfaces that may have been soiled in the course of installation of work in this section.

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

E. Advise contractor of procedures and precautions for protection of material and installed equipment and casework from damage by work of other trades.

END OF SECTION 115313
PURDUE UNIVERSITY
WHISTLER HALL ROOM 119 LAB RENOVATION 2019
C.40.10589
175 S UNIVERSITY ST, WEST LAFAYETTE, IN 47907

CONSTRUCTION DOCUMENTS
PROJECT DATE: JANUARY 17, 2020
P.I.D.: C.40.10589
PROJECT NUMBER: 0270075

SYNTHESIS INCORPORATED
251 N ILLINOIS STREET
SUITE 200
INDIANAPOLIS, IN 46204
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FAX: 317.951.9501
www.synthinc.com

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CONSTRUCTION DOCUMENTS
SET NO.
GENERAL CONSTRUCTION NOTES

A. DO NOT SCALE DOCUMENTS.
B. DIMENSIONS ARE TO/FROM FINISH FACE UNLESS NOTED OTHERWISE.
C. PROVIDE BLOCKING AND FRAMING BETWEEN METAL STUDS AROUND AND BEHIND ITEMS RECESSED IN, OR SURFACE MOUNTED ON, GYPSUM BOARD WALLS. REFER TO PROJECT MANUAL FOR BLOCKING REQUIREMENTS TO SUPPORT MISCELLANEOUS ITEMS OR EQUIPMENT TO BE INSTALLED.
D. REFER TO MECHANICAL, ELECTRICAL, AND PLUMBING SYMBOLS SHOWN ON ARCHITECTURAL DOCUMENTS ARE FOR COORDINATION ONLY AND DO NOT REPRESENT ELECTRICAL SCOPE OF WORK. REFER TO ENGINEERING DRAWINGS FOR EXTENT OF PENETRATIONS THROUGH RATED FLOOR CONSTRUCTION OR RATED WALLS.
E. KEEP EXIT CORRIDORS AND STAIRWAYS FREE FROM DEBRIS AND OBSTRUCTIONS FOR EGRESS.
F. PROVIDE FIRE STOPPING AS REQUIRED. REFER TO ENGINEERING DRAWINGS FOR COMPLETE INFORMATION.
G. THESE DRAWINGS AND ALL COPIES THEREOF ARE AND SHALL REMAIN THE PROPERTY AND COPYRIGHT OF THE ARCHITECT. PERMITTED USE. MANUFACTURING CHANGES MAY OCCUR BETWEEN TIME OF DESIGN AND CONSTRUCTION WORK, INCLUDING DEMOLITION, SHALL CONFORM TO APPLICABLE FEDERAL, STATE AND LOCAL CODES AND ORDINANCES.
H. PROVIDE BLOCKING AND FRAMING BETWEEN METAL STUDS AROUND AND BEHIND ITEMS RECESSED IN, OR SURFACE MOUNTED ON, GYPSUM BOARD WALLS. REFER TO PROJECT MANUAL FOR BLOCKING REQUIREMENTS.
I. CONDUCT WORK WITH EQUIPMENT MANUFACTURERS TO ENSURE APPROPRIATE ROUGH IN CLEARANCES FOR EQUIPMENT INSTALLATION AND INTEGRATION.
J. USE. MANUFACTURING CHANGES MAY OCCUR BETWEEN TIME OF DESIGN AND CONSTRUCTION WORK, INCLUDING DEMOLITION, SHALL CONFORM TO APPLICABLE FEDERAL, STATE AND LOCAL CODES AND ORDINANCES.
K. PREVENT DAMAGE OUTSIDE OF PROJECT CONTRACT LIMITS SHALL BE REPAIRED TO THE SATISFACTION OF THE ARCHITECT.
L. PROVIDE SPOT ELEVATION.
M. MANUFACTURER SYMBOLS AND NUMBER.
N. REPORT ALL DISCREPANCIES AND DAMAGES TO WHISTLER HALL ROOM 119 LAB RENOVATION 2019.
O. OWNER'S SCOPE NOTES.
P. KEEP EXIT CORRIDORS AND STAIRWAYS FREE FROM DEBRIS AND OBSTRUCTIONS FOR EGRESS.
Q. PROVIDE FIRE STOPPING AS REQUIRED. REFER TO ENGINEERING DRAWINGS.
R. MANUFACTURER SYMBOLS AND NUMBER.
S. MANUFACTURER SYMBOLS AND NUMBER.
T. MANUFACTURER SYMBOLS AND NUMBER.
U. MANUFACTURER SYMBOLS AND NUMBER.
V. MANUFACTURER SYMBOLS AND NUMBER.
W. MANUFACTURER SYMBOLS AND NUMBER.
X. MANUFACTURER SYMBOLS AND NUMBER.
Y. MANUFACTURER SYMBOLS AND NUMBER.
Z. MANUFACTURER SYMBOLS AND NUMBER.

GENERAL LIFE SAFETY NOTES:

A. LIFE SAFETY INFORMATION PRESENTED FOR USE IN CONTRACT DOCUMENTS IS FOR INFORMATION PURPOSES ONLY. THE USER IS RESPONSIBLE FOR ASSESSING THE ACCURACY OF ALL INFORMATION AND THE CONFORMITY OF THE PROPOSED WORK TO THE CORRECT CODES AND ORNANCES.
B. REFER TO PROJECT INFORMATION SHEET FOR CONTRACT LIMITS.
C. REFER TO PROJECT MANUAL FOR BLOCKING REQUIREMENTS TO SUPPORT MISCELLANEOUS ITEMS OR EQUIPMENT TO BE INSTALLED.
D. REFER TO MECHANICAL, ELECTRICAL, AND PLUMBING SYMBOLS SHOWN ON ARCHITECTURAL DOCUMENTS ARE FOR COORDINATION ONLY AND DO NOT REPRESENT ELECTRICAL SCOPE OF WORK. REFER TO ENGINEERING DRAWINGS FOR EXTENT OF PENETRATIONS.
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I. PROVIDE BLOCKING AND FRAMING BETWEEN METAL STUDS AROUND AND BEHIND ITEMS RECESSED IN, OR SURFACE MOUNTED ON, GYPSUM BOARD WALLS. REFER TO PROJECT MANUAL FOR BLOCKING REQUIREMENTS.
J. MANUFACTURER SYMBOLS AND NUMBER.
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O. MANUFACTURER SYMBOLS AND NUMBER.
P. MANUFACTURER SYMBOLS AND NUMBER.
Q. MANUFACTURER SYMBOLS AND NUMBER.
R. MANUFACTURER SYMBOLS AND NUMBER.
S. MANUFACTURER SYMBOLS AND NUMBER.
MECHANICAL / PLUMBING SYSTEMS AND SYMBOLS

PIPING:
- PCW
- LP GAS
- PHWR
- WAGD
- HPSR
- CWR
- APW
- RHG
- HWR
- HWHR
- HWC
- CO2
- HPS
- LPS
- RO
- N2
- CS
- VV
- N
- GEN
- REFRIGERANT SUCTION
- OXYGEN
- CARBON DIOXIDE
- CONDENSER WATER RETURN
- 140 DEGREE DOMESTIC HOT WATER
- CHILLED WATER RETURN
- HIGH PRESSURE STEAM SUPPLY
- HIGH PRESSURE STEAM
- NATURAL GAS
- LOW PRESSURE CONDENSATE
- DUCTWORK:
- BDD
- FD
- AND FLEXIBLE DUCT CONNECTION
- MOTORIZED DAMPER
- DUCT TRANSITION FROM SQ. (OR
- RECTANGULAR DUCT
- EQUIPMENT:
- RETURN / EXHAUST GRILLE:
- SD-X
- 250
- ATU
- 01
- A
- DIFFUSER CFM
- DRAWING THAT DETAIL IS REFERENCED ON OR
- DESIGNATION AND BOTTOM NUMBER INDICATING
- NEW
- FITTINGS & MISCELLANEOUS
- TWO WAY TEMPERATURE CONTROL VALVE
- PLUG VALVE
- BUTTERFLY VALVE
- BALL VALVE
- SMOKE DETECTOR (DUCT MOUNTED)
- CO2 SENSOR
- PRESSURE SENSOR
- PIPE GUIDE
- REDUCER, ECCENTRIC
- LINE BREAK
- CLEANOUT
- FLOW SWITCH
- SENSOR (T=TEMP H=HUMIDITY)
- SIDEWALL SPRINKLER HEAD
- DRY PENDANT SPRINKLER HEAD
- STEAM SAFETY RELIEF VALVE
- WITH SUPERVISORY SWITCH
- DRAWING
MECHANICAL AND PLUMBING SPECIFICATIONS:

1. **General:**
   - Procedures shall indicate the use of tools, techniques, and procedures suitable for the particular job being performed. Use of tools, techniques, and procedures shall be in accordance with best practice and professional engineering judgment.

2. **Material:**
   - Material provided shall be of high quality and shall be suitable for the purposes for which they are used. All material shall be new and properly stored to maintain its quality.

3. **Installation:**
   - Installations shall be done in accordance with the manufacturer's instructions. All fittings shall be properly seated and tightened to the manufacturer's recommended torque values.

4. **Testing:**
   - All systems shall be tested for leakage. All joints shall be checked for tightness and seal integrity.

5. **Inspection:**
   - All work shall be inspected by the owner or their representative before being accepted.

6. **Supervision:**
   - The contractor shall provide supervision to ensure that all work is done in accordance with the specifications and drawings.

7. **Records:**
   - All records related to the installation, testing, and inspection shall be kept on file for a period of three years.

8. **Guarantee:**
   - The contractor shall provide a guarantee for the work performed, covering any defects that may occur within the first year of operation.

9. **Acceptance:**
   - The owner shall accept the work only after it has been inspected and found to be in accordance with the specifications and drawings.

MECHANICAL AND PLUMBING SPECIFICATIONS: (continued)

10. **Air Conditioning:**
    - All air conditioning systems shall be designed and installed to meet the requirements of the building codes and standards in effect.

11. **Plumbing Systems:**
    - All plumbing systems shall be designed and installed to meet the requirements of the building codes and standards in effect.

12. **Sanitary Systems:**
    - All sanitary systems shall be designed and installed to meet the requirements of the building codes and standards in effect.

13. **Fire Protection Systems:**
    - All fire protection systems shall be designed and installed to meet the requirements of the building codes and standards in effect.

14. **Heat Exchangers:**
    - All heat exchangers shall be designed and installed to meet the requirements of the building codes and standards in effect.

15. **Combustion Air:**
    - All combustion air systems shall be designed and installed to meet the requirements of the building codes and standards in effect.

16. **Insulation:**
    - All insulation shall be installed in accordance with the manufacturer's instructions and shall meet the required thermal resistance.

17. **Wiring:**
    - All wiring shall be installed in accordance with the building codes and standards in effect.

18. **Piping Systems:**
    - All piping systems shall be designed and installed to meet the requirements of the building codes and standards in effect.

19. **Ductwork:**
    - All ductwork shall be designed and installed to meet the requirements of the building codes and standards in effect.

20. **Valves:**
    - All valves shall be designed and installed to meet the requirements of the building codes and standards in effect.

21. **Accessories:**
    - All accessories shall be designed and installed to meet the requirements of the building codes and standards in effect.

22. **Sprinkler Systems:**
    - All sprinkler systems shall be designed and installed to meet the requirements of the building codes and standards in effect.

23. **Waste and Vent Systems:**
    - All waste and vent systems shall be designed and installed to meet the requirements of the building codes and standards in effect.

24. **Hot Water Systems:**
    - All hot water systems shall be designed and installed to meet the requirements of the building codes and standards in effect.

25. **Cold Water Systems:**
    - All cold water systems shall be designed and installed to meet the requirements of the building codes and standards in effect.

26. **Gas Systems:**
    - All gas systems shall be designed and installed to meet the requirements of the building codes and standards in effect.

27. **Electric Systems:**
    - All electric systems shall be designed and installed to meet the requirements of the building codes and standards in effect.

28. **Control Systems:**
    - All control systems shall be designed and installed to meet the requirements of the building codes and standards in effect.

29. **Chilled Water Systems:**
    - All chilled water systems shall be designed and installed to meet the requirements of the building codes and standards in effect.

30. **Boiler Systems:**
    - All boiler systems shall be designed and installed to meet the requirements of the building codes and standards in effect.

31. **Refrigerant Systems:**
    - All refrigerant systems shall be designed and installed to meet the requirements of the building codes and standards in effect.

32. **Fuel Oil Systems:**
    - All fuel oil systems shall be designed and installed to meet the requirements of the building codes and standards in effect.

33. **Heat Recovery Systems:**
    - All heat recovery systems shall be designed and installed to meet the requirements of the building codes and standards in effect.

34. **Hot Water Boilers:**
    - All hot water boilers shall be designed and installed to meet the requirements of the building codes and standards in effect.

35. **Steam Boilers:**
    - All steam boilers shall be designed and installed to meet the requirements of the building codes and standards in effect.

36. **Pumps:**
    - All pumps shall be designed and installed to meet the requirements of the building codes and standards in effect.

37. **Compressors:**
    - All compressors shall be designed and installed to meet the requirements of the building codes and standards in effect.

38. **Chillers:**
    - All chillers shall be designed and installed to meet the requirements of the building codes and standards in effect.

39. **Heat Pumps:**
    - All heat pumps shall be designed and installed to meet the requirements of the building codes and standards in effect.

40. **Refrigeration Systems:**
    - All refrigeration systems shall be designed and installed to meet the requirements of the building codes and standards in effect.

41. **Air Handling Units:**
    - All air handling units shall be designed and installed to meet the requirements of the building codes and standards in effect.

42. **Load Centers:**
    - All load centers shall be designed and installed to meet the requirements of the building codes and standards in effect.

43. **Meters:**
    - All meters shall be designed and installed to meet the requirements of the building codes and standards in effect.

44. **Transformers:**
    - All transformers shall be designed and installed to meet the requirements of the building codes and standards in effect.

45. **Generators:**
    - All generators shall be designed and installed to meet the requirements of the building codes and standards in effect.
### Electrical Systems Legend

<table>
<thead>
<tr>
<th>Legend</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LUG</td>
<td>4-1/2&quot; ROUND FLUSH MOUNTED LIGHT FIXTURE</td>
</tr>
<tr>
<td>L</td>
<td>4-1/2&quot; ROUND WALL MOUNTED LIGHT FIXTURE</td>
</tr>
<tr>
<td>LUG W/OUT녁</td>
<td>4-1/2&quot; ROUND FLUSH MOUNTED LIGHT FIXTURE WITH LOCATION</td>
</tr>
<tr>
<td>LUG W/OUTières</td>
<td>4-1/2&quot; ROUND FLUSH MOUNTED LIGHT FIXTURE WITH DESIGNATION</td>
</tr>
<tr>
<td>LUG W/OUTisChecked</td>
<td>4-1/2&quot; ROUND FLUSH MOUNTED LIGHT FIXTURE WITH CHECKED</td>
</tr>
<tr>
<td>LUG W/OUTmultiplier</td>
<td>4-1/2&quot; ROUND FLUSH MOUNTED LIGHT FIXTURE WITH MULTIPLES</td>
</tr>
</tbody>
</table>

### Panel To tals

<table>
<thead>
<tr>
<th>Receptacle 14940 VA 100.00% 14940 VA</th>
<th>Load Classification</th>
<th>Connected Load</th>
<th>Demand Factor</th>
<th>Estimated Demand</th>
<th>Panel To tals</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>41 SOUTHWEST RACEWAY REC</td>
<td>25 WEST ISLAND BENCH</td>
<td>11 SOUTH CENTER RACEWAY</td>
<td>5 EAST LAB BENCH KNEE SPACE</td>
<td>3 WATER PURIFIER REC 119</td>
</tr>
<tr>
<td>20 A</td>
<td>1</td>
<td>360 VA</td>
<td>180 VA</td>
<td>1 20 A</td>
<td>Receptacle NORTHEAST RACEWAY REC 119 4</td>
</tr>
<tr>
<td>540 VA</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>120/208 Wye</td>
<td>EXISTING</td>
<td></td>
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<td></td>
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<td></td>
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  - Receptacle NORTHEAST RACEWAY REC 119 4
  - LUG-4 RECESSED LINEAR HIGH-PERFORMANCE FLUORESCENT: DIE-FORMED AND
  - UC-2 UNDERCABINET SOLID-FRONT TASK LIGHT

- **Abbreviations:**
  - OS: OCCUPANCY SENSOR
  - K=KEY
  - OS=OCCUPANCY SENSOR
  - FS=FLUSH MOUNTED EXIT LIGHT WITH DIRECTIONAL ARROWS
  - HATCHING INDICATES EMERGENCY FOR ANY
  - ROUND HIGH CEILING MOUNTED EXIT LIGHT WITH DIRECTIONAL ARROWS
  - WALL MOUNTED SCONCE TYPE LIGHT FIXTURE
  - K=KEY
  - OS=OCCUPANCY SENSOR
  - FS=FLUSH MOUNTED EXIT LIGHT WITH DIRECTIONAL ARROWS

- **Telecommunications Symbols (Legend):**
  - VOICE ONLY PIC; FLOOR FED
  - STANDARD PIC
  - DATA/VOICE PIC
  - TELECOMMUNICATIONS SYMBOLS LEGEND

- **General Notes:**
  - THE MANUFACTURER SHALL HAVE PREVIOUSLY BUILT THE LUMINAIRE AND THE LUMINAIRE SHALL BE A PRODUCTION ITEM. THE SAMPLE SHALL REMAIN ON FILE AS COMPARISON WITH THE
  - SPECIFIED AND AS SUCCESSFULLY AWARDED, PURCHASED CEILING SYSTEMS. MULTIPLE TRIM COLORS AND TILES MAY BE NEEDED FOR EACH LUMINAIRE (LIGHT FIXTURE) TYPE.

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1. GROUND FLOOR TELECOM DEMOLITION PLAN

2. GROUND FLOOR TELECOM PLAN

3. GROUND FLOOR FIRE ALARM PLAN

TELECOM DEMOLITION NOTES:
1. PROVIDE CEILING MOUNTED FIRE ALARM STROBE.
2. PROVIDE (1) 1/4" EMT CONDUIT, WITH DATA CABLING, FROM LAB BENCH MOUNTED PEDESTAL TO CORRIDOR SKELETAL CONDUIT. PROVIDE CABLING BACK TO IDF LOCATED IN ROOM 145; SEE SHEET ET102 FOR ROUTING.
3. PROVIDE NEW DATA ONLY PIC IN TELECOM COMPARTMENT OF NEW SURFACE MOUNTED RACEWAY (REFER TO SHEET E101 FOR NEW locate.
4. PROVIDE NEW PIC'S INSTALLED IN NEW SURFACE RACEWAY LOCATED ABOVE EXISTING SURFACE RACEWAY. PROVIDE (1) 1/4" EMT CONDUIT, WITH DATA CABLING, FROM LAB BENCH MOUNTED PEDESTAL TO CORRIDOR SKELETAL CONDUIT. PROVIDE CABLING BACK TO IDF LOCATED IN ROOM 145; SEE SHEET ET102 FOR ROUTING.
5. REMOVE ASSOCIATED SURFACE MOUNTED RACEWAY AND CONDUITS COMPLETE. ASSOCIATED CABLING TO REMAIN. PROTECT DURING WORK OF THE PROJECT.

GROUND FLOOR FIRE ALARM PLAN NOTES:
1. PROVIDE NEW SURFACE MOUNTED RACEWAY IN NEW DATA ONLY RACEWAY IN SHARED DIVIDED RACEWAY.

TELECOM PLAN NOTES:
1. PROVIDE A NEW SURFACE MOUNTED RACEWAY IN NEW DATA ONLY RACEWAY IN SHARED DIVIDED RACEWAY.
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TELECOM DEMOLITION WORKING SCHEDULE:

<table>
<thead>
<tr>
<th>SHEET</th>
<th>DATA QTY</th>
<th>TV QTY</th>
<th>VOICE QTY</th>
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<tbody>
<tr>
<td>ET101</td>
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<td></td>
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<td></td>
</tr>
<tr>
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</tr>
</tbody>
</table>
1 GROUND FLOOR TELECOMMUNICATIONS ROUTING PLAN
HORIZONTAL LINK IDENTIFIER SHALL MATCH PORT LOCATION ON PATCH PANEL. IDENTIFIER TO BE LABELED WITHIN 12" OF END OF CABLE.

NOTES:
1. EACH DATA ONLY OUTLET TYPICALLY CONSISTS OF (2) DATA JACKS.
2. LETTER DESIGNATION INDICATES A DATA JACK AT THE OUTLET LOCATION.
3. JACK LABELING IN A SINGLE ROOM CONSISTS OF STARTING AT THE FIRST OUTLET LEFT OF DOOR AND PROCEEDING CLOCKWISE AROUND ROOM (AS SEEN IN PLAN).