PART 1 - GENERAL

1.1 DESCRIPTION
This section includes chemical (general purpose) hoods, radioisotope hoods, and Perchloric acid hoods in designs and configurations specified hereunder.

1.2 DEFINITIONS
A. CHEMICAL OR GENERAL-PURPOSE HOODS
1. AUXILIARY-AIR HOOD: A hood with a dedicated duct that supplies up to 50% outside air to the face of the hood.
2. BYPASS HOOD: A hood that contains openings above the sash and below the airfoil, which redistribute the air to reduce fluctuations in face velocity and turbulence within the hood, when the sash is repositioned.
3. 100% RE-CIRCULATORY (DUCTLESS) FUME HOODS: A ductless, self-contained, carbon and/or HEPA-filtered enclosure, that draws air into the front of the hood, passes it through multi-stage filters, and then re-circulates it into the lab. These hoods can be placed onto fixed work surfaces or on mobile stands.
4. LOW-VELOCITY HOOD: A high-performance hood that yields energy savings by reducing the sash opening and the corresponding exhaust volume, while maintaining safe containment levels with the sash raised for set-up and face velocity as low as 60fpm.

B. Radioisotope Hood: A hood that is used for radioactive applications, with a stainless steel liner and an integral work surface.

C. PERCHLORIC ACID HOOD: A hood that is dedicated for use with Perchloric Acid only, due to the potential reaction of the acid with other chemicals. The hood, duct and fan must have a water wash-down system for removal of perchlorate crystals (salts) after use.

1.3 RELATED WORK
A. Section 22 15 00, GENERAL SERVICE COMPRESSED-AIR SYSTEMS: Connections to Compressed Air System.
B. Section 22 11 00, FACILITY WATER DISTRIBUTION: Plumbing Connections.
C. Section 22 13 00, FACILITY SANITARY SEWERAGE: Plumbing Connections.
D. Section 22 66 00, CHEMICAL-WASTE SYSTEMS FOR LABORATORY and HEALTHCARE FACILITIES: Plumbing Connections.
E. Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY and HEALTHCARE FACILITIES: Connections to Gas and Vacuum Systems.
F. Section 22 63 00, GAS SYSTEMS FOR LABORATORY and HEALTHCARE FACILITIES: Connections to Gas and Vacuum Systems.
G. Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
H. Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC and STEAM GENERATION: Integral Blowers on Hoods.
I. Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC: Face Velocity Sensor Controller.
J. Section 23 34 00, HVAC FANS.
K. Section 23 36 00, AIR TERMINAL UNITS: Airflow Control Valves.
L. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Electrical Connections.
M. Section 26 27 26, WIRING DEVICES: Electrical Devices.
N. Section 26 29 11, LOW-VOLTAGE MOTOR STARTERS: Motor Starters.

1.4 PERFORMANCE REQUIREMENTS

A. Average Face Velocity for general chemical and ductless laboratory fume hoods: 0.51 m/s (100 fpm) with sash located at the average sash stop of 18 inches.

B. Average Face Velocity for Low Velocity laboratory fume hoods can be as low as 60 fpm with sash located at the average Low Velocity hood sash stop height of 12 to 18 inches.

C. Containment: Furnish and install laboratory fume hoods that are tested according to ASHRAE 110 at a release rate of 4.0 L/min. (0.1 CFM) (VA Comment: Provide equivalent inch/pound unit.)

1. Face Velocity Variation: Allowable VA variation threshold is not more than +/−10% of average face velocity.

SPEC WRITER NOTE: Size hood exhaust system for sash in the fully open position for the specified static pressure losses.

2. Sash Position:
   a. For horizontal-sash units, test with maximum opening on one side, with maximum opening in the center, and with opening at each side equal to half of maximum opening.
b. For combination-sash units, test with sash fully raised, with maximum opening on one side, with maximum opening in the center, and with opening at each side equal to half of maximum opening.
c. For Vertical Sash units, test with sash fully open, and at typical sash stop height of 18”.

SPEC WRITER NOTE: Options for AM and AI rating requirements included below are examples only; verify requirements for project.
d. VA Comment: Why vertical sash hoods not mentioned?

3. As-Manufactured (AM) Rating: AM // 0.05 (0.05 ppm) // [_____] //.
4. As-Installed (AI) Rating: AI // 0.05 (0.05 ppm) // [_____] //.

D. Average Static-Pressure Loss: Not more than 93 Pa (3/8-inch wg) at 0.51-m/s (100-fpm) face velocity when tested according to SEFA 1.2.

1.5 QUALITY CONTROL
A. Mechanical, electrical and associated systems shall be safe, reliable, efficient, durable, easily and safely operable, maintainable, and accessible.
B. Standard Products: Material and equipment shall be the standard products of the selected manufacturer, and they should be regularly engaged in the manufacture of such products for at least 3 years.
C. All items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall assembly.
D. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years. The design, model and size of each item shall have been in satisfactory and efficient operation on at least three installations for approximately three years. However, digital electronics devices, software and systems such as controls, instruments, computer work station, shall be the current generation of technology and basic design that has a proven satisfactory service record of at least three years. See other specification sections for any exceptions.
E. Electrical Components and Devices: UL listed and labeled for intended use.

1.6 SUBMITTALS
A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Manufacturer's Literature and Data: Include the following:
   1. Illustrations and descriptions of laboratory fume hoods and factory-
      installed devices for fume hoods.
   2. Catalog or model numbers for each item incorporated into the work.
   3. Static-pressure losses and exhaust volumes for fume hoods.
   4. Results of testing according to ASHRAE 110.

C. Shop Drawings: Show details of fabrication, installation, adjoining
   construction, coordination with mechanical and electrical work,
   anchorage, and other work required for complete installation.

D. Field Test Reports: Indicate dates and times of tests and certify test
   results.

E. Factory Test Reports: Provide manufacturer’s QC checklist or other
   reports that indicate comprehensive factory testing has been performed,
   and the results of these tests have been certified.

F. Operating Instructions: Comply with requirements in Section 01 00 00,
   GENERAL REQUIREMENTS.

   SPEC WRITER NOTE: Edit the following
   requirements to coordinate with project
   sustainability goals.

G. LEED Information:
   1. LEED (v 3.0) MR Credit 4, Recycled Content: Product data indicating
      percentages, by weight of post-consumer and post-industrial recycled
      content for products having recycled content:
         a. Include statement indicating costs for each product having
            recycled content.
   2. LEED (V 3.0) MR Credit 5, Regional Materials: Manufacturer’s data
      identifying point of origin for products procured within 500 mile
      radius of the project:
         a. Include statement indicating costs for each product submitted.

1.7 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the
   extent referenced. The publications are referenced in the text by the
   basic designation only.

B. American National Standards Institute / American Society of Heating,
   Refrigerating and Air-Conditioning Engineers (ANSI/ASHRAE):
   110-1995................Method of Testing Performance of Laboratory
   Fume Hoods

C. Scientific Equipment and Furniture Association (SEFA):
   1-2005....................Recommended Practices for Laboratory Fume Hoods
2-1999..................Recommended Practices for Installation

D. National Fire Protection Association (NFPA):
45-2011..................Standard on Fire Protection for Laboratories using Chemicals

PART 2 - PRODUCTS

2.1 FUME HOODS, GENERAL

A. Furnish and install laboratory fume hoods that comply with recommendations in SEFA 1

SPEC WRITER NOTE: Show types, quantities, and locations of service fixtures required for each type of fume hood on drawings.

B. Confirm factory-installed service fixtures and electrical devices in locations shown on drawings.

C. Ductwork: All ductwork shall be stainless steel. Refer to Section 23 31 00 HVAC DUCTS and CASINGS.

D. Face Velocity Controller (VAV Fume hoods): Provide fume hood exhaust controllers to control a damper in the hood discharge to maintain the velocity through the open face of the hood regardless of sash position. Refer to Section 23 09 23 DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC.

E. Gas, Air, and Vacuum Service Fixtures: Remote controlled; with valve identified by index button; with serrated tip outlets; color-code valves and outlets. Refer to Section 22 62 00 VACUUM SYSTEMS FOR LABORATORY and HEALTHCARE FACILITIES and Section 22 63 00 GAS SYSTEMS FOR LABORATORY and HEALTHCARE FACILITIES.

F. Water Service Fixtures: Remote controlled, with integral vacuum breaker and as follows:

1. // Turret // 152.4 mm (6 inch) swivel gooseneck // Turret and 152.4 mm (6 inch) swivel gooseneck // outlet.
2. // PVC // Epoxy-coated brass //.
3. Refer to Section 22 11 00 FACILITY WATER DISTRIBUTION.

G. Service-Fixture Color-Coding: Color-code service fixtures as follows:

<table>
<thead>
<tr>
<th>Service</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>Dark Green</td>
</tr>
<tr>
<td>Air</td>
<td>Orange</td>
</tr>
<tr>
<td>Gas</td>
<td>Dark Blue</td>
</tr>
<tr>
<td>Vacuum</td>
<td>Yellow</td>
</tr>
</tbody>
</table>

H. Lighting Fixtures:
   SPEC WRITER NOTE: Include the paragraph below where explosion-proof hoods are required and specifically identify explosion-proof type hoods on the drawings. These types of hoods are not typically used and their application requires close coordination with the associated electrical requirements and exhaust fan.

2. Explosion-Proof Fixtures: 120-V // incandescent // 2-tube fluorescent //. Fixtures shall be shipped loose for field wiring and installation.  
   SPEC WRITER NOTE: Edit the paragraph below for project specific needs.

I. Receptacles and Switches: Include junction box and cover plate. Refer to Section 26 27 26 WIRING DEVICES.
1. Duplex Receptacles: 120 V, single phase, // 15 A // 20 A //, 2 pole, 3 wire. 
   SPEC WRITER NOTE: Provide if a sink is within 6 feet of the receptacle per NEC.
4. Lighting Fixture Switches: Toggle, single pole, 120-277 V, 20 A.
6. Switches with Neon Pilots: Single-pole toggle turns on pilot light, which indicates switch and load are "on"; 120 V, 15 A.
7. Motor Starter Switches: Double-pole switch with pilot light and thermal-overload protection. Refer to Section 26 29 11 LOW-VOLTAGE MOTOR STARTERS.  
   SPEC WRITER NOTE: Where explosion-proof hoods are required, the hood be provided with only an explosion-proof light and no wiring. The wiring of the hood light and any electrical devices (switches, receptacles, etc.) needs to be shown on the electrical drawings per NEC requirements.

J. Airflow Monitor: With audible alarm and warning light. Provide digital type unit with alarm contacts to allow connection to the DDC control

J. Airflow Monitor: With audible alarm and warning light. Provide digital type unit with alarm contacts to allow connection to the DDC control.
system to facilitate remote monitoring. Refer to Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

K. Airflow Control Valve (VAV Hoods): Refer to Section 23 36 00 AIR TERMINAL UNITS.

SPEC WRITER NOTES:
1. For fume hood exteriors, SEFA 1 requires materials resistant to chemical fumes and exposures encountered in the laboratory; therefore, it allows the use of epoxy-coated metal.
2. If a specific exterior material is required, insert requirements in articles below describing fume hoods.
3. Match liner and work surface to type of hood, chemicals, and the work that will be performed in the hood.

2.2 BYPASS FUME HOODS

A. Airflow Systems: Bypass. For hoods served by variable air volume exhaust systems, a factory installed bypass block shall be installed to restrict the bypass and allow reduction of the exhaust air volume as the sash is lowered while maintaining a constant face velocity.

B. Liners: // Polyester resin // Stainless Steel // Type 304, NO. 4 finish

C. Work Surfaces: Epoxy resin.

D. Sinks: Epoxy resin.
   1. Cup Sinks: Equip with DN 40 (NPS 1-1/2) tailpiece, sink stopper, and P trap.
   2. Laboratory Sinks: Equip with DN 40 (NPS 1-1/2) sink outlet, sink stopper, beehive overflow, and P trap.

E. Lighting Fixtures: // Vapor proof // Explosion-proof where specifically indicated on the drawings //.

F. Blowers: Remote; sized to create exhaust air volume that produces average face velocity indicated with sashes fully open. Blowers shall be constructed with chemical chemical-resistant coating. Refer to Section 23 34 00 HVAC FANS.

G. Sashes: // Vertical // Horizontal // Combination // type; fully tempered safety glass.
   1. Accessories: Sash stops, commonly installed 18”.

H. Bases: // Table // Cabinet //.

2.3 RADIOISOTOPE FUME HOODS

A. Airflow Systems: Bypass
B. Liners and Work Surfaces: Stainless steel, Type 304, No. 4 finish; seamless construction; and with integral dished work surface.

C. Lighting Fixtures: Vapor proof.

SPEC WRITER NOTES: The designer shall coordinate the need to install filters in the exhaust air stream with the end-users and VA Radiology Safety Officer. Based on the number and type of isotopes, the exhaust air stream may require (a) HEPA (99.97% efficiency at 0.3 Microns), (b) HEPA and Active Charcoal Filters, or No Filters in the exhaust air prior to its discharge outdoors. Radioisotope hoods require HEPA filters. Where requested by the Medical Center, carbon type shall also be provided. Due to the nature of the material conveyed, bag-in/bag-out type are required for all filters.

D. Filters: // HEPA // Carbon // Type; with bag in and bag out housings.

E. Blowers: Remote; sized to create exhaust air volume that produces average face velocity indicated with sashes at the sash stop (18” open). Blowers shall be constructed with chemical chemical-resistant coating. Refer to Section 23 34 00 HVAC FANS.

F. Sashes: Vertical Type; fully tempered safety glass.

1. Accessories: Sash stops, commonly installed at 18”.

G. Bases: // Table // Cabinet //.

2.4 AUXILIARY-AIR FUME HOODS

SPEC WRITER NOTES:

1. The designer shall perform a life-cycle cost analysis to justify the use of auxiliary hoods, as the initial and recurring costs associated with the make-up air system reduce the anticipated energy savings.

2. This type hood includes a supply air plenum, connected to a dedicated make-up air system, with integral diffusers to provide uniform flow of supply air to the face of the hood.

A. Airflow Systems: Bypass

B. Liners: // Polyresin // Stainless Steel // Type 304, No. 4 finish

C. Work Surfaces: // Epoxy resin // Stainless Steel // Type 304, No. 4 finish

D. Sinks: Epoxy resin

1. Cup Sinks: Equip with DN 40 (NPS 1-1/2) tailpieces, sink stoppers, and P traps.
2. Laboratory Sinks: Equip with DN 40 (NPS 1-1/2) sink outlets, sink
stoppers, beehive overflows, and P traps.

E. Lighting Fixtures: Vapor proof

F. Blowers: Remote for supply and exhaust air; supply sized based on 50
percent supply make up; remote sized to create exhaust air volume that
produces average face velocity indicated with sashes at the sash stop (18” open). Blowers shall be constructed with chemical chemical-resistant coating. Refer to Section 23 34 00 HVAC FANS.

G. Sashes: // Vertical // Horizontal // Combination // Type; fully
tempered safety glass
1. Accessories: Sash stops, commonly installed at 18”.

H. Bases: // Table // Cabinet //.

2.5 PERCHLORIC-ACID FUME HOODS

A. Airflow Systems: Bypass

B. Liners and Work Surfaces: // Stainless steel, Type 316, No. 4 finish //
PVC //; seamless construction; and with integral dished work surface
and full-width drainage trough at back face of work surface.
1. Drainage Trough: Equip with DN 40 (NPS 1-1/2) tailpiece and with P
trap.

C. Lighting Fixtures: Vapor proof

D. Blowers: Remote; Spark and corrosion-resistant, sized to create exhaust
air volume that produces average face velocity of 125 fpm with sashes
at the sash stop (18” open); constructed of chemical-resistant PVC.
Locate motor out of from the air stream.

E. Wash-Down System: Required for exhaust ductwork, blower, and hood
structure. The system within the hood structure shall be integral to
the hoods with provisions for connecting the piping to the nozzles in
the duct and blower. The nozzles/wash rings shall be provided by the
hood manufacturer. Wash rings are required at every change in direction
and every 8 to 10 feet in the exhaust duct system. Provide drain for
exhaust blower. Refer to Section 22 11 00, FACILITY WATER DISTRIBUTION
for plumbing connections.

F. Sashes: Vertical. Combination type, fully tempered safety glass.
1. Accessories: Sash stops, commonly installed at 18”

G. Bases: // Table // Cabinet //.

H. Ductwork: Welded 316 stainless steel; use of flexible duct is not
permitted; Manifold with any other exhaust ductwork is not permitted.
Provide shortest route with minimum horizontal runs.
SPEC WRITER NOTE: A Low Velocity Hood maintains safe containment levels with face velocity as low as 60fpm.

2.6 LOW VELOCITY FUME HOODS

A. Airflow Systems: Restricted Bypass. For hoods served by variable air volume exhaust systems, a factory installed bypass block shall be installed to further restrict the bypass and allow reduction of the exhaust air volume as the sash is lowered while maintaining a constant face velocity.

B. Liners: // Stainless steel, Type 304, // Polyresin //.

C. Work Surfaces: Epoxy
   1. Cup Sinks: Equip with DN 40 (NPS 1-1/2) tailpieces, sink stoppers, and P traps.

D. Lighting Fixtures: // Vapor-proof // Explosion-proof where specifically indicated on the drawings //.

E. Blowers: Remote; sized to create exhaust air volume that produces average face velocity indicated with sashes fully open (sized at the reduced average face velocity the hood is rated for). Blowers shall be constructed with chemical chemical-resistant coating. Refer to Section 23 34 00 HVAC FANS.

F. Sashes: // Vertical // Horizontal // Combination // Type; fully tempered safety glass
   1. Accessories: Sash stops, commonly installed at 18”

G. Bases: // Table // Cabinet //.

2.7 100% RE-CIRCULATORY FUME HOODS

A. Airflow Systems: Bypass

B. Liners: // Acrylic // Type 304 Stainless Steel //

C. Work Surfaces: // Type 304 Stainless Steel // Fiberglass // Epoxy //

SPEC WRITER NOTE: Match the number and types of filters to the chemicals that are being used inside the hood.

D. Filters: Multi-Stage, // HEPA // Charcoal //

E. Receptacles and Switches: Include junction box and cover plate. Refer to Section 26 27 26 WIRING DEVICES.
   1. Duplex Receptacles: 120 V, single phase, // 15 A // 20 A //, 2 pole, 3 wire.

SPEC WRITER NOTE: Provide if a sink is within 6 feet of the receptacle per NEC.
5. Lighting Fixture Switches: Toggle, single pole, 120-277 V, 20 A.
7. Switches with Neon Pilots: Single-pole toggle turns on pilot light, which indicates switch and load are "on"; 120 V, 15 A.
8. Motor Starter Switches: Double-pole switch with pilot light and thermal-overload protection. Refer to Section 26 29 11 LOW-VOLTAGE MOTOR STARTERS.
F. Lighting Fixtures: Vaporproof.
G. Blowers: Built-in; sized to create exhaust air volume that produces average face velocity indicated with sashes fully open.
H. Sashes: Vertical, fully tempered safety glass.
1. Accessories: Sash stops, commonly installed at 8”.
I. Bases: // Table // Mobile Cart //.

PART 3 - EXECUTION

3.1 INSTALLATION
A. Install laboratory fume hoods to comply with SEFA 2.
B. Locate unit away from fans, heating and air conditioning registers, laboratory hoods, high traffic areas and doors that could interfere with airflow patterns.

3.2 TESTS
A. Field test installed laboratory fume hoods according to ASHRAE 110 to verify compliance with performance requirements for containment.
1. For units that fail testing, make adjustments and corrections to installation, or replace fume hoods, and repeat tests until fume hoods comply with requirements.

3.3 PROTECTING AND CLEANING
A. Protect equipment from dirt, water, and chemical or mechanical injury during the remainder of the construction period.
B. At the completion of work, clean equipment as required to produce ready-for-use condition.
3.4 INSTRUCTIONS

Instruct personnel and transmit operating instructions in accordance with requirements in Section 01 00 00, GENERAL REQUIREMENTS. Training must be provided by Manufacturer or Installer.

--- END ---