PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Standards: Except where modified or exceeded by the requirements of this Specification, conform to the following standards:

2. Service Fittings: Scientific Apparatus Makers Association Standard for Laboratory and Hospital Service Fittings.

B. Testing – Chemical Fume Hoods: Submit proof of design testing by the tracer gas method. [Note to AE: All submittals require approval from F&S Engineering Services and Division of Safety and Compliance.] The testing method shall be in accordance with the most recent edition of ANSI/ASHRAE 110: Method of testing Performance of Laboratory Fume Hoods. The test report shall include who performed the tests, the procedures and the results given “as manufactured”.

C. Certification – Chemical Fume Hoods: Certification measurements to be taken with a hot wire anemometer with calibration traceable within one year. Certification measurements to be made at the sash opening with the hood sash at operating position [Note to AE: typically 18 inches unless variance approved by F&S Engineering Services and Division of Safety and Compliance]. Final acceptance of hood testing to be by Owner [Note to AE: Final acceptance by Safety and Compliance and Engineering Services]. New installations and recommissioning existing chemical fume hoods (installation of new exhaust fans) require that the face velocity measurement be between 95-110 lfpm with no face velocity measurement more than plus or minus 20% of the average.

D. Testing – Biological Safety Cabinets: Before shipping, each unit shall be tested to meet requirements of N.S.F. Standard #49 for periodic certification. Submit one copy of test with each unit.

E. Testing – Biological Safety Cabinets: Submit a certified copy of the Personnel, Product and Cross-Contamination (Biological) Tests, N.S.F. Standard #49 performed on one (1) unit from each production run from which cabinets have been purchased. Owner representative may witness test.

F. Certification – Biological Safety Cabinets: Manufacturer will arrange for certification of cabinets after installation in accordance with N.S.F. Standard #49.

1. Division of Research Safety, Biological Safety Section will approve certification firm.

1.2 SUBMITTALS

A. Record Documents:
1. Shop Drawings: Fabrication and Installation: Show fabrication and installation details and dimensions for chemical fume hoods, biological safety cabinets and other items in this section. Show location and details of field joints between units and in tops. Show fastening types and locations for securing units in place. If they are required, show location, size and details of fillers.

2. Shop Drawings – Rough-In: Show location and requirements for utility and service connections to this Work.

3. Certified air flow for hoods and room balance report.


PART 2 - PRODUCTS

2.1 SERVICE FITTINGS

A. Finish: Polished chrome on brass body unless specified otherwise.

B. Equip valve handles with color coded plastic index buttons as follows:

<table>
<thead>
<tr>
<th>Service</th>
<th>Indexing</th>
<th>Button Color</th>
<th>Lettering Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold Water</td>
<td>CW</td>
<td>Green</td>
<td>White</td>
</tr>
<tr>
<td>Hot Water</td>
<td>HW</td>
<td>Red</td>
<td>White</td>
</tr>
<tr>
<td>Air</td>
<td>AIR</td>
<td>Blue</td>
<td>White</td>
</tr>
<tr>
<td>Gas</td>
<td>GAS</td>
<td>Orange</td>
<td>White</td>
</tr>
<tr>
<td>Vacuum</td>
<td>VAC</td>
<td>Yellow</td>
<td>White</td>
</tr>
<tr>
<td>Distilled Water</td>
<td>DW</td>
<td>White</td>
<td>Black</td>
</tr>
<tr>
<td>Steam</td>
<td>Steam</td>
<td>Black</td>
<td>White</td>
</tr>
<tr>
<td>Oxygen</td>
<td>OXY</td>
<td>Lt. Green</td>
<td>White</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>N2</td>
<td>Gray or Brown</td>
<td>Black or White</td>
</tr>
</tbody>
</table>

C. Chemical Fume Hood Fittings

1. CW Faucet: Goose-neck spout with vacuum breaker.

2.2 CHEMICAL FUME HOODS

A. Bypass air hoods shall be used unless active face velocity controls are included as part of a VAV system. Other chemical fume hood types are allowed only under special situation and must be approved by Safety and Compliance. Special purpose hoods (perchloric acid, radioactive, etc.) shall be individually designed.

B. High-efficiency (low-flow) chemical fume hoods are not approved for use at reduced flow rates.

C. Material: Stainless steel, and/or treated and coated steel, or other approved material as indicated. All interior surfaces to be stainless steel.

D. Counter tops, interior surfaces, front sash and/or apron: materials with flame spread index of 25 or less.
E. Hoods shall have a 6 inch wide “picture frame” airfoil at sides, top and bottom. The lower airfoil shall be Type 316 stainless steel.

F. Bottom airfoil: Outside edge of airfoil shall be slightly below the counter top with an unobstructed air space between the airfoil and the counter top to allow air flow when sash is closed.

G. All interior surfaces to be coved stainless steel. Counter top to be dished stainless steel integral with the sidewalls.

H. Side panels shall be flush with the entrance edge of the airfoil.

I. Automatic air bypass: Located at top of sash opening with completely positive operation not dependent upon mechanical or electrical linkage. Bypass shall limit increase in air velocity (500 percent maximum) through the hood face regardless of sash position.

J. Exhaust slots:
   1. Slot air velocity: 1500 fpm minimum.
   2. Locate controls to minimize tampering and interference with normal hood operation.
   3. Maximum slot area shall be less than two-thirds of the cross sectional area of the respective parts of the plenum.
   4. Locate horizontal slots at counter top level, center and top section of hood.

K. Exhaust requirements:
   1. Operate chemical fume hood at the following face velocity and air flow as indicated on drawings.
      a. Face velocity – 80-120 lfpm with no face velocity measurement more than plus or minus 20% of the average. New installations and recommissioning existing chemical fume hoods (installation of new exhaust fans) require that the face velocity measurement be between 95-110 lfpm with no face velocity measurement more than plus or minus 20% of the average.
      b. Air flow, 4 foot hood, 18 inch sash opening – 480-720 CFM.
      c. Air flow, 5 foot hood, 18 inch sash opening – 600-900 CFM.
      d. Air flow, 6 foot hood, 18 inch sash opening – 720-1080 CFM.
   2. Chemical fume hoods with integral blowers are not approved for use. Chemical fume hoods must be exhausted using an external exhaust fan with spark resistant construction.
   3. Design shall carefully consider acoustics and result in a laboratory noise level of NC 50 or lower. Proper acoustic design shall be accomplished using appropriate duct and fan sizing. If attenuators must be used they shall be constructed of 316L stainless steel and be a 'packless' type.
4. Effluent discharges shall be a minimum of 10 feet above the roof surface with an exit velocity of 3000 fpm at “minimum” flow unless the chemical being exhausted dictates taller stack heights, and/or higher velocities; and/or prevailing wind patterns dictate increased heights etc. such that surrounding buildings could otherwise be in the prevailing wind path.

L. Support structure: Accommodate a distributed load of 250 psf and a single concentrated load of 500 lbs. in addition to the hood weight.

M. Locate sinks and service fittings 6 inch minimum beyond hood face. Locate cup sinks and service fittings at back of hood unless indicated otherwise. All CFH’s to be prepiped – no pipes less than or equal to ½ inch. For gas, use schedule 40 black iron. For vacuum and air use type K silver solder (15 percent solder). No flex connectors on gas – all hard piped. Use all domestic material. All hoods to be GFCI, hospital grade stainless steel.

N. Sash windows: Laminated glass. ¼ inch acrylic plastic and tempered glass acceptable if indicated. Wired glass not allowed.

O. Base cabinet support unit: Provide vented solvent storage cabinet meeting requirements of OSHA, Section 1910.106(d) (3) or NFPA 30, Section 4-3 unless indicated otherwise. Vent cabinet with 2 inch diameter galvanized screw pipe connected into the hood exhaust duct at approximately 90 inches above finish floor. Vent to be concealed within sidewalls of hood. Provide ¼ inch hardware cloth screen at vent inlets. Venting must not occur inside the hood. Flammable liquid storage cabinet doors to be self closing.

P. Base cabinet support unit: Standard metal casework.

Q. Base cabinet support unit: Vented acid storage cabinet. Vent similar to solvent storage cabinet using 2 inch diameter GALV screw pipe. Doors to be self-closing.

R. Radioisotope and radiochemical hoods: All interior surfaces to be coved stainless steel. Counter top to be dished stainless steel integral with sidewalls.

S. Flow monitors:
   1. A flow monitor, preferably with an audible alarm, shall be installed on each new laboratory hood.
   2. A flow monitor, preferably with an audible alarm, shall be installed on existing laboratory hoods whenever any modifications or changes are made that can affect laboratory unit ventilation or the airflow through existing laboratories.

2.3 BIOLOGICAL SAFETY CABINET – CLASS II, TYPE A

A. Units shall meet or exceed requirements of NCI Specification “General Purpose Clean Air Biological Safety Cabinet” (Class II, Type A) and NSF Standard #49.

B. Units shall be tested and certified as required in the paragraph entitled Quality Assurance in this Section.

C. Units to be console type, nominal 4 foot or 6 foot wide as indicated. Unit shall be transportable through a 3'-0" x 6'-8" doorway. Unit and ergonomic stand must be able to be moved easily as one unit with roller lift. Unit shall be installed as a Type A Cabinet.
D. Units shall be UL listed.


F. Interior material: 16 gage Type 304 stainless steel with No. 4 finish. Interior corners shall be radiused (7/16 inch). Work surface to be recessed with radiused corners.

G. Unit legs: Adjustable.

H. Sliding View-screen: Slanted with 10 degree angle from the vertical, ¼ inch safety or tempered glass capable of moving to a fully closed position during shutdown periods.

I. Air intake velocity through 8 inch front access: 100 fpm minimum.

J. Unit shall be designed to recirculate 70 percent of the air volume and to exhaust 30 percent to the room.

K. Units shall have standard supply and exhaust HEPA filters, 99.99 percent efficient for 0.3 microns per DOP test. The HEPA filters shall be low resistance type achieving a low static pressure of 0.30 to 0.45 inches water column. Provide one extra set of filters for each cabinet. Filter frames shall be constructed of wood.

L. Filters shall be front loading.

M. Stainless steel air diffuser and filter protector provided in work area.

N. Control valve or damper to maintain supply and exhaust air balance and shut-off for decontamination.

O. Unit to have fluorescent fixture mounted outside cabinet providing more than 100 footcandle lighting.

P. Electrical power receptacles: Provide following unless indicated otherwise on Drawings; GFI type, on separate circuit from fan motor and lights, located in drip-proof, gas-tight box inside cabinet. For 6 foot units, provide two (2) duplex receptacles. For 4 foot units, provide one (1) duplex receptacle. Stainless steel cover plates.

Q. Air and vacuum on right and left side.

R. Spill trough drain valve: Stainless steel ball valve.

S. Locate service fittings 6 inch minimum beyond cabinet face. All cabinets are to be prepiped with no pipe less than or equal to ½ inch diameter in size. Make service connections to the cabinet through the top and toward the back of the cabinet. Connections through the back or sides of the cabinet are not acceptable. Connections shall extend 2 inches above the cabinet. Provide schedule 40 black iron pipe for gas piping. Provide type K copper silver solder (15 percent solder) piping for vacuum and air lines. Flexible connectors on gas piping are not acceptable. Install all hard pipe. Use all domestic materials.

T. Exhaust Air Flow

U OF I FACILITIES STANDARDS 11 53 13 -5 CHEMICAL FUME HOODS AND BIOLOGICAL SAFETY CABINETS LAST UPDATED JUNE 15, 2013
1. 4 foot 8 inch opening 269 CFM
2. 4 foot 10 inch opening 355 CFM
3. 6 foot 8 inch opening 408 CFM
4. 6 foot 10 inch opening 510 CFM

U. Unit shall have an audible alarm and a flashing LED to indicate when the sliding view screen is in an unsafe position. Provide mute alarm switch.

2.4 BIOLOGICAL SAFETY CABINET – CLASS II, TYPE B1

A. Units shall meet or exceed requirements of NCI Specification “General Purpose Clean Air Biological Safety Cabinet” (Class II, Type B Safety Cabinet) and NSF Standard #49.

B. Units shall be tested and certified as required in the paragraph entitled Quality Assurance in this Section.

C. Units to be console type, nominal 4 foot or 6 foot wide as indicated. Unit shall be transportable through a 3'-0" x 6'-8" doorway.

D. Units shall be UL listed.

E. Exterior material: 14 gage cold rolled steel with white baked enamel finish.

F. Interior material: Type 304 stainless steel with No. 4 finish. Interior corners shall be radiused. Work surface to be recessed with radiused corners.

G. Unit legs: Adjustable.

H. View-screen: Vertical sliding, counterweighted, ¼ inch safety or tempered glass.

I. Air intake velocity through 8 inch front access: 100 fpm minimum.

J. Unit shall be designed to directly exhaust 70 percent (through a HEPA filter) of the total volume of air handled in the unit from the work surface area to an outside exhaust provided by others. 30 percent recirculation within cabinet.

K. Units shall have zero-probed supply and exhaust HEPA filters, 99.99 percent efficient for 0.3 microns per DOP test. The HEPA filters shall be low resistance type achieving a low static pressure of 0.30 to 0.45 inches water column. Provide one extra set of filters for each cabinet. Filter frames shall be constructed of wood.

L. Filters shall be front loading.

M. Protect supply filter with metal diffuser.

N. Air-tight control valve or damper to maintain supply and exhaust air balance and shut-off for decontamination.

O. Unit to have fluorescent fixture mounted outside cabinet.
P. Electrical power receptacles: Provide following unless indicated otherwise on Drawings; GFI type on separate circuit from fan motor and lights, located in drip-proof, gas-tight box. For 6 foot units, provide two (2) duplex receptacles. For 4 foot units, provide one (1) duplex receptacle. Stainless steel cover plates.

Q. Gas/vacuum service fittings: Two (2) valves each side wall, unless indicated otherwise on Drawings.

R. Spill through drain valve: Stainless steel ball valve.

S. Locate service fittings 6 inch minimum beyond cabinet face. All cabinets are to be pre-piped with no pipe less than or equal to ½ inch diameter in size. Make service connections to the cabinet through the top and toward the back of the cabinet. Connections through the back or sides of the cabinet are not acceptable. Connections shall extend 2 inches above the cabinet. Provide schedule 40 black iron pipe for gas piping. Provide type K copper silver solder (15 percent solder) piping for vacuum and air lines. Flexible connectors on gas piping are not acceptable. Install all hard pipe. Use all domestic materials.

T. Unit shall have an audible and visible alarm to indicate low exhaust air flow by monitoring air mass. Audible and visible alarm when sliding viewscreen is in an unsafe position.

2.5 BIOLOGICAL SAFETY CABINET – CLASS II, TYPE B2

A. Units shall meet or exceed requirements of NSF Standard #49.

B. Units shall be tested and certified as required in the parag, Quality Assurance.

C. Units to be console type, nominal 4 foot or 6 foot wide as indicated. Unit shall be transportable through a 3'-0" x 6'-8" doorway.

D. Unit shall be UL listed.

E. Exterior material: Cold rolled steel with white baked enamel finish.

F. Interior material: Type 304 stainless steel with No. 4 finish. All stainless steel to be welded construction with radiused corners.

G. Unit legs: Adjustable.

H. View-screen: Vertical sliding, slanted 10 degree, counter-weighted, ¼ inch safety glass – opens to 8-¼ inch.

I. Air intake velocity through 8 inch or 10 inch front access: 105 fpm minimum.

J. Unit shall be designed to directly exhaust 100 percent of the total volume of air handled in the unit from the work surface area to an outside exhaust provided by others.

K. Units shall have zero-probed supply and exhaust HEPA filters, 99.99 percent efficient for 0.3 microns per DOP test. The HEPA filters shall be low resistance type achieving a low static pressure of 0.30 to 0.45 inches water column. Provide one extra set of filters for each cabinet. Filter frames shall be constructed of wood.
L. Filters shall be front loading.

M. Units shall feature a bag-in/bag-out procedure for replacement of exhaust filter.

N. Protect supply filter with metal diffuser.

O. Air-tight control valve or damper to maintain supply and exhaust air balance and shut-off for decontamination.

P. Unit to have fluorescent fixture mounted outside cabinet.

Q. All electrical components shall be outside Work zone and exhaust flow ducting.

R. Electrical power receptacles: Provide following unless indicated otherwise on Drawings: GFI type, on separate circuit from fan motor and lights. Provide two (2) duplex receptacles. Stainless steel cover plates.

S. Air/Gas/Vacuum service fittings: Two (2) remote control valves.

T. Spill trough drain valve: Stainless steel ball valve.

U. Locate service fittings 6 inch minimum beyond cabinet face. All cabinets are to be prepiped with no pipe less than or equal to ½ inch diameter in size. Make service connections to the cabinet through the top and toward the back of the cabinet. Connections through the back or sides of the cabinet are not acceptable. Connections shall extend 2 inches above the cabinet. Provide schedule 40 black iron pipe for gas piping. Provide type K silver solder (15 percent solder) piping for vacuum and air lines. Flexible connectors on gas piping are not acceptable. Install all hard pipe. Use all domestic materials.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate installation and service requirements with other trades.

3.2 CASEWORK INSTALLATION

A. Install this Work under direction of manufacturer.

B. Floor supported Work: Set in position, level and fasten to adjacent units as required. Fasten counter tops to base cabinets. Seal tops and splashes to abutting vertical surfaces. Install filler panels between cabinets and walls.

C. Wall mounted Work: Fasten in place to bracing provided in wall system.

3.3 CHEMICAL FUME HOOD AND BIOLOGICAL SAFETY CABINET INSTALLATION

A. Install new fan and electrical disconnect on equipment supports per Division 07. Install motor starter for ¾ horsepower and larger motors in a protected location near fan. Coordinate with Owner’s Representative.
B. Install new stack per attached detail. Provide guy wire to support stack as required. Coordinate location of guy wire with Owner’s Representative.

C. Paint and identify fan housing.

D. Provide reinforced neoprene connector between fan and ductwork.

E. Provide stainless steel transition section between hood or safety cabinet and ductwork.

F. Install volume control damper in ductwork directly above hood and transition section.

G. Install new base cabinet under existing hood and install concealed vent(s) to exhaust duct above hood as required.

H. Connect electrical and mechanical services to devices furnished with hood or safety cabinet.

3.4 CLEANING

A. Remove debris from area of installation daily and at completion of Project.

END OF SECTION 11 53 13

This section of the U of I Facilities Standards establishes minimum requirements only. It should not be used as a complete specification.