SECTION 11535 – BIOLOGICAL SAFETY CABINETS

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 15212 – (22 60 13) Laboratory Gas Connections
B. Section 15810 – (23 33 00) Ductwork Connections
C. Section 16150 – (26 05 03) Electrical Connections

1.2 DESIGN AND PERFORMANCE CRITERIA

A. Provide biological safety cabinets with workspace for testing and experimentation of low to moderate risk agents in the Classes and Types indicated, as defined by National Sanitation Foundation (NSF) Standard #49.

B. Design meeting requirements of the particular class and type of cabinet as follows:

1. Class II Type A2: Suitable for testing and experimentation with low to moderate risk biological agents and when connected by canopy connection to HVAC treated with minute quantities of toxic chemicals and trace quantities of radionuclides that will not interfere with the work if recirculated in the downflow air.

1.3 SUBMITTALS

A. Shop Drawings: Show complete construction details, fittings, duct connection, electrical connection, filters and other information necessary to fully describe each unit and its installation. Include plans and elevations. Include CFM and static pressure requirements. Indicate required clearances to wall and ceilings.

B. Product Data: Show test designs and performance charts.

C. Informational Submittals

1. Statement of manufacturer’s qualifications.
2. Certificates:
   a. Certify that factory tests have been performed and that work meets or exceeds specified requirements.
   b. Certify that each unit meets or exceeds NSF requirements for the class listed for the unit.
3. Start-up Test Report shall be submitted by independent 3\textsuperscript{rd} party accredited by NSF to test and balance biological safety cabinets.
4. Operation and Maintenance Data:
a. Description of equipment operation and control, motor control and alarm systems.
b. Wiring diagrams showing separate circuits for outlets, lights and blowers.
c. Operator’s manual and performance factory test report for each Class II, Type A2 unit by serial number.

5. Warranty: Warrant the cabinets for six years from date of delivery.
6. Field Reports: By independent qualified certification group.

D. Structural Performance: Provide cabinet components capable of withstanding the following loads without permanent deformation, excessive deflection, or binding of cabinet walls and viewscreen:
1. Channel Base Stands: 50-lb/ft. (74-kg/m) plus weight of hood.

1.4 QUALITY ASSURANCE

A. List each Class II, Type A2 cabinet as certified by cULus for electrical safety and integrity.
B. Safety Glass: Products complying with testing requirements in 16 CFR 1201 for Category II materials.
C. Pre-Installation Conference: Conduct at project site with manufacturer’s representative to assure site is prepared for acceptance of equipment.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacture of products specified with a minimum ten years documented experience to the US market.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or another suitable material. Supply each unit with a drop and tell indicator on the packaging to notify receiving personnel of any possible damage during transit.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install biological safety cabinets until building is enclosed, wet work and utility roughing-in is complete, sheetrock, spackling, painting, flooring and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.8 EXTRA MATERIALS

A. Furnish complete touchup kit for each type and color biological safety cabinet finish provided. Include fillers, primers, paints and other materials necessary to perform permanent repairs to damaged biological safety cabinets.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide SterilGARD III Model SGx04 manufactured by The Baker Company.
1. SG404: Exterior dimensions – 53 3/4” w x 30 9/16” d x 61 3/4” h
2. SG504: Exterior dimensions – 65 3/4” w x 30 9/16” d x 61 3/4” h
3. SG604: Exterior dimensions – 77 3/4” w x 30 9/16” d x 61 3/4” h

B. Comparable product by one of the following permitted:
1. Nuaire Model 437 with all metal plenums. Hepex bag not permitted.
2. Thermo Model 1305

C. Other substitutions are not permitted.

2.2 MATERIALS

A. Construction: Cabinet Exterior – 16 gauge and 18 gauge, cold rolled steel, with baked enamel white finish. Cabinet Interior-One piece 16 gauge corrosion resistant stainless-Steel sheet, type 304, no. 4 finish, side walls and rear walls with 7/16 inch radiused rounded corners. Cabinet to be double wall construction with negative pressure airflow between the walls from drain pan to top surrounding sides and back of work area. Provide high velocity return air slots in the side walls and top adjacent to front access opening for enhanced containment and reduction of air turbulence. Sealant joints are not permitted. Provide welded, gasketed and/or hermetically sealed joints for cabinet components to achieve a bubble tested seal when completely assembled. Provide vertical sliding front view screen with ¼” thick laminated safety plate glass at a ten degree angle from the vertical. Viewscreen adjustable from 20 inches fully open to fully closed for system shutdown. Bottom of access opening shall be an aerodynamic airfoil design directing airflow into front grill. Provide higher velocity momentum air curtain immediately behind the viewscreen for added personnel and product protection. Provide a telescoping steel air plenum that allows HEPA filters to be front loading, directly clamped, uniformly loaded and sealed by closed cell neoprene gaskets. Provide stainless steel air diffuser and filter protector on top of the cabinet.

B. Controls – Cabinet shall have a microprocessor based control system with an easy to clean membrane control panel mounted on the front of the cabinet facing down towards the user while seated. Unit shall have an audible alarm and flashing LED to indicate when the sliding viewscreen is at the improper height position. An alarm mute switch shall be provided on the front of the cabinet to allow a brief time for equipment loading in the work zone. The audible alarm shall automatically reactivate after five minutes if the viewscreen sash remains at the improper height. The visible alarm shall not shut off. The cabinet shall have adjustable delay off timers for lights, outlets and optional ultraviolet lights. These timers shall be capable of 15 minute interval settings.
C. **Illumination:** Cabinet shall have externally mounted fluorescent lighting fixture with solid state ballasts producing an average of 100 foot candles at work surface.

D. **Filters:** One supply and one exhaust, scan-tested, zero-probe HEPA Filter, 99.99 percent efficient on 0.3 micron particles by DOP test, serviceable and removable from front of unit. Exhaust filter also accessible from top of unit. Provide air balancing damper in filter housing with external control. Provide stainless steel diffuser in the top of the work area and stainless steel filter protector on top of cabinet.

E. **Calculated Air Velocity:** 100 to 110 fpm through 8” sash opening with audible alarms which sound when viewscreen is not at its proper operating height.

F. **Provide StediFLOW motor/blower combination capable of producing a constant air volume despite increased resistance in filter loading as follows:**
   1. Capable of automatically handling a 300 percent increase in pressure drop across filter with not more than 10 percent reduction in total air delivery with no manual speed control adjustment. The motor blower combination continually regulates the air volume to the end of the useful life of the filter.
   2. **Provide ReadySafe Mode capable of setting the Biosafety Cabinet into a low flow energy saving mode when the view screen is closed and returning the Biosafety Cabinet to the normal mode when the viewscreen is opened. The energy saving mode shall reduce energy consumption by at least 50% and when the Biosafety Cabinet is in this mode, the cabinet shall meet the product and personnel protection testing requirements of NSF49. In addition, particle testing while the cabinet is in ReadySafe Mode shall show that the cabinet exceeds the requirements for ISO Class 5 conditions for .3 micron particles.**

G. **Electrical Requirements – A dedicated 115V, 20 amp, 60 Hz single phase circuit shall be required for proper operation. The cabinet shall be pre-wired with a 14’ power cord terminated with a NEMA 5-20P plug. Provide two GFCI outlets in the work area protected by an independent self resetting breaker.**

H. **Bulkhead Fittings:** Use bulkhead connectors with elastomeric seals that are easily and cleanly removable and reusable. Penetrations using applied sealants not permitted. Standard blank-out plugged penetrations for future fittings must be sealed gas tight.

I. **Exhaust Requirements to Room – Measured directly above the exhaust filter before any restrictions, elbows or reductions.**
   1. SG403A-HE – 290 CFM (8” sash)
   2. SG503A-HE – 360 CFM (8” sash)
   3. SG603A-HE - 455 CFM (8” sash)

J. **Gaskets:** Closed cell Neoprene to form airtight seals to suit installation conditions and cabinet function. Minimum 1/2 inch wide x 1/4 inch thick, fitted over bolt studs.

K. **Drain Pan – Unit shall have a unitized drain pan with 7/16” radius corners on all sides to facilitate cleaning. Work surface and supports shall be easily removable to facilitate cleaning the drain pan. A stainless ball valve shall also be included to allow safe and effective drain out for spills.**
L. Cable Port – A port through negative pressure sidewalls to allow passage of tubes or cables. Design shall meet Class 100 (ISO Class 5) air cleanliness immediately inside opening in the work area as verified by a particle counter. Cabinet shall be NSF listed with this feature.

M. Optional Accessories:
1. Channel stand – Adjustable work surface from 30 1/8” to 38 5/8”, with leg levelers
2. Casters – added to channel stand adjustable work surface from 30” to 36”.
3. Utility Valve – Greaseless
4. Piping to Back of Cabinet
5. UV Germicidal Lamp – Design must include safety interlock that shuts off the UV lamp when the sash is raised.
6. Canopy Exhaust Connection – Basis of Design shall be the FlexAIR CEC manufactured by The Baker Company. It shall be located between cabinet exhaust Hepa Filter and the building exhaust system with 12”(305mm) collar duct connection. Design shall allow maintenance of proper A2 operating airflows through sash opening whether exhaust flow decreases to no flow or whether exhaust flow increases by fifty percent. Design shall incorporate a low flow alarm. Design shall include features to minimize turbulence in the housing. Design shall be helium leak challenged to prove no leaking under normal operation.
   a. CEC 403A HE – 290 CFM at 0.08” w.c. (8” sash)
   b. CEC 503A HE – 360 CFM at 0.12” w.c. (8” sash)
   c. CEC 603A HE - 460 CFM at 0.13” w.c. (8” sash)
7. Duct reducers
   a. 12” to 8”
   b. 12” to 10”
8. Mass Airflow Monitor with audible and visual indicators to monitor cabinet conditions.
9. Air Tight Damper with flange to mate to top of canopy exhaust transition to allow proper decontamination of the cabinet.
10. Seismic Restraints – Anchor bolts for wall or floor design mount, shake table tested and certified to AC156 2006 and acceptance criteria per CBC2007 CCR Title 24 for Hospitals.
11. Ergonomic Footrest
12. Ergonomic Adjustable Chair
13. Ergonomic Sit/Stand Stool
14. Electric Hydraulic Lift to allow work surface to raise and lower for varying worker heights.

2.3 FABRICATION

A. General: Assemble biological safety cabinet in factory to greatest extent possible. Disassemble cabinet only as necessary for shipping and handling limitations.

B. Steel Exterior: Fabricate from steel sheet, 16 gauge 0.060 inch and 18 gauge 0.0478 inch nominal thickness, with durable powder coated white finish, with component parts bolted together to allow removal of end panels and front fascia to allow access to plumbing lines and service fittings and allow access for maintenance and decontamination.

C. Fabricate bottom of sash opening to provide an aerodynamic airfoil to ensure smooth, even flow of air into biological safety cabinet.
D. Interior Lining: Provide the following unless otherwise indicated:
   1. Stainless steel 304, not less than 16 gauge (.060 inches) nominal thickness, one piece
      construction of back and side walls.

E. Exhaust Plenum: All steel construction and with adequate volume to provide unidirectional
   airflow from hood and with duct stub for connection to 10” duct if necessary.
   1. Duct-Stub Material: Steel with powder coated white finish

F. Sashes: Viewscreen guide design shall be a counterweighted pulley system allowing effortless
   movement up and down with one hand. Design shall be durable, hidden and maintenance free.
   Provide operable sashes of type indicated.
   1. Glass edges covered with metal extruded channel.
   2. Glaze with laminated safety glass.
   3. Provide guide rails capable of holding the sash in place regardless of position. Provide
      rubber bumpers to cushion sash when fully opened or closed.

G. Light Fixtures: Units shall be provided with fluorescent light fixtures external to the cabinet,
   covered and protected inside a canopy. Units shall be provided with energy efficient fluorescent
   bulbs easily replaceable from front of cabinet.

2.4 STANDARD ACCESSORIES

A. Service Fittings: Comply with requirements in Division 12 Section "Laboratory Casework."
   1. Provide service fittings with exposed surfaces, including fittings, escutcheons, and trim,
      made of brass with a chrome finish on left sidewall in work area.

B. One stainless steel ball valve from drain pan located in knee space on left side.

C. Ergonomic Flow Through Bypass Armrest fitted over aerodynamic airfoil allowing viewscreen
   to fully close while cabinet is running without creating added noise to laboratory. Armrest shall
   incorporate a closed cell neoprene pad for worker comfort.

D. Stainless Steel Downflow Diffuser and Exhaust Filter Protector on top of the cabinet.

E. Airflow Indicator: Provide each cabinet with airflow indicator of the following type(s):
   1. Indicator Type: Magnehelic Gauge

F. Cable Port through negative pressure sidewalls to allow passage of vacuum tubes or cables.

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

3.2 INSTALLATION

A. General: Install biological safety cabinets according to Shop Drawings and manufacturer's written instructions.

3.3 START-UP AND TESTING

1. Field test installed biological safety cabinets according to manufacturer’s instructions. Include tests of filters, intake and exhaust air velocities, and airflow pattern evaluations. Call manufacturer’s technical support and retest units that do not meet specified standards.

3.4 DEMONSTRATION

A. Provide demonstration and instruction on each type of unit furnished, using manufacturer’s representative.

END OF SECTION 11535