

SECTION 11600 - LABORATORY EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Special Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of laboratory equipment required is indicated on drawings and in schedules.
- B. Plumbing requirements are specified in Division 15.
- C. Electrical services and connections are specified in Division 16.

1.3 SUBMITTALS:

- A. Product Data: Submit manufacturer's specifications and installation instructions for each type of laboratory equipment, including data indicating compliance with requirements. Submit operating and maintenance instructions for each item of laboratory equipment.
- B. Product Warranties: Submit manufacturer's standard written warranty for each item of laboratory equipment.
- C. Equipment Lists:
 - 1. Prepare and complete list of materials and equipment scheduled on the Drawings including Owner-Furnished Contractor Installed equipment.

PART 2 - PRODUCTS

2.1 CONTRACTOR FURNISHED/CONTRACTOR INSTALLED ITEMS:

- A. Furnish and install, together with all required accessories, those items listed as "CFCI" on the Equipment Schedule in the Drawings.

2.2 OWNER-FURNISHED/CONTRACTOR-INSTALLED ITEMS:

- A. The Equipment Schedule lists the items furnished by Owner and is included for Contractor's information and coordination for installation with the work of this Contract. Provide miscellaneous materials required for installation of items, and provide the installation required for each item listed.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations.

3.2 BUILT-IN EQUIPMENT

- A. Securely anchor units to supporting cabinetry or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.

3.3 FREESTANDING EQUIPMENT

- A. Place units in final locations after finishes have been completed in each area. Verify clearances are adequate for proper operation of equipment.

3.4 UTILITIES

- A. Refer to Divisions 15 and 16 for plumbing and electrical requirements.

3.5 TESTING

- A. Test each item of equipment to verify proper operation. Make necessary adjustments.

3.6 ACCESSORIES

- A. Verify that accessory items required have been furnished and installed.

3.7 CLEANING:

- A. Remove packing material from equipment items and leave units in clean condition, ready for operation.

END OF SECTION 11600

SECTION 11602 – GRAVITY STEAM STERILIZER

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Free Standing Gravity Steam Sterilizer, Single Door.

1.2 RELATED SECTIONS

- A. Section 15010 – Basic Mechanical Requirements
- B. Section 15410 – Plumbing Piping
- C. Section 15450 – Plumbing Equipment

1.3 REFERENCES

- A. ASME (Section VIII, Division 1) Code for Pressure Vessels.
- B. Uniform Plumbing Code
- C. ETL Testing Laboratory Listed to UL 544.

1.4 STEAM STERILIZER GENERAL DESIGN REQUIREMENTS

- A. Temperature:
 - 1. Must be capable of operating at a temperature range 230°F-275°F.
 - 2. Temperature selectability for liquids shall be from 104°C to 135°C (219°F –275°F)
- B. Microprocessor Unit:
 - 1. Shall be furnished with programmed cycles loaded in the software.
 - 2. Microprocessor must be capable of monitoring and sequencing all cycle phases providing both audible and visual notification of any deviation from the programmed operation parameters.
- C. Provide a printer to document and record cycle performance on thermal paper for permanent records.
- D. Unit service connection must include a” cold water delivered at 30-60psig dynamic, ½” hot water at 20-50 psig dynamic with a 1 ½ “ ODT floor drain.
- E. When installed and connected to the required utilities, the system must provide accurate and repeatable results.
- F. Sterilizer unit must be capable of programmable cycles and hold cycle parameters in the event of a power failure.

1.5 SUBMITTALS

- A. Shop Drawings: Indicate equipment locations, large scale plans, elevations, cross sections, rough-in and anchor placement dimensions and tolerances and all required clearances.
- B. Product Data: Submit manufacturer's data for steam sterilizer equipment and accessories specified. Include component dimensions, configurations, utility and service requirements and locations.
- C. Instructions: Submit for review and approval. Written instructions in booklet form providing additional details on safe and proper operation and maintenance.

1.6 QUALITY ASSURANCE

- A. Single source responsibility: Gravity steam sterilizer and accessories shall be manufactured or furnished by a single manufacturing company.
- B. Manufacturer's qualifications: Modern plant with proper tools, dies, fixtures and skilled workmen to produce high quality laboratory casework and equipment, and shall meet the following minimum requirements:
 - 1. A list of names and cities of at least three full time manufacture's employees who are responsible for warranty and post warranty service response.
 - 2. Units must conform to ASME (Section VIII, Division I) Code for pressure Vessels and be label by a nationally recognized testing laboratory to UL 3101-1 Electrical Safety Code and IEC 61010-2-041 prior to leaving the Factory. The sterilizer shall be supplied with an ASME U1 form.
- C. The microprocessor control and associated parts must have been in production for a minimum of two years.
- D. Installer's Qualifications: Factory certified by the manufacturer.
- E. Make manufacturing facility, testing facility, and quality control procedures available for owner inspection.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Schedule delivery of equipment so that spaces are sufficiently complete that equipment can be installed immediately following delivery.
- B. Protect finished surfaces from soiling or damage during handling and installation. Keep covered with polyethylene film or other protective coating

1.8 PROJECT CONDITIONS

- A. Do not deliver or install equipment until the following conditions have been met:
 - 1. Windows and doors are installed and the building is secure and weather tight.
 - 2. Ceiling, overhead ductwork and lighting are installed.
- B. All painting is completed and floor tile located below casework is installed

1.9 WARRANTY

- A. See Section 01705 – Project Closeout , for additional warranty requirements.
- B. The entire sterilizer, including, but not limited to, all components, valves, computers, boilers, sensors, relays, traps, gaskets, will be covered by a one year parts and labor warranty.
- C. The pressure vessel shall be covered for a fifteen (15) year extended warranty..

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products equal to the following :
 - 1. Getinge/Castle Model 122 LS Freestanding Gravity Steam Sterilizer, Single Door. with 30 kw integral steam generator with an automatic feed water pump.
- B. Substitutions: See Section 01600 - Product Requirements.

2.2 INTERNAL CHAMBER

- A. Chamber size shall be a minimum of 17.5" (445mm) x 17.5" (445) x 26" (660mm) with a volume of 4.6 CF with rack and two adjustable, extendible shelves.

2.3 EXTERNAL CHAMBER

- A. Unit shall have a square body that is thermally insulated with fiberglass.
- B. Must provide emergency chamber access for immediate removal of loads. Manual chamber exhaust valve to be provided. Door must be able to be opened manually without the use of tools.

2.4 CHAMBER DOOR

- A. Single, vertical sliding door that is power operated. Door material must be manufactured of stainless steel. Door operation shall be either foot pedal actuated for "hands free" operation or by a switch on the control panel. The door shall also be capable of open and closing manually. During a powered closing or opening, the door motion shall be reversed when either switch is actuated.
- B. Door position
 1. When in the fully open position, the door must be out of the way to allow safe access to the chamber. The door must store in the down position when fully open.
 2. In the closed position, eight structural members must secure the door in position and the door be self-latching, with automatic sealing and unsealing at the beginning/end of the cycle.
- C. Gasket shall be recessed in the gasket ring for long life and protection.
- D. Door shall not be able to open door when the chamber is pressurized.
- E. Door shall be counter balanced for ease of operation
- F. Shall be insulated with material 5/8" thick and covered with a stainless steel panel.
- G. Front paneling to be hinged for easy and full access to the manual retract valve, door gasket and integral steam generator.
- H. Front panel is to be constructed of nominal 0.050" stainless steel.

2.5 MICROPROCESSOR CONTROLS

- A. Users shall be able to access additional real time information during the cycle.
- B. Operator shall have the capability to change or modify any pre-programmed time or temperature to fit specific processing needs. As standard, the operator must have access to the cycle selection, cycle start and the door control.
- C. The steam vapor and moisture from the door shall be routed away from the completely enclosed controls by a deflection barrier.
- D. Must be able to enter a password protected service mode and actuate all solenoid valves via the front interface panel.
- E. Microprocessor unit shall be provided with a durable color screen.
- F. The microprocessor control shall have the ability to store in memory different error messages / faults with a time and date stamp as to when the incident occurred.
- G. The sterilizer shall utilize a water in drain and chamber alarm. If a malfunction were to occur, and water was present in the chamber, the control system would take action to clear the water. If it could

not do so, the cycle would abort, an audible alarm would sound, a message would display warning of water in chamber. The printout should indicate a " water in chamber alarm" and a message would be stored in the computers error log. The door would remain sealed and the operator could not open the door via the control panel.

- H. All operator controls and printer to be mounted above the sterilizer door.
- I. Jacket and chamber pressure gauges must be provided above the door.

2.6 PRINTER

- A. Printer unit shall be located on the control panel.
- B. Printout may include but not limited to:
 1. Cycle parameters selected.
 2. Cycle transition points, documenting time, temperature and pressure.
 3. Process fault information messages.
 4. Cycle verification signature line, with an exposure values summary.
 5. Switches for paper feed and repeat print
 6. Paper roll replacement must be quick and easy and must use thermal paper for a permanent record.

2.7 OPERATOR INTERFACE PANEL

- A. An illuminated button for the on/off controls, cycle selection, door controls and status indicator lights.
- B. Easy to read color screen indicating the cycle selected and during the cycle, provides a descriptive message of the phase and cycle status.
- C. Jacket and Chamber pressure gauges
- D. Audible and visible operator feedback when a button is pressed or fault/information is displayed.
- E. Temperature displayed in either degrees C or F, pressure in psig or psia.
- F. Supervisor password protection.
- G. Utility Control to set a 7 day timer to for start up and shut down.
- H. Must contain a high water alarm to detect water in the chamber drain.

2.8 CYCLE PROGRESSION

- A. Gravity/Wrapped Goods (pressure pulsing conditioning).
 1. Conditioning – steam flows into the chamber for a timed period, followed by a series of pressure pulses to remove chamber air.
 2. Heat-Up — to selected temperature.
 3. Exposure – selected chamber temperature is attained and timed.
 4. Exhaust — chamber vented to atmospheric pressure.
 5. Dry— The filtered air is drawn through the chamber at atmospheric pressure for selected drying time.
 6. Cycle Complete – Signaled by a tone, light and display message
- B. Gravity/Unwrapped Goods (3 minutes for nonporous items or 10 minutes for porous items)
 1. Conditioning — steam flows into chamber for a timed period to remove air. The 10-minute Flash cycle for porous items has a series of positive pulses for dynamic air removal.
 2. Heat-Up — to selected temperature.
 3. Exposure — selected chamber temperature is attained and timed.

4. Exhaust — Chamber vented to atmospheric pressure.
5. Dry — filtered air is drawn through chamber for the duration of time selected.
6. Cycle Complete — signaled by a tone, light and display message.

C. Liquids

1. Conditioning – steam flows into the chamber for a timed period, followed by a series of pressure pulses to remove chamber air.
2. Heat-Up — to selected temperature.
3. Dwell – Allows liquids to reach drain temperature (when liquid RTD is not used)
4. Exposure – selected chamber temperature is attained and timed.
5. Exhaust — an adjustable linear exhaust
6. Cycle Complete – Signaled by a tone, light and display message

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify equipment rough-in before proceeding with work.
- B. Coordinate with other trades for proper installation of plumbing and electrical services and for rough opening dimensions required for installation.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions; comply with requirement of authorities having jurisdiction.
- B. Schedule installation to ensure that utility connections are achieved in an orderly and expeditious manner.
- C. Demonstrate fume hood operations and functions to Owner at completion of installation.

3.3 FIELD QUALITY CONTROL

- A. Provide a qualified independent certifier to certify gravity steam sterilizer conforms with ASME (Section VIII, Division I).

3.4 ADJUSTING AND CLEANING

- A. Clean adjacent construction and surfaces soiled in the course of installation of this work.
- B. Touch up minor damaged surfaces caused by installation. Replace damaged components as directed by Architect and Engineer.

3.5 PROTECTION

- A. Provide protective measures to prevent exposure to construction activity that might cause damage.

END OF SECTION-11602

SECTION 11610 -LABORATORY FUME HOODS

PART 1 GENERAL

1.1 SECTION INCLUDES:

- A. Stainless steel radioisotope fume hoods with automatic by-pass air flow system for use with remotely located constant volume exhaust system.
- B. Steel chemical fume hoods with automatic by-pass air flow system for use with remotely-located constant volume exhaust system.

1.2 RELATED SECTIONS:

- A. Section 11600 – Laboratory Equipment
- B. Section 12311 – Wood Laboratory Casework.
- C. Section 15410 – Plumbing Piping
- D. Section 15420 – Natural Gas, Compressed Air and Vacuum System Piping
- E. Section 15885 – Filters
- F. Section 15931 – Air Terminal Units

1.3 REFERENCES

- A. ASHRAE Std 110 - Method of Testing Performance of Laboratory Fume Hoods; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 1995.
- B. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 1999.
- C. ASTM A 366/A 366M - Standard Specification for Commercial Steel (CS) Sheet, Carbon, (0.15 Maximum Percent) Cold-Rolled; 1997.
- D. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 1999.

1.4 FUME HOOD GENERAL DESIGN REQUIREMENTS

- A. Fume hoods shall function as ventilated, enclosed workspaces, designed to capture, confine and exhaust fumes, vapors and particulate matter produced or generated within the enclosure.
- B. Design fume hoods for consistent and safe air flow through the hood face. Negative variations of face velocity shall not exceed 20% of the average face velocity at any designated measuring point as defined in this section.
- C. Average illumination of work area: Minimum 80 foot-candles. Work area shall be defined as the area inside the superstructure from side to side and from face of baffle to the inside face of the sash, and from the working surface to a height of 28 inches.
- D. Fume hood shall be designed to minimize static pressure loss with adequate slot area and bell shaped exhaust collar configuration. Maximum average static pressure loss readings taken three diameters above the hood outlet from four points, 90 degrees apart, shall not exceed the following maximums with sash in full open position:

Face Velocity	Measured S.P.L. (W.G.)
75 F.P.M.	.18 inches
100 F.P.M.	.30 inches
125 F.P.M.	.45 inches
150 F.P.M.	.60 inches

- E. Fume hood shall maintain essentially constant exhaust volume at any baffle position for safety. Maximum variation in exhaust CFM, static pressure and average face velocity as a result of baffle adjustment shall not exceed 5% for any baffle position at the specified face velocity.
- F. Fume hoods shall be field convertible, from bypass type to auxiliary air by simple component replacement or addition. Change-over shall be accomplished without construction modifications and without special tools.
- G. Noise Criteria: Test data of octave band analysis verifying hood is capable of a 50 NC value when connected to a 50 NC HVAC source. Reading taken 3' in front of open sash at 110 fpm face velocity.

1.5 SUBMITTALS

- A. Shop Drawings: Indicate equipment locations, large scale plans, elevations, cross sections, rough-in and anchor placement dimensions and tolerances and all required clearances.
- B. Product Data: Submit manufacturer's data for each component and item of laboratory equipment specified. Include component dimensions, configurations, construction details, joint details, and attachments, utility and service requirements and locations.
- C. Samples: Submit 3 x 6 inch samples of finish for fume hood, work surfaces and for other pre-finished equipment and accessories for selection by Architect.
- D. Test Reports: Submit test reports on each size and type of hood verifying conformance to test performances specified. Test report must accompany each hood as part of installation and usage package. Submit independent test reports as required by specification.
- E. Instructions: Submit for review and approval
 1. Instructions to be inscribed on instruction plate to be attached to hood.
 2. Written instructions in booklet form providing additional details on safe and proper operation and maintenance.

1.6 QUALITY ASSURANCE

- A. Single source responsibility: Fume hood casework, work surfaces, and other laboratory equipment and accessories shall be manufactured or furnished by a single laboratory furniture company.
- B. Manufacturer's qualifications: Modern plant with proper tools, dies, fixtures and skilled workmen to produce high quality laboratory casework and equipment, and shall meet the following minimum requirements:
 1. Five years or more experience in manufacture of laboratory casework and equipment of type specified.
 2. Ten installations of equal or larger size and requirements.
 3. UL 1805 Specification: Fume Hood must be Underwriters Laboratories subject 1805 classified. The 1805 standard covers electrical and mechanical hazards, investigates the flammability of materials and measures the effectiveness of airflow characteristics. Proper labeling must be affixed to the face of each fume hood indicating classification to the UL 1805 standard for Laboratory Fume Hoods. UL listing covering electrical components only or other listings that do not encompass all issues covered in UL 1805 is insufficient. All factory testing shall be performed in a U.L. certified test facility.
- C. Installer's Qualifications: Factory certified by the manufacturer.

- D. Maintain testing facility at manufacturer's place of business for testing and evaluate laboratory fume hoods under both ideal and adverse conditions, in accordance with ASHRAE Std 110.
- E. Make manufacturing facility, testing facility, and quality control procedures available for owner inspection.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Schedule delivery of equipment so that spaces are sufficiently complete that equipment can be installed immediately following delivery.
- B. Protect finished surfaces from soiling or damage during handling and installation. Keep covered with polyethylene film or other protective coating
- C. Protect all work surfaces throughout construction period with 1/4" corrugated cardboard completely covering the top and securely taped to edges. Mark cardboard in large lettering "No Standing".

1.8 PROJECT CONDITIONS

- A. Do not deliver or install equipment until the following conditions have been met:
 - 1. Windows and doors are installed and the building is secure and weather tight.
 - 2. Ceiling, overhead ductwork and lighting are installed.
 - 3. All painting is completed and floor tile located below casework is installed.

1.9 WARRANTY

- A. Warrant against defects in materials and workmanship on fume hoods, work surfaces, and accessories; include labor and replacement parts (except lamps).
- B. Warranty Period: One year from date of installation or two years from date of purchase, whichever is sooner.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following manufacturers:
 - 1. Fisher Hamilton Industries
 - 2. ACL/Mott
 - 3. Kewaunee Scientific Corp.
 - 4. Labconco Corporation

2.2 FUME HOOD MATERIALS

- A. Steel: High quality, cold rolled, mild steel meeting requirements of ASTM A366; gauges U.S. Standard and galvanized.
- B. Stainless steel: Type 304; gauges U.S. Standard.
- C. Bypass grilles: Low resistant type, 18 gauge steel, upward directional louvers.
- E. Safety glass: 7/32" thick laminated safety glass.
- F. Sash cables: Stainless steel, uncoated, 1/8" diameter military spec. quality. (MIL-W-83420D-3)
- G. Sash guides: Provide alternate to corrosion-resistant material to poly-vinyl chloride.

- H. Pulley assembly for sash cable: 2" diameter, zinc dichromate finish, ball bearing type, with cable retaining device. (Nylon tired-not acceptable.)
- I. Sash pull: Full width corrosion resistant plastic, stainless steel or steel with chemical resistant powder coating.
- J. Gaskets: Provide alternate material to 70 durometer PVC for interior access panels. Gasket interior access panels to eliminate air leakage and to retain liquids inside hood.
- K. Fastenings:
 - 1. Exterior structural members attachments: Sheet metal screws, zinc plated.
 - 2. Interior fastening devices concealed. Exposed screws not acceptable. (Screw head "caps" not acceptable.)
 - 3. Exterior panel member fastening devices to be corrosion resistant, non-metallic material. Exposed screws not acceptable.
- L. Instruction plate: Corrosion resistant or plastic plate attached to the fume hood exterior with condensed information covering recommended locations for apparatus and accessories, baffle settings and use of sash.

2.3 FUME HOOD CONSTRUCTION

- A. Superstructure: Rigid, self supporting assembly of double wall construction, maximum 4-7/8" thick.
 - 1. Wall consists of a sheet steel outer shell and a corrosion resistant inner liner, and houses and conceals steel framing members, attaching brackets and remote operating service fixture mechanisms and services. Panels must be attached to a full frame construction, minimum 14 gauge galvanized members. Panels and brackets attached to eliminate screw heads and metallic bracketry from hood interior.
 - 2. Access to fixture valves concealed in wall provided by exterior removable access panels, gasketed access panels on the inside liner walls, or through removable front posts.
- B. Exhaust Outlet: Rectangular with ends radiused, shaped and flanged, 18 gauge steel finished with Chameleon powder coating.
- C. Access Opening Perimeter: Air foil or streamlined shape with all right angle corners radiused or angled. Bottom horizontal foil shall provide nominal one inch bypass when sash is in the closed position. Bottom foil shall be removable without use of special tools. Bottom foil shall provide access areas for electrical cords. Bottom foil: Steel with black powder coating or stainless steel to increase acid and abrasion resistance. Air foil and sill to extend no more than 1.5" in front of work surface on non-auxiliary air hoods to provide maximum aisle space and allow deeper usage.
- D. Fume Hood Sash: Full view type with clear, unobstructed, side-to-side view of fume hood interior and service fixture connections.
 - 1. Bottom sash rail: 2" maximum, 18 gauge steel with powder coating finish. Provide integral formed, flush pull the full width of bottom rail.
 - 2. Set safety glass into rails in deep form, extruded glazing channels. No PVC channels will be accepted.
 - 3. Counter balance system: Single weight, pulley, cable, counter balance system which prevents sash tilting and permits one finger operation at any point along full width pull. Maximum 7 pounds pull required to raise or lower sash throughout its full length of travel. Design system to hold sash at any position without creep and to prevent sash drop in the event of cable failure. Life cycle test 100 pound sash and weight to 100,000 cycles without sign of failure. Provide independent test data.
 - 4. Postless sash design: Per drawing details.
 - 5. Open and close sash against rubber bumper stops.
- E. Fume Hood Liner: Poly-resin: Reinforced polyester panel; smooth finish and white color in final appearance. Flexural strength: 14,000 psi. Flame spread: 15 or less per U.L. 723 and ASTM E84-80.
- F. Baffles: Baffles providing controlled air vectors into and through the fume hood shall be fabricated of the same material as the liner. Provide exhaust slots full height on vertical sides of the baffle

with upper and lower slots adjustable. Provide fixed, permanently open horizontal slot 17" above the work surface. Minimum depth of 19" for interior work space is required at the extreme upper portion of the fume hood to provide maximum interior work area. All baffle supports/brackets to be non-metallic.

- G. Remote Baffle Adjustment: Toggle style, one handed, single point control, accomplished while hood is in use, without disturbing apparatus, from outside right hand corner post of fume hood with sash in either the open or closed position, and permitting setting for (1) high thermal loading, (2) heavier than air gases or fumes generated near work surface, and (3) normal or average operation.
1. Remote adjuster: Toggle style control handle and an acid resistant label indicating proper control handle location for baffle function.
 2. Rigidly correlate control handles to baffle positioner; cable-type adjustments are not acceptable
 3. Design baffle adjuster to engage and disengage from the adjustable baffle without the use of tools.
 4. Must comply with OSHA Lab Standard Guidelines. (Easily reached/adjusted with only arm in hood.)
 5. Baffles providing no adjustment or requiring internal manipulations are not acceptable.
 6. Non-metallic supports and fasteners required inside of hood.
- H. Service Fixtures and Fittings: Color coded washers at hose nozzle outlets and valves mounted inside the fume hood and controlled from the exterior with color coded index handles.
1. Valves: Needle point type with self-centering cone tip and seat of hardened stainless steel. Tip and seat shall be removable and replaceable.
 2. Provide piping for all service fixtures from valve to outlet: Galvanized iron or copper for water, air and vacuum and black iron for gas services.
 3. Fixtures exposed to hood interior: Brass with chemically resistant black powder coating.
 4. Remote control handles: Black nylon four-arm handle with nylon color-coded index buttons.
 5. Services: As shown or specified.
- H. Service Fixtures and Fittings: Broen remote control fume hood fixtures.
1. Service treatment: Fittings are to be coated with a chemically resistant polyester powder lacquer electrostatically applied and backed on for a uniform finish. Epoxy coatings are not acceptable.
 2. Handle and outlet nozzle will be color coded to the media, with the same polyester powder lacquer finish. Handles shall be metal with media identification text. Outlet nozzles shall be made of the same high quality brass as the valve bodies. Other materials may be in contact with media where appropriate.
 3. Provide piping for all service fixtures from valve to outlet: Galvanized iron or copper for water, air and vacuum and black iron for gas services.
 4. Fixture fittings shall incorporate quick-connect compression fittings on the valve body (for the media inlet and media outlet) as well as the fume hood outlet nozzle. With this system, no soldering or brazing should be required to complete mechanical connections.
 5. Fixtures exposed to fume hood interior. Brass with chemically resistant polyester powder lacquer color coded to the media.
 6. Fixtures are to be provided with easy-to-mount attachment device for secure mounting in deck or wall mounted applications. System to be installed with simple hand tools.
 7. Fittings are to be constructed to operate with the following maximum working pressure without leak or failure.
 - a. Water Fittings: 145 PSI
 - b. Non-Burning Gas: 145 PSI
 - c. Burning Gases: 100 PSI
 - d. Special Water Fittings: 145 PSI
 - e. Oxygen Fittings: 145 PSI
 8. All outlets shall have detachable serrated nozzles.
 9. All valves shall be front-loaded for ease of access and maintenance at point of use.
- I. Hood Light Fixture: Two lamp, rapid start, UL listed fluorescent light fixture with sound rated ballast installed on exterior of roof. Provide safety glass panel cemented and sealed to the hood roof.
1. Interior of fixture: White, high reflecting plastic enamel.
 2. Size of fixture: Largest possible up to 48" for hoods with superstructures up to six feet. Provide two 36" fixtures for hoods with eight foot superstructures.
 3. Include lamps with fixtures.

4. Illumination: Per performance values, Part 1 of this Section.

- J. Electrical Services: Three wire grounding type receptacles rated at 120 V.A.C. at 20 amperes. Provide 250 V.A.C. receptacles where specified. Flush plates: Black acid resistant thermoplastic.
- K. Work Surfaces: 1-1/4" thick surface, 3/8" deep dished solid epoxy resin surface conforming to hood interior.
- L. Safety Monitor/Alarm System: By VAV controls supplier. See Section 15976 – Laboratory Air Flow Control System.

2.4 RESTRICTED BYPASS FUME HOODS

- A. Bypass shall be sufficient in size to allow 25% flow with sash closed. Bypass must be achieved through grill or louver on face of front lintel panel.
- B. Sash: Standard vertical-rising, with VAV applications.
- C. Width: As indicated on drawings

2.5 RADIOISOTOPE FUME HOODS

- A. Constant volume type with built-in automatic compensating bypass to maintain constant exhaust volume regardless of sash position.
- B. Bypass: Positive in action and controlled by the sash operation.
- C. Low impedance, directionally louvered panel provided in the lintel bypass area and one inch bypass provided immediately above the work surface and directly below the bottom horizontal sash rail. Designs which require all bypass to enter hood over front solid panel - not acceptable.
- D. As sash is lowered, bypass design shall limit the increase in face velocity to maximum of four times the average face velocity with the sash full open.
- E. Perimeter of access opening: Air foil or radiused or angled. Bottom horizontal foil shall provide nominal one inch bypass when sash is in the closed position. Bottom foil shall be removable without use of special tools. Provide black powder coating on bottom foil to increase resistance to acid and abrasion.
- F. Width: As indicated on drawings
- G. Work Surfaces, Radioisotope Fume Hoods: Type 304 stainless steel, 1/4 inch deep dished seamless surface welded to hood interior, joints ground smooth and polished; provide supporting substrate to satisfactorily mount hood to base cabinet.

2.6 METAL FINISH

- A. Preparation: Spray clean metal with a heated cleaner/phosphate solution, pretreat with iron phosphate spray, water rinse, and neutral final seal. Immediately dry in heated ovens, gradually cooled, prior to application of finish.
- B. Application: Electrostatically apply urethane powder coat of selected color and bake in controlled high temperature oven to assure a smooth, hard satin finish. Surfaces shall have a chemical resistant, high grade laboratory furniture quality finish of the following thicknesses:
 - 1. Exterior and interior surfaces exposed to view: 1.5 mil average and 1.2 mil minimum.
 - 2. Backs of cabinets and other surfaces not exposed to view: 1.0 mil average.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify equipment rough-in before proceeding with work, including rough opening dimensions required for fume hood installation.
- B. Coordinate with other trades for proper installation of plumbing and electrical services.

3.2 INSTALLATION

- A. Installation:
 - 1. Install fume hoods and equipment in accordance with manufacturer's instructions.
 - 2. Install equipment plumb, square, and straight with no distortion and securely anchored as required.
 - 3. Secure work surfaces to casework and equipment components with material and procedures recommended by the manufacturer.
- B. Accessory installation: Install accessories and fittings in accordance with manufacturer's recommendations.
- C. Demonstrate fume hood operations and functions to Owner at completion of installation.

3.3 ADJUSTING AND CLEANING

- A. Adjust operating equipment, with the exception of air moving equipment, to provide efficient operation for intended use and as required by manufacturer.
 - 1. Combination Vertical/Horizontal Sashes: Operate smoothly without binding; remain at rest in any open position.
- B. Clean equipment, casework, countertops, and other surfaces as recommended by manufacturer, rendering work in new and unused appearance.
- C. Clean adjacent construction and surfaces soiled in the course of installation of this work.
- D. Touch up minor damaged surfaces caused by installation. Replace damaged components as directed by Architect.

3.4 PROTECTION

- A. Provide protective measures to prevent equipment and surfaces from exposure to other construction activity.

END OF SECTION 11610

SECTION 11615 - OVERHEAD SERVICE CARRIER

PART 1 GENERAL

1.1 SECTION INCLUDES:

- A. Carrier Body
- B. Ceiling Post Assembly
- C. Filler Panel Assembly
- D. Patch Panel Assemblies
- E. Support Framing Above Ceiling

1.2 RELATED SECTIONS:

- A. Section 12311 – Wood Laboratory Casework
- B. Section 12346 – Heavy Duty Equipment Racks

1.3 SYSTEM DESIGN REQUIREMENTS

- A. Horizontal service chase ties directly into the ceiling grid and to support framing installed above ceiling.
- B. Carrier body shall serve as a service chase for all cabling, plumbing, electrical Wiremold, and localized exhaust ductwork.
 - 1. Modular units shall be suitable for floor-mounted cabinets, freestanding tables and mobile equipment racks.
 - 2. Mobile carrier bodies can be ganged side-to-side.
 - 3. Equipped with (2) easy to remove 4" bottom panels entry covers for ease of utility access, visual inspection and utility shut-offs.
 - 4. Designed with recessed opening to accommodate 3 channel G3000 or AL3300 Wiremold raceway provided and installed under Division 16. Raceway channels provided for dedicated services as follows: one for voice/data, one normal power, and one for emergency power.
 - 5. Snorkel exhaust and plumbing fixtures to be installed on bottom panel when shown. Fixtures provided and installed under Division 16.
 - 6. All piping, conduit and exhaust duct by Division 16.
- C. System requirements:
 - 1. Independently supported overhead storage components.
 - 2. Modular units can be linked in tandem for a continuous service run.
 - 3. Horizontal chase can be supplied with quick connects and disconnects for mobile bench and/or equipment rack applications.

1.4 SUBMITTALS

- A. Shop Drawings: Provide 3/4"=1'-0" scale elevations of all components, cross sections, rough-in and anchor placements, tolerances and clearances. Provide 1/4"= 1'-0" rough-in plan drawings for coordination with trades. Rough in shall show free area.

1.5 QUALITY ASSURANCE

- A. Single source responsibility: Laboratory furniture system, heavy-duty equipment racks, casework, work surfaces, laboratory equipment, chemical fume hoods and accessories shall be manufactured or furnished by a single laboratory furniture company.

- B. Manufacturer's qualifications: Modern plant with proper tools, dies, fixtures and skilled workmen to produced high quality laboratory horizontal service chase and equipment, and shall meet the following minimum requirements:
 - 1. Five years or more experience in manufacture of laboratory equipment of type specified.
 - 2. Ten installations of equal or larger size and requirements.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Schedule delivery of laboratory furniture system so that spaces are sufficiently complete that material can be installed immediately following delivery.
- B. Protect finished surfaces from soiling or damage during handling and installation.

1.7 PROJECT CONDITIONS

- A. Do not deliver or install equipment until the following conditions have been met:
 - 1. Windows and doors are installed and the building is secure and weather tight.
 - 2. Ceiling, overhead ductwork and lighting are installed.
 - 3. All painting is completed and floor tile is installed.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Design, materials, construction and finish of product specified are the minimum acceptable standard of quality for the Overhead Service Carrier. The basis of this specification is Fisher Hamilton L.L.C., 1316 – 18th Street, Two Rivers, WI 54241 product.

2.2 OVERHEAD SERVICE CARRIER

- A. General requirements for carriers:
 - 1. Carrier body and inside/outside access covers shall be fabricated from 16-gauge cold rolled steel.
 - 2. Carrier body shall also incorporate factory punched and plugged service ports. Service fixtures to be field installed.
 - 3. Finish: Chemical resistant powder paint finish in manufacturer's standard color to be selected.
- B. CARRIER BODY:
 - 1. Nominal table frame dimensions:
 - a. Width: As noted on drawings
 - b. Depth: 18"
 - c. Height: 12" or as noted on drawing details.
 - 2. Interior service bracket: Support bracket of 11-gauge cold rolled steel that can accept attachment brackets for copper and conduit service lines.
 - 3. Carrier body end covers shall include a set of two end covers to enclose exposed ends of the carrier body.
 - 4. Load bearing capabilities:
 - a. Total overhead service carrier plus 400 pounds per unit.
 - b. Shelf unit plus 100 to 180 pounds respective of size.

2.3 FINISHES

- A. METAL FINISH:
 - 1. Preparation: Spray clean metal with a heated cleaner/phosphate solution, pretreat with iron phosphate spray, water rinse, and neutral final seal. Immediately dry in heated ovens, gradually cooled, prior to application of finish.
 - 2. Application: Electrostatically apply urethane powder coat of selected color and bake in controlled high temperature oven to assure a smooth, hard satin finish. Surfaces shall have a

chemical resistant, high-grade laboratory furniture quality finish of the following thickness:

- a. Exterior and interior exposed surfaces: 1.5 mil average and 1.2 mil min.
- b. Backs of cabinets and other surfaces not exposed to view: 1.0 mil average.

3. Chemical Resistance:

- a. The basis for the finish performance test shall be SEFA (Scientific Equipment & Furniture Association) 8 1999 standards. The purpose of the chemical test is to evaluate the resistance a finish has to chemical spills.
- b. Obtain one sample panel measuring 14" X 24". The received sample to be tested for chemical resistance and described herein. Place panel on a flat surface, clean with soap and water and blot dry. Condition the panel at ambient temperature 73 degrees +/- 3 degrees and 50+/-5% relative humidity using the following rating system. Test the panel for chemical resistance using 49 different chemical reagents by one of the following methods.

B. Test Procedure

- 1. Method A - Test volatile chemicals by placing a cotton ball saturated with reagent in the mouth of a one-ounce (29.574cc) bottle and inverting the bottle on the surface of the panel.
- 2. Method B: Test volatile chemicals by placing five drops of reagent on the surface of the panel and covering with a 24mm watch glass, convex side down.
- 3. For both of the above methods, leave the reagents on the panel for a period of one hour. After a test period of one hour, chemicals shall be flushed away with cold water and the surface washed with detergent and naphtha, warm water at 150 degrees F (65.5 degrees C) and alcohol to remove surface stains. Surface shall be examined under 100 foot-candles of illumination. Dry with a towel and evaluate after 24-hours using the following rating system.
- 4. Evaluation Ratings: Change in surface finish and function shall be described by the following ratings:
 - a. Level 0: No detectable change
 - b. Level 1: Slight change in color or gloss.
 - c. Level 2: Slight surface etching or severe staining.
 - d. Level 3:Pitting, cratering, swelling or erosion of coating. Obvious and significant deterioration.
- 5. Test results (concentration by weight) Overhead Service Carrier (based on Chameleon CH color):
 - a. Manufacturer to provide "Independent" and "Certified" performance finish test results, for specified finish color with submittal of Compliance Statement.

<u>CHEMICAL Reagent</u>	<u>Test Method</u>
1. Acetate, Amyl	A
2. Acetate, Ethyl	A
3. Acetic Acid, 98%	B
4. Acetone	A
5. Acid Dichromate, 5%	B
6. Alcohol, Butyl	A
7. Alcohol, Ethyl	A
8. Alcohol, Methyl	A
9. Ammonium Hydroxide, 28%	B
10. Benzene	A
11. Carbon Tetrachloride	A
12. Chloroform	A
13. Chromic Acid, 60%	B
14. Cresol	A
15. Dichlor Acetic Acid	A
16. Dimethylformamide	A
17. Dioxane	A
18. Ethyl Ether	A

19.	Formaldehyde, 37%	A
20.	Formic Acid, 90%	B
21.	Furfural	A
22.	Gasoline	A
23.	Hydrochloric Acid, 37%	B
24.	Hydrochloric Acid, 48%	B
25.	Hydrogen Peroxide, 3%	B
26.	Iodine, tincture of	B
27.	Methyl Ethyl Ketone	A
28.	Methylene Chloride	A
29.	Mono Chlorobenzene	A
30.	Naphthalene	A
31.	Nitric Acid, 20%	B
32.	Nitric Acid, 30%	B
33.	Nitric Acid, 70%	B
34.	Phenol, 90%	A
35.	Phosphoric Acid, 85%	B
36.	Silver Nitrate, Saturated	B
37.	Sodium Hydroxide, 10%	B
38.	Sodium Hydroxide, 20%	B
39.	Sodium Hydroxide, 40%	B
40.	Sodium Hydroxide, Flake	B
41.	Sodium Hydroxide, Saturated	B
42.	Sulfuric Acid, 33%	B
43.	Sulfuric Acid, 77%	B
44.	Sulfuric Acid, 96%	B
45.	Sulfuric Acid, 77% and Nitric Acid, 70% equal parts	B
46.	Toluene	A
47.	Trichloroethylene	A
48.	Xylene	A
49.	Zinc Chloride, Saturated	B

- b. Acceptance Level: Laboratory grade finishes should result in no more than four Level 3 conditions. Suitability for a given application is dependent upon the chemicals used in a given laboratory.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Furniture system installation:
1. Install system in strict accordance with manufacturer's instructions.
 2. Set system components plumb, square, and straight with no distortion and securely anchored to building structure. Shim as required using concealed shims.
- B. Install Overhead Service Carrier and accessory items per Section 12345.

3.2 ADJUSTING

- A. Repair or remove and replace defective work, as directed by [Architect] [Owner] upon completion of installation.

3.3 CLEANING

- A. Clean shop finished laboratory Overhead Service Carrier system and touch up as required.

3.4 PROTECTION OF FINISHED WORK

- A. Provide all necessary protective measures to prevent exposure of laboratory Overhead Service Carrier system and attached components from exposure to other construction activity.
- B. Advise contractor of procedures and precautions for protection of material, installed laboratory Overhead Service Carrier system, and fixtures from damage by work of other trades.

END OF SECTION 11615

SECTION 11625 – BIOLOGICAL SAFETY CABINETS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Class II, Type B1 vertical flow biological safety cabinets. (30% air recirculated, 70% exhausted)
- B. Class II, Type A vertical flow biological safety cabinets.

1.2 RELATED SECTIONS

- A. Section 11600 - Laboratory Equipment.
- B. Section 12311 – Wood Laboratory Casework
- C. Section 15410 - Plumbing Piping.
- D. Section 15420 – Natural Gas, Compressed Air and Vacuum System Piping
- E. Section 15931 – Air

1.3 REFERENCES

- A.. NSF 49 - Class II (Laminar Flow) Biohazard Cabinetry; NSF International; 1992.
- B. UL 3101-1 - Electrical Equipment for Laboratory Use; Part 1: General Requirements; Underwriters Laboratories Inc.; 1993.
- C. NCI Specification "General Purpose Clean Air Biological Safety Cabinet" (Class II, Type B Safety Cabinet dated July 6, 1976).

1.4 SUBMITTALS

- A. See Section 01330 – Submittals for submittal procedures.
- B. Product Data: Manufacturer's product data, including physical properties and application instructions.
- C. Shop Drawings: Prepared specifically for this project; show dimensions and interface with other products.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm that maintains a testing facility at manufacturer's place of business for performance testing safety cabinets of the type specified to the minimum requirements of NSF 49 according to complete NSF 49 methodology, and willing to make manufacturing facility, testing facility, and quality control procedures available for owner inspection.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle in a manner to prevent damage to units or adjacent work.

1.7 WARRANTY

- A. See Section 01705 – Project Closeout , for additional warranty requirements.
- B. Warrant against defects in materials and workmanship on biological safety cabinets and accessories;

include labor and replacement parts (except HEPA filters and lamps).

C. Warranty Period: 3 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products from one of the following manufacturers:
 - 1. The Baker Company. www.bakerco.com.
 - 2. Nuair, Inc. www.nuair.com.
- B. Substitutions: See Section 01600 - Product Requirements.
- C. Provide all biological safety cabinets from a single manufacturer.

2.2 BIOLOGICAL SAFETY CABINETS

- A. Provide products as scheduled in the Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify equipment rough-in before proceeding with work.
- B. Coordinate with other trades for proper installation of plumbing and electrical services and for rough opening dimensions required for installation.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions; comply with requirement of authorities having jurisdiction.
- B. Install equipment plumb, square, and straight, without distortion; securely anchor.
- C. Schedule installation to ensure that utility connections are achieved in an orderly and expeditious manner.

3.3 FIELD QUALITY CONTROL

- A. Provide a qualified independent certifier to certify biological safety cabinet before use, performing tests recommended in NSF 49.

3.4 ADJUSTING AND CLEANING

- A. Clean equipment, casework, countertops, and other surfaces as recommended by manufacturer, leaving work with new and unused appearance.
- B. Clean adjacent construction and surfaces soiled in the course of installation of this work.
- C. Touch up minor damaged surfaces caused by installation. Replace damaged components as directed by Architect.

3.5 PROTECTION

- A. Provide protective measures to prevent exposure to construction activity that might cause damage.

END OF SECTION-11625