DIVISION 11 - EQUIPMENT

11 00 00 - GENERAL INFORMATION
A. Fixed and movable equipment:
   1. Fixed equipment shall generally be furnished and installed by the General Contractor as part of the construction contract.
   2. Movable equipment shall, as a rule, be a separate bid item not included in the general construction contract. Provisions for installation however, (mechanical, electrical and plumbing), may be included in the Contract Documents.

11 10 00 - VEHICLE AND PEDESTRIAN EQUIPMENT
A. General Information:
   1. Fuel islands must have high volume pumps and be capable of pumping diesel fuel.
   2. Pumping stations for Alternative Fuels to include cascade pumping with pressure control.
   3. Pumping stations shall meet NEC, NFPA-30 and UFC 79.

11 40 00 - FOODSERVICE EQUIPMENT
A. General Information:
   1. All food service equipment and installation shall be approved by the University's Environmental Health Services and shall be coordinated with the University Representative. All food service equipment shall be approved and stamped with National Sanitation Foundation numbers.

11 53 00 - LABORATORY EQUIPMENT
A. Storage Cabinets:
   1. Approved storage cabinets shall be provided to eliminate the storage of chemicals in fume hoods.
   2. Storage cabinets may be vented into laboratory dedicated exhaust systems if desired or feasible. PVC is not permissible for ducting of flammables cabinets. PVC may be used for venting of acid and other chemical storage cabinets. Vent ducting for flammable storage cabinets must be of the same or greater gauge as the cabinet. Do not provide cabinet fans. Typical exhaust rates should be <50 cfm, or as indicated by the manufacturer.
   3. Provide adequate space in room layout for storage cabinets; if this is not possible, then provide storage bases for fume hoods.

B. Sterilizing Equipment:
   1. Sterilizers should be provided with new steam generators. Natural gas, electric or plant steam may be used as primary energy source. Do not use plant steam directly for sterilizing due to potential future changes to water treatment chemicals. Plant steam can be used with water-to-
steam heat exchangers.

2. Provisions may be necessary for separate piping to building steam supply with a dedicated steam regulator for water-to-steam heat exchangers.

3. Sterilizers should be specified based on the required operational temperature needed for the particular research program using the lab.

4. Designer shall notify, through the University Representative, the Facilities Management Maintenance Contract Administrator to set up outside service contract.

11 53 13 - LABORATORY FUME HOODS

A. General Requirements:

1. Acceptable types of fume hoods include bypass with constant volume and conventional with variable air volume control. Unacceptable types include conventional and auxiliary air.

2. Fume hoods marketed and certified through testing by manufacturer as “High Performance”, “Low-Flow” “High Efficiency” or similar model identification are preferred specification. Hoods not marketed and/or tested as such will be required to operate at higher values and may be discounted or deemed not acceptable due to energy inefficiencies.

3. Biological safety hoods are not fume hoods and have a different set of design parameters, but generally follow the same design process. Biological safety hoods and fume hoods cannot be connected with common ductwork or fans.

4. Other types of exhaust devices such as canopy hoods, storage cabinets, slot hoods, snorkels, flow benches etc. are generally not accepted as substitutes for fume hoods.

5. Design and installation of fume hoods is strictly controlled according to the following procedures:
   a. User identifies to University Representative requirements for fume hoods which include type (horizontal or vertical sash, bench or floor mount), size, number, and list chemicals and compatibilities. University Representative submits requirements and chemical list to Environmental Health Services for review. All new hood installations must be capable of sustaining the utilization of highly toxic chemicals/ materials. Hood performance and testing data will determine acceptable uses for the fume hood and required face velocity.
   b. The Classification and chemical list is submitted to mechanical engineer to use in designing the exhaust duct and fan system and selection of suitable materials.

6. Fume hoods require outside air makeup through the central system or with dedicated HVAC systems. Fume hood exhaust systems shall not be connected to general building exhaust systems. However, exhaust systems dedicated to the laboratory where hood is located can be connected to hood exhaust.

7. Bypass Type Fume Hoods are specified unless the total accumulated exhaust flow in air exchanges per hour exceeds the industry standard for that conditioned space. At that point it shall be necessary to provide VAV control to maintain the face velocity on the fume hood at prescribed or specified levels (determined by hood performance ratings and data and recommendations of Environmental Health Services), without the aid of a by-pass section on the hood.

8. All fume hoods shall have face velocity audible and visual alarms.
9. Integral vacuum breakers for faucets are required, but are not permitted inside of the hood.

10. Other standards for the exhaust system, ductwork, air balance, controls and utilities are identified in Division 23 – HVAC.

11. The manufacturer shall guarantee all materials and workmanship provided for a period of 1 year from date of Notice of Acceptance. Any defects due to the use of improper material or workmanship on the part of the manufacturer occurring within that time shall be promptly rectified, by repair or replacement of the defective materials or correction of defective workmanship by manufacturer at his own expense, after notification by the Owner.

B. Submittals:

1. 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 indicate location, size and service requirements for each utility connection. See Division 01 for additional requirements.

2. Test Data: Submit test reports on each size and type of chemical fume hood verifying point of manufacture conformance to test performances specified below:


   b. Sound level compliance of the following maximum criteria:

   c. Test data of octave band analysis verifying hood is capable of a 50 NC value when connected to a 50 NC HVAC source. All readings taken 3 feet in front of full open sash at 110 fpm face velocity.

3. ASHRE 110-1995 test report (as manufactured) for each fume hood type.

   a. Test one fume hood of each type and size specified in accordance with the method prescribed in ASHRAE Standard ANSI/ASHRAE 110-1995. The minimum overall performance rating of each test shall be 4.0 AM 0.05 ppm with 4.0 equal to liters per minute of tracer gas release, AM identifying as manufactured test, and 0.05 indicating the level of tracer gas control in parts per million. Test shall be performed at 50 fpm face velocity with the sash at 28” open or greater (fully open position).

   b. Hood test shall take place in the manufacturer’s test facility with testing personnel, samples, apparatus, instruments, and test materials supplied by the manufacturer at no cost to the buyer. All submittals shall include numerical and graphical data showing the relationship between Containment, CFM, face velocity and sash height from 12” to full open position. Test requirements shall meet or exceed the standards of ASHRAE-110-1995.

   c. Submit test report consisting of the following test parameters and equipment for each hood width and configuration specified.

   d. Hood shall achieve a rating of 4.0 AM 0.05 PPM or better containment and indicate conditions and volume of leakage at the point of failure

   e. Submit a test report, for each hood tested for the following in addition to ASHREA-110-1995 test results:
i. Set condition A: 18" sash height / face velocity 80 fpm

ii. Set condition B: 18" sash height / face velocity 95 fpm

iii. Provide sash height where face velocity drops to 60 fpm for both set conditions.

iv. Provide face velocity at full open sash for both initial and final set conditions.

v. Provide face velocity and sash height measurements indicating performance conditions that fail to meet ASHREA 110-1995 minimum containment standards.

vi. Operation and Maintenance Manuals: Submit 2 copies of written instructions for fume hoods.

C. Quality Assurance:

1. **Single Source Responsibility:** Laboratory fume hoods shall be manufactured and/or furnished by a single laboratory supplier. Proposals from brokers, multiple suppliers or manufacturers will not be accepted.

2. **Manufacturer:** Design of chemical fume hoods are based on high performance products manufactured by Fisher Hamilton, Inc., Kewaunee and Labconco. Equal or better products may be proposed for substitution by another manufacturer, provided they meet applicable industry standards such as indicated by SEFA and ASREA for product design and performance. In all cases chemical fume hoods shall be the product of one manufacturer for any one construction project.

3. **Experience:** The supplier shall have furnished installations of equal or larger size and requirements within the last five years. The supplier shall provide products of established manufacturers with production facilities that include test facilities in the manufacturing plant, and with ten years or more experience in manufacture of laboratory and equipment of type specified.

4. **Required testing** shall be validated by a third party

5. **UL 1805 testing and certification** shall be performed by a U.L.certified testing laboratory.

D. Design and Performance Requirements:

1. Fume hoods shall function as ventilated, enclosed work spaces, designed to capture, confine and exhaust fumes, vapors and particulate matter produced or generated within the enclosure.

2. 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.

3. Fume hood shall be designed to minimize static pressure loss with adequate slot area and bell shaped exhaust collar configuration. Provide testing as required by SEFA 1.2 "Laboratory Fume Hoods, Recommended Practices."
4. Metal finish performance requirements: Manufacturer shall provide verification of metal finish performance. Testing to be performed by independent testing agency, which adheres to SEFA 8 requirements.

E. Fume Hood Type:

1. Bypass Type Fume Hoods are specified unless the total accumulated exhaust flow from the conditioned space in air exchanges per hour exceeds the industry standard.

   a. Constant volume type with built-in automatic compensating bypass to maintain constant exhaust volume regardless of sash position.

   b. Fume hoods must be capable of maintaining 80 fpm (high performance models) or 105 fpm (standard models) minimum face velocity through the sash opening with the sash door at 18 inches, measured from the top of the air foil. Provide sash stops located 18 inches above working surface and with override release.

   c. Bypass: Positive in action and controlled by the sash operation.

   d. Low impedance, directionally louvered panel provided in the bypass area. Designs which require all bypass air to enter hood over front solid panel are not acceptable.

   e. As sash is lowered to 6", bypass design shall limit the increase in face velocity to maximum of three times the average face velocity with the sash fully open.

2. VAV type fume hood control is specified to maintain the face velocity on the fume hood at 80 fpm at 18" (high performance models as marketed and officially tested by manufacture) or 105 fpm at 18" (standard performance hoods failing to meet accepted or expected containment values as compared to High Performance Low Flow counterparts) without the aid of a by-pass section on the hood if; the total accumulated exhaust flow from the conditioned space in air exchanges per hour exceeds the industry standard.

3. Pressure independent devices equal to or exceeding Phoenix Controls shall be acceptable VAV devices. Substitutions will only be accepted with prior approval from CSU Facilities Maintenance Engineering staff.

F. Fume Hood Construction:

1. Fume hood construction shall be in accordance with all SEFA, ASHREA, OSHA, NEC and NFPA guidelines

2. Mechanical And Electrical Fixtures: Fume hood service fixtures and fittings and related mechanical and electrical service fixtures shall be furnished, installed and internally wired and piped for single point final connection by the Mechanical and Electrical Contractors. Each hood shall be demonstrated by the Equipment Contractor to properly function in accordance with the specifications.
G. Alarms:

1. Safety Monitor/Alarm System: Fisher Hamilton Model 54L0405, or equal. Where shown or specified provide Safety Monitor/Alarm System which monitors face velocity and provides audible and visual alarm if face velocity drops below or rises above pre-set values.

2. Safety monitor: UL listed, tamper proof, with all alarm circuits, electric components, external tubing, restrictors, and manifolds furnished complete and factory installed. Monitor shall have light emitting diode display which provides clear indication of airflow conditions.

3. Field calibrate monitor based upon user-specified face velocity.

4. Airflow sensor: Thermally compensated glass-beaded thermistor, factory connected to a sidewall connection. Thermistor alarms with hot wire in hood sidewall - not acceptable.

5. Alarm signal: Audible signal and a visual, red, green emitting diode. Have no input or output capabilities. Low flow set point. No display.
   a. Silence push button, which disables the audible alarm for a period of five minutes, shall be accessible on the front of the Safety Monitor.
   b. Provide alternate mode in which audible alarm is silenced indefinitely but visual alarm remains activated until the alarm condition is corrected.
   c. It shall not be possible to routinely disable the alarm signal.
   d. When alarm condition is corrected and face velocity and volume return to specified levels, the Safety Monitor will automatically reset and begin routine monitoring.
   e. Test circuit will be provided to verify proper Safety Monitor operation.
   f. Electrical rating: Maximum 12 VDC, and maximum current rating of 200MA.

H. Work Surfaces:

1. Dished Epoxy Resin Work Surface:
   a. Manufacturers: Laboratory Tops, Inc.; The Durcon Company; Epoxyn Products or equal.
   b. Material shall be a 1-1/4inch monolithic modified epoxy resin product and shall consist of a cast resin material formulated to provide a work surface with high chemical resistance characteristics. A combination of epoxy resins and inert materials, oven-cured in molds to obtain maximum chemical resistance then removed from the molds and oven tempered to achieve maximum physical strength and stability. Surfaces shall have a uniform low-sheen surface and the finished material shall be extremely hard and resistant to scratches and abrasion.

2. Cup Sinks:
   a. Oval epoxy resin cup sinks: Provide where noted on drawings.
   b. Manufacturers: Laboratory Tops, Inc.; The Durcon Company; Epoxyn Products; or equal.
c. Oval flush mounted cup sinks shall be of molded epoxy resin and shall be flush mounted. Cup sink size shall be nominal 5-5/8" long by 2-5/8" wide by 4-1/4" deep (inside dimensions). Cove inside corners and pitch bottom to 1-1/2" NPSM outlet with 1-1/2" NPSM threaded tailpiece.

I. Base cabinets and tables:
1. All cabinetry supplied shall be in compliance with SEFA 8-1999 as a minimum standard.

J. Fume Hood Installation:
1. Installation of the fume hood and associated equipment shall be in accordance with the engineers design and planned use of the equipment.
2. FIELD QUALITY CONTROL, TESTING AND ADJUSTING OF FUME HOODS (AS INSTALLED) ARE TO BE PREFORMED BY CERTIFIED PERSONEL AS INDICATED IN DIVISION 15-990.
3. NEBB, ASHREA 110-1995 and SEFA LF-1, 1992 requirements are recognized standard for procedures and reporting methods as they pertain to TABB. These methods are to be adhered to unless prior arrangements are made with CSU Facilities Services and Environmental Health Services personnel.
4. Test reports: Provide the Architect and Owner with a record of all preliminary tests adjustments and Balance information in NEBB format.
5. Testing Equipment:
   a. Properly calibrated Shortridge Airdata Model No. 860 electronic manometer and Velor grid, or equal.
   b. Test Procedure shall be complaint with manufacturer, SEFA LF-1-1992, NEBB practices, ASHREA 110-1995, or an alternate as agreed upon by representatives of CSU Facilities and Environmental Health Services.
   c. Provide Owner with Balance Report of all TABB results.

K. References:
2. SAMA Standard LFB-1976 Metal Laboratory Furniture
3. ASHRAE-110-1995
4. ANSI 2.95
5. NFPA

11 70 00 – HEALTHCARE EQUIPMENT

A. Automated External Defibrillators (AED):
   1. AED’s shall be included in new and remodel construction drawings.
2. Environmental Health Services will determine quantity and location of AED devices. Information can be obtained from the University Project Manager.