UNIVERSITY OF WISCONSIN-MADISON
SPECIFICATION UW-MDN-09-SATS-2020
THREE SIDE ACCESSIBLE SMALL ANIMALTRANSFER STATION

A STAND ALONE WORK ENCLOSURE DESIGNED FOR ISO CLASS 5 PRODUCT PROTECTION
WORKZONE AIRFLOW IS PARTIALLY RECIRCULATED AND THE REMAINING PORTION SIMULTANEOUSLY
DISCHARGED INTO THE ROOM ATMOSPHERE

AIR RECIRCULATED

SPECIFICATION OUTLINE

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1.0 SCOPE, OBJECTIVE, CLASSIFICATION, INNOVATIVE DESIGN, DEFINITIONS

1.1 Scope This performance and hardware specification covers three sided small animal transfer station designed with internal fan/motor systems in which a portion of the airflow is re-circulated within the cabinet work space. Integral with the fan/motor system is a dual high efficiency particulate air filtration system designed with efficiency such that particulate-free air is produced in the work zone and simultaneously discharged to the surrounding atmosphere. Discharge air will be directed out of the work zone and not directly to the floor. This device will provide limited occupational or environmental protection. Therefore only non-hazardous, non-pathogenic work where the product must be manipulated in a particle free zone shall be done. Please consult the University Agent or Biological Safety Officer before purchase, if additional information on allowable practices in this device is required. It is recommended that the cabinet user develop a Standard Operating Practice (SOP) to ensure compliance to non-hazardous practices. If bio-hazardous protocols are planned the work should be carried out with a biological safety cabinet animal transfer station as detailed in UW-MDN-01-A1-ATS-2020.

1.2 Objective The objective of this document is to provide University specifications for the procurement of three open sided mobile clean air devices designed with a non-contaminated positive pressure plenum, which is contiguous to the ambient environment via a sealed metal barrier. The complete unit shall be listed as certified by Canadian Standards Association (CSA) and/or Underwriters Laboratories (UL) for electrical safety and integrity.

1.2.1 Noncompliance Clean air devices which have been selected from the competitive bidding process and delivered to the University shall conform to the specifications and standards cited in this document. In the event that the delivered cabinet does not conform to these requirements, the supplier shall be contacted by the University Agent to arrange for rectification of any identified non-compliance requirement either in performance and/or construction specification not agreed to by the owner and supplier.

1.3 Classification The clean air devices covered by the specification shall be of the following sizes:

1.3.1 Sizes

1.3.1.1 Four foot ATS cabinet

1.3.1.2 Five foot ATS cabinet

1.3.2 Style Clean air devices covered by the specification shall be specified in a mobile console (floor standing) model which is small, ergonomically designed, and easily moved to each work site. The design weight has been restricted.

1.3.2.1 Console unit is a free-standing unit which will rest directly on four casters, blower below the work surface, and is designed to be pulled or pushed to the work site using side bar stainless handles and stainless rear and front push bar.

1.4 Innovative Design It is the intent of this specification to limit the purchase of Clean Air to units with a demonstrated record of safety, excellent ergonomic design, sustained performance, and maintainability at the time of this writing. The University recognizes that these specifications may limit new technology development in the future and is prepared to review design changes which would be outside the boundaries of the following specifications as currently written. If a selected supplier chooses to revise a clean air device during the duration of the contract and the University is convinced that an innovative design is acceptable via impartial testing results and/or review, a written variance to these specifications may be granted and specifications revised. Therefore, a selected supplier contemplating changes in the clean air devices which will conflict with the specifications as written is invited to submit documentation to the University for “innovative designs” consideration. Changes in cabinet design will be reviewed and if an approval is issued, fabrication of University clean air devices may be commenced. Until approval is granted, the specifications as written remain enforcable.

1.4.1 Any conflict with the specifications contained herein during the competitive bidding process, using innovative design(s), shall be identified the supplier per each subsection of the specification with an explanation as to why the innovative design(s) is justified in terms of better safety, performance, testing, and maintainability. The University may review said changes, but expeditious approval within the bidding

process period can not be guaranteed. Each bidder is encouraged to adhere to the specifications contained herein to be considered for competitive selection.

1.4.2 The cabinet design shall include ergonomic considerations in the use, maintenance and certification of clean air devices. Those suppliers that display the greatest level of human engineering mechanics and safety, sound control, ease of testing and maintenance and conformance with this specification and conservative economic product shall be considered in the bidding process.

1.5 Definitions

1.5.1 Clean Air Device, a device providing product protection for work requiring a particulate free zone, for example in electronic assembly, plant tissue culturing, pharmaceutical preparation and intravenous preparations. The work zone atmosphere shall control particles to within ISO 5 conditions (Class 100 per F.S. 209E). A clean air device is not a biological safety cabinet.

1.5.2 RPM, revolutions per minute

1.5.3 VAC, voltage - alternating current

1.5.4 CFM, cubic feet per minute

1.5.5 WC, water column

1.5.6 QT, total fan airflow

1.5.7 R, filter resistance. Filter resistance is the pressure drop in inches water column across a HEPA filter

1.5.8 ID, inside diameter

1.5.9 OD, outside diameter

1.5.10 Fail safe mechanism, a mechanical device which requires operator assistance to place mechanism into service and to disconnect mechanism from service

1.5.11 PAO-4, the default aerosol challenge and test agent of choice

1.5.11.1 DOP, dioctylphthalate, acceptable alternative aerosol challenge, agent of second choice

1.5.11.2 Mineral Oil, acceptable alternative aerosol challenge, agent of third choice

1.5.12 AMCA, Air Moving and Conditioning Association

1.5.13 LFPM, linear feet per minute

1.5.13.1 SLFPM, Standard linear feet per minute, corrected to 29.92”Hg, 70 degrees F

1.5.13.2 ALFPM, Actual linear feet per minute, corrected to actual density and temperature

1.5.14 PEP, Positive Pressure Plenum shall be defined as any plenum which has been designed to be maintained at a pressure greater than a surrounding exterior atmosphere in order to ensure the satisfactory operation of the clean air device.

1.5.15 NEP, Negative Exterior Plenum shall be defined as any plenum which has been designed to be maintained at a pressure less than a surrounding exterior atmosphere in order to insure the satisfactory operation of the clean air device.

1.5.16 NPT, national pipe taper

1.5.17 Filter velocity, the air velocity measured in the media section of the HEPA filter, in a plane projection parallel with and four inches perpendicular from the media. The perimeter of the plane projection shall be offset at least three inches from any filter media obstructions.

1.5.18 Average filter velocity, the average air velocity associated with clean air devices designed with a uniform velocity distribution in the work zone.

1.5.19 HEPA, High Efficiency Particulate Air filter, a throw away, extended media, dry type filter in a rigid frame having a maximum clean filter pressure drop of 1.0 inch water gauge at a rated airflow capacity. Each filter shall have a filter label with the designated filter efficiency, airflow, and static pressure drop. The label shall include the factory name and address, filter model and filter serial number.

1.5.20 Supplier, the supplier of the clean air device. Supplier is the clean air device contractor. Job site building contractors must provide only UW specification grade clean air devices, alternates will be rejected. Please contact the University Agent for assistance at 608-262-1809.

1.5.21 SF, square foot

1.5.22 Closure panel, the barrier between a positive or negative pressure plenum in the cabinet and the ambient environment

1.5.23 HP, horsepower

1.5.24 Performance envelope, the range of airflow velocities in which a clean air device will provide product protection as defined at 0.5 micron particles at 100 particles per cubic foot of air sampled.

1.5.25 Barometric Pressure, BP. Local atmospheric pressure. BP unit as inches mercury

1.5.26 Port, a resealable mechanical penetration into the cabinet interior to provide a service entrance for aerosol testing and pressure measurement.

1.5.27 University Agent: One designated individual with an engineering degree, formal training in the certification of clean air devices, recommended Active Professional Engineering Registration, and recent listing as an Accredited NSF Field Certifier.

1.5.28 NSF, National Sanitation Foundation

1.5.29 SOP, Standard Operating Practice, A written operating practice containing protocols on the operation of an experiment or piece of equipment. The SOP shall be reviewed and approved by the Principle Investigator (PI) in consultation with the University Agent or Biological Safety Officer.

2.0 APPLICABLE DOCUMENTS

2.1 Specifications and Standards The following documents, of the issues in effect on the date of the invitation for bids or requests for proposal, form a part of this specification to the extent specified herein:

International Standards

ISO 14644-1 Clean rooms and Associated Controlled Environments

National Standards

National Sanitation Standard No. 49, the current edition in effect

National Sanitation Standard Listing, the current edition in effect

Federal Specifications

J-C-145 Cable, Power, Electrical and Wire, Electrical; (Weather Resistant)

W-C-00596 Connector, Plug, Electrical: Connector Receptacle, Electrical

W-S-00896 Switch, Toggle

W-S-893 Switch, Toggle, and Mounting Strap, (Interchangeable)

CC-M-636 Motor, Alternating current, (Fractional Horsepower)

DD-G-1403 Glass, Plate (Float), Sheet, Figured, and Spandrel (Heat Strengthened and Fully Tempered)

QQ-S-698 Steel, Sheet and Strip, Low-carbon

QQ-S-766 Steel Plates, Sheets, and Strip-corrosion Resisting

TT-C-490 Cleaning Methods and Pretreatment of Ferrous Surfaces for Organic Coatings

TT-C-535 Coating, Epoxy, Two Component for Interior and Exterior Use of Metal, Concrete and Masonry

TT-C-001224 Coating System, Epoxy, Glaze for Interior Surfaces

TT-C-001227 Coating System, Polyurethane Glaze for Interior Surfaces

PPP-B-601 Boxes, Wood, Cleated-plywood

PPP-B-621 Boxes, Wood, Nailed and Lock-corner

PPP-B-640 Boxes, Fiberboard, Corrugated, Triple wall

PPP-B-650 Crates, Wood, Open and Covered

PPP-B-843 Cushioning Material, Cellulose

PPP-T-60 Tape, Packaging, Waterproof

Federal Standards

Federal Standard No. 102, Preservation, Packaging and Packing Levels

Federal Standard No. 123, Marking for Domestic Shipment

Federal Standard No. 209E, Airborne Particulate Cleanliness Classes

Military Specifications

MIL-C-104 Crates, Wood; Lumber and Plywood Sheathed Nailed and Bolted

MIL-C-132 Crates, Wood, Open; Maximum Capacity 2,500 pounds

MIL-C-3774 Crates, Wood, Open; 12,000 and 16,000 Pound Capacity

MIL-F-51079B Filters, Particulate, High Efficiency, Fire Resistant, Biological Use

MIL-L-10547 Liners, Case and Sheet Overwrap, Water vaporproof or Waterproof, Flexible

MIL-P-116 Preservation, Methods of

MIL-R-3065 Rubber, Fabricated Products - Gaskets, Synthetic Rubber

MIL-S-8802 Sealing Compound, Temperature resistant, Aircraft High Adhesion

Military Standards

MIL-STD-282 Filter Units, protective clothing, gas mask components, and related products.

2.2 Other Publications

Air Moving and Conditioning Association (AMCA)

AMCA 99-76 Standards Handbook

AMCA 210-74 Test Code for Air Moving Devices

AMCA AS-2406-66 Fans, Designation of Direction of Rotation and Discharge

AMCA 211-80 Fans, Labeling Requirements

AMCA 401-66 Classifications for Spark Resistant Construction

American National Standards Institute, Inc. (ANSI)

A11.1-120083 Industrial Lighting RP-7

N101.1-120082 Efficiency Testing of Air Cleaning Systems Containing Devices for Removal of Particles

S1.2-1962 (R120081) Method for the Physical Measurement of Sound

S1.4-120081 Specification for Sound Level Meters

S2.2-1959 (R2011) Methods for the Calibration of Shock and Vibration Pick-ups

Z97.1-2009 Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings

Illuminating Engineering Society (IES)

IES Lighting Handbook

National Electrical Code (NEC)

Electrical Component and Wiring Specification

National Electrical Manufacturer's Association (NEMA)

Underwriters Laboratories (UL)

UL Standards

UL-817 Cord Sets and Power Supply Cords

UL-62 Flexible Cord and Fixture Wire

UL-586 High Efficiency Particulate Air Filter Unit

UL-900 Safety Standards for Air Filter Units

UL-2701-1 Electrical Safety and Integrity

UL-61010-1 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use

United States Atomic Energy Commission (AEC)

ORNL-NSIC-65 (1/70) Design, Construction, and Testing of High-Efficiency Air Filtration Systems for Nuclear Applications

Canadian Standards Association (CSA)

C22.2 No. 151-1979 Laboratory Equipment

Institute of Environmental Sciences and Technology (IEST)

IEST-RP-CC-001.5 HEPA and ULPA Filters

IEST-RP-CC-007.2 Testing ULPA Filters

IEST-RP-CC-013.3 Calibration Procedures and Guidelines for Select Equipment Used in Testing Cleanrooms and Other Controlled Environments

IEST-RP-CC-002.3 Unidirectional-Flow Clean Air Devices

American Society for Microbiology

"Evaluation of the Edgegard Laminar Flow Hood" Lewis J. Coriell and Gerard J. McGarrity, Institute for Medical Research, Copyright, 1970

3.0 REQUIREMENTS

3.1 Bid Submittal Requirements The following requirements apply to clean air devices bid on an individual basis. For clean air devices procured via a purchasing contract, the selected supplier need only comply with Sections 3.1.1, 3.1.2 and 3.1.3 for the initial bid, unless the cabinet fan/motor system is changed during the contract period. In this event, revised motor and fan graphs must be resubmitted and approved by the University prior to construction of any modified cabinet as represented in the original contract. Sections 3.1.4, 3.1.5 and 3.1.6 shall apply to all clean air devices received by the University.

3.1.1 Motor and Fan Graphs Detailed motor and fan graphs for each clean air device shall be submitted with each bid to the Purchasing Department. The graphs shall include sufficient detail to permit the University to determine if the selected fan/motor combination will comply with requirements in Section 3 of this specification. Sample graphs detailing the recommended format are included in Appendix A, Graphs 1 and 2. Acceptable Alternative: As an alternative to the graphs included in Appendix A, graphs and data tables can be provided in an alternative format given that the graphs/data tables detail the following:

1. Motor manufacturer
2. Motor model, horsepower, and capacitor size
3. Clean air device model in which the motor is to be installed, including appropriate details such as prefilters installed, etc.

4. Operational airflow data in CFMs associated with required air velocities detailed in Paragraph 3.14.1.
5. Initial fan static pressure using clean filters and associated motor RPMs and amperage.
6. Fan static pressure, associated motor RPMs, motor amperage, representative airflows in CFMs, and change in total airflow detailing 50%, 100%, and 200% filter loading.

This requirement shall be fulfilled by actual testing of the clean air device offered for purchase or testing of a prototype model of identical design and filters.

3.1.1.1 Motor Performance Graph(s) Submitted bid(s) shall contain motor performance graph(s) selected by the supplier for the equipment to be used in the clean air devices proposed under bid. Each graph shall list the motor supplier, model number, horsepower and capacitor size. The ordinate of each graph shall contain units for motor RPM. The abscissa of each graph shall contain units for torque, voltage and amperes with applicable multipliers. At least three curves shall appear on the graph:

1. Motor torque versus RPM
2. Motor voltage versus RPM
3. Motor amperes versus RPM

3.1.1.2 Fan/Motor Performance Graph(s) Submitted bid(s) shall contain fan/motor performance graph(s) for the equipment selected by the supplier to be used in the clean air devices proposed under bid. Each graph shall detail the fan supplier, fan model number, motor supplier and motor model number. The ordinate of each graph shall contain units for static pressure in inches water gage. The abscissa of each graph shall contain units for cubic feet per minute of air at standard conditions. The following elements shall appear on each graph:

3.1.1.2.1 A series of constant fan wheel speed curves in RPM's.

3.1.1.2.2 A series of constant fan wheel torque curves in ounce feet.

3.1.1.2.3 A discrete motor/fan torque curve with the motor speed control(s) at full line voltage - 115 VAC. The curve points shall be obtained from the motor performance graph.

3.1.1.2.4 The fan design curve shall be such that the loaded and unloaded system resistance curves intersect the fan characteristic curve in the negative sloped portion of the fan curve. Fan/motor designed to operate at the specified airflows on either the broad or flat portion of the fan curve(s) - i.e., positive slope - may be rejected depending on how the performance characteristics of the exhaust and supply air velocities are effected when the filters have been loaded in accordance with specification 3.1.1.2.5.5

3.1.1.2.5 A discrete fan/motor torque curve with the motor speed control adjusted to the operational airflow in CFM's associated with required air velocities detailed under Paragraph 3.14.1. The curve points for reduced voltage operation may be approximated from the following formula: torque 1/torque 2 = (voltage 1/voltage 2) squared, or with actual motor performance data. The supplier shall indicate on the fan/motor performance graph how the curve points for reduced voltage operation have been derived and submit motor performance data for reduced voltage operation if used as curve points.

3.1.1.2.5.1 The curve generated under Paragraph 3.1.1.2.5 shall detail a representative initial fan static pressure using clean filters and a representative operational motor voltage.

3.1.1.2.5.2 The curve generated under Paragraph 3.1.1.2.5 shall detail the fan static pressure associated with a 100 percent increase in filter static pressure. One hundred percent increase in filter static pressure shall be determined by multiplying the clean filter static pressure, exhaust or supply filter static pressure, whichever is greater, by 2.0. The static pressure across each filter is that pressure necessary to develop the design mass filter airflow rate per filter such that the air velocity requirements specified in Paragraph 3.14.1 are achieved.

3.1.1.2.5.3 The curve generated under Paragraph 3.1.1.2.5 shall detail the fan airflow rate associated with a 10 percent drop in operational total airflow rate.

3.1.1.2.5.4 The supplier shall detail on the fan/motor performance graph a representative initial filter pressure drop at the total fan airflow associated with average down flow and face velocities required under Paragraph 3.14.1. This requirement shall be fulfilled by actual testing of the clean air devices offered for purchase or testing of a prototype clean air device with clean HEPA filters with resistance and flow characteristics which are within ±5 percent of those HEPA filters offered in the production clean air devices. The total airflow in CFM, the motor speed in RPM and filter static pressure in inches W.C. at this set point shall be stated. This detail shall appear on the motor/fan performance graph using the following format:

Clean Filters with Cabinet Air Velocities at Factory Set Point
QT CFM, Motor Speed RPM's, Filter R "W.C.

3.1.1.2.5.5 With the supply filter(s) evenly loaded to produce a 10 percent reduction in the clean filter total airflow delivery detailed in Paragraph 3.1.1.2.5.4 the supplier shall detail the resultant airflow in CFM, motor speed in RPM's and filter static pressure in inches W.C. This detail shall appear on the motor/fan performance graph using the following format:

Loaded Filters with 10 Percent Reduction in Total Airflow
QT = CFM, Motor Speed RPM's, Filter R " W.C.

3.1.2 Fabrication Drawings and Performance Data

3.1.2.1 Fabrication Drawings One set of detailed fabrication drawings shall be submitted with each bid to the University Purchasing Department. Drawings shall include sufficient detail to permit the University of Wisconsin to determine if all physical construction, mechanical, electrical and dimensional requirements in Section 3 have been included in the fabrication plans. Sample figures with dimensional requirements are included in Appendix B, Figure 1.

3.1.2.2 Performance Data The submitted bid should contain performance data detailing the cabinet's ability to effectively handle controlled particle challenge under ISO 5 conditions.

3.1.2.2.1 The data shall be reviewed by the University Agent to ensure that the cabinet under bid can safely perform under ISO 5 conditions.

3.1.2.2.2 Failure to submit performance data as called for in paragraph 3.1.2 shall result in bid rejection.

3.1.3 Submitted Bids Submitted bids will be reviewed within 60 days of receipt and the successful bidder notified accordingly by the University.

3.1.3.1 Any bid which does not comply with the specifications and performance standards contained herein may be rejected.

3.1.3.2 Any bid which does not format requested data within the requirements of Paragraph 3.1 may be rejected.

3.1.3.3 Any bid containing proposed fan/motor systems sized and rated such that the operational air delivery required under Paragraph 3.9.3 cannot be obtained shall be rejected.

3.1.4 Selected Supplier The supplier selected to construct a clean air device shall submit one set of detailed final fabrication drawings to the University. The drawings shall include sufficient detail to permit the University to determine if all physical construction, mechanical, electrical and dimensional requirements in Section 3 have been included in the fabrication plans. Electronic drawing submittal shall be the preferred method for submission to comply with this requirement and expedite the orders.

3.1.4.1 Any optional equipment specified by the University for a particular bid shall be detailed on the final fabrication drawings.

3.1.4.2 The selected supplier shall commence cabinet fabrication after receiving written and/or verbal approval to proceed from UW Environment, Health & Safety – biological Safety Cabinet Program. The default approval authority shall be the UW Environment, Health & Safety – Biological Safety Cabinet Program, attention University Agent.

3.1.4.3 Once approval for final fabrication drawings has been given, the University shall permit no variance in the construction without prior approval.. Contact the University Agent for questions regarding variance.

3.1.5 Field Fan/Motor Performance Test The clean air device selected for purchase may be subjected to a field fan/motor performance test during performance testing of the device. If this test demonstrates a failure of the fan/motor system to comply with the operational air delivery required under Paragraph 3.9.3, the device manufacturer shall be contacted in order to arrange for replacement of the device or purchase cancellation. Those clean air devices returned to the manufacturer shall be at the manufacturer's expense (FOB - clean air device field location). Arrangements and costs for packaging of the device for shipment will be the responsibility of the supplier.

3.1.6 Field Specification Compliance Inspection The clean air devices selected for purchase may be subjected to a field compliance inspection to determine whether the supplier has complied with the construction specifications contained here in. The device may be completely dismantled and any conflicts with the construction brought to the attention of the supplier, as detailed in Paragraph 1.2.1.

3.2 General Description

3.2.1 The cabinet shall be a mobile unit, free standing, fabricated with materials of construction as required and contain all items of equipment as necessary to be functional and to operate fully within the intent of this document.

3.2.1.1 The cabinet shall be a mobile console (floor standing unit) provided with left and right stainless steel pull bars and rear stainless push bar and stainless tool tray.

3.2.2 The cabinet, when connected to external source of electrical power, shall be completely independent of all other sources for successful operation and performance, excluding optional plumbing services.

3.2.3 The working face of the unit shall be an unobstructed opening on three sides.

3.2.4 The cabinet shall consist of a partially enclosed workspace into which air, which has been filtered by a HEPA filter, is supplied in a near unidirectional vertical manner through the work space.

3.2.5 The work area shall consist of the following items going from side to side: the work access opening (Paragraph 3.4.4), linear perimeter intakes, stainless steel work surface and drain pan. The free open area of the perimeter perforated areas shall permit the supply air to pass through, with a minimum amount of turbulence, into the negative air zone created by the perimeter perforations, which are connected to the suction side of the primary HEPA/fan. The bottom of the work area shall consist of a stainless perimeter drain pan and foam pre-filter. The lower horizontal work zone shall extend from the front perforated entrance and extend around the foam filter inlet. It shall be sloped to a 1 inch NPT liquid drain.

3.2.5.1 The work surface with perforated air intake shall be 16 gauge stainless steel with 2 sections with a drip seam to capture spills emptying into the perimeter pan to protect filters. The work surface shall be provided with stainless lift handles to allow for cleaning under the work surface. The work surface shall be designed to fit onto the cabinet in one direction and shall not fit into the work zone in other positions.

3.2.6 Air shall leave the workspace via the perimeter perforated grills in the entrance of the work zone extending the full length of the horizontal entrance plane on all operator sides. This work zone air then enters into the blower plenum. Air passing into the blower plenum shall pass through a supply HEPA filter and an exhaust HEPA filter, both located above the work zone.

3.2.7 Drain Pan: A stainless steel drain pan shall be located below the work surface so arranged as to stop any spillage in the working area from entering the prefilter zone. Permanent supporting structures for the work surface and front perforated area shall not cover more than a 10 percent projection of the horizontal surface of the work zone.

3.2.8 The cabinet shall have four rubber tread, stainless steel swivel wheels with wheel locks, stainless push handles and front and rear corner rubber bumpers.

3.2.9 Reinforced panels shall provide front and rear access to the primary supply filter and motor/fan. Access closure panels shall be gasketed.

3.2.9.1 All closure panels to the filters and fan/motor shall be designed so that each panel can be removed from the cabinet without obstruction from adjacent closure panels and associated fasteners.

3.2.11 Construction and Fabrication Requirements

3.2.11.1 The cabinet shall be constructed with the strength, rigidity and finish to meet noise and vibration levels and glove tear resistance specified in Paragraphs 3.9, 3.14 and 3.5.5.4.2.

3.2.11.2 The cabinet shall be constructed in a manner making it easy to clean and service. The cabinet shall be provided with a removable horizontal work surface with perimeter perforations. Cracks or crevices which provide reservoirs for access of contamination shall not be accepted. There shall be no sharp edges on any service or edge that may come into contact with the hands or fingers of the laboratorian and all certification and maintenance personnel. The work tray shall have at least two stainless finger pulls to facilitate cleaning.

3.2.11.2.1 All interior nuts, bolts, screws, stud screws, stud bolts, etc. shall be stainless steel. All screws and electric welded studs, etc., shall be 0.25 inches in diameter, twenty threads per inch. The method in mounting the multi-section clean air devices together shall be the use of electric welded stainless steel studs. These studs shall be used to attach all service panels and all sections of the multi-section clean air devices. The bolting unit shall be a stainless steel cap nut, a stainless steel lock washer, and a stainless steel flat washer where the stud protrudes through to the outside of the cabinet. Where two flanges meet inside the cabinet, stainless steel nuts and bolts shall be used. The holes in the service panels and closure plates and sections of the

cabinet shall be at least 10 percent larger in diameter than the stud diameters. Exterior fasteners may be either stainless steel or zinc plated sized to at least 1/4-20 threads.

3.2.11.2.2 Phillips head screws and plastic molded fasteners will not be allowed on gasket closure plates used to provide access to the negative and/or positive pressure plenums of the cabinet. Use of said construction will result in a 1.2.1 notification.

3.2.11.2.3 The console clean air device shall be provided with an electric lift hydraulic system and cushioned casters installed in the base of the cabinet. The casters shall be heavy enough to support the weight of the cabinet during shipment, moving and set-up at the use point. Caster construction should be stainless steel and the caster foot shall be flexible to reduce floor damage on movement. Hard casters that damage the floor may result in a 1.2.1 notification and the supplier required to replace the parts. The supplier must pay close attention to caster construction since many floors in facilities are now being provided with sealed soft floor coverings.

3.2.11.3 Dimensional tolerances shall be as follows:

3.2.11.3.1 Linear dimensions shall be within +0.125 inches of the specified dimension.

3.2.11.3.2 The squareness of the cabinet shall have the overall outside and inside surfaces perpendicular within the following limits: the maximum offset from 90 degrees shall be 0.125 inches or 0.0625 in/ft, whichever is greater.

3.2.11.3.3 The flatness of the outside surfaces which can be mated to other equipment and/or furniture shall be flat within 0.125 inches maximum offset over 50 inches.

3.2.12 Fabrication Welding Requirements

3.2.12.1 Prior to welding, work shall be degreased, buffed, and brushed as necessary to remove all dirt, scale corrosion, dust, grease, oil, water or other foreign material. All buffing shall be done with a stainless steel brush. In no case shall a carbon steel brush be used.

3.2.12.2 Weld surfaces as deposited shall be smooth and uniform in appearance without abrupt changes in contour.

3.2.12.3 Weld metal and base metal shall be free of excessive splatter due to too high a welding current, too large an electrode, wrong electrode angle, etc., when using the base metal consumable electrode with inert gas shielding for the welding method.

3.2.12.4 Weld surfaces, root or face, shall not show oxidation. Oxidation, as here defined, shall mean granulation (sugary) or scaling of the metal that cannot be removed or restored to a bright metal surface by wire brushing. Heat discoloration or blackening by flux residue is not considered oxidation.

3.2.12.5 A crevice on any weld surface in any weld joining (other than between "skip" welds on lap joints) is not acceptable. A crevice is defined as a space or depression which will retain liquid by capillary attraction, generally having a depth greater than its smallest surface dimension.

3.2.12.6 Arc burns on the base material are not acceptable. Arc burns are defined as scars left where the welding arc has been struck on or dragged across the base metal surface.

3.2.12.7 Welds shall be entirely free of evidence of lack of fusion or cold lap, pinholes, cracks and weld craters, and shall be free of porosity, slag inclusion, and other imperfections as, in the opinion of the University, is obtainable by exercise of the high skills of the art.

3.2.12.8 Suck-back on the root face of welds made from one side only shall not exceed five percent of the base metal thickness. Suck-back is defined as a minor depression in the center of the weld-metal surface, as measured from the base metal surface, caused by metal solidification, shrinkage and/or action of gravitational forces on the molten metal.

3.2.12.9 All welds welded from one side only (except lap joints) shall have 100 percent penetration with melt-through. For butt joints, the weld metal on the front surface shall in no place be lower than the adjacent base metal surfaces; for butt, corner and tee joints, the weld metal on the back side shall in no place show a depression lower than the adjacent base metal thickness. Weld metal protrusion on the back side of welds made from one side shall not exceed 20 percent of the adjacent base metal thickness or 0.09375 inches, whichever is less. Joints detailed to be welded from one side only may, at the option of the supplier, be welded from both sides to obtain 100 percent penetration, provided that no excessive warping in the sections being joined is caused thereby. All tolerance requirements shall be met as previously mentioned in Paragraphs 3.2.11.3.

3.2.12.10 All welds shall develop the full strength of the lighter of the sections being joined, except where only a "tack" or "seal" weld is required.

3.2.12.11 All interior work area welds shall be finished flush with adjacent surfaces and shall be no rougher than adjacent surfaces. Exterior weld area shall be ground smooth and flush with adjacent surfaces where necessary to provide gasket seating surfaces. Finishes made for this or other reasons shall be no rougher than the finish on adjacent surfaces. All interior air plenum welds shall be buffed.

3.2.12.12 Permanent joints in the sheet metal comprising the boundaries of the air passages should have continuous welds. Permanent joints in the sheet metal comprising the boundaries of the air passages made by tack welding and sealant bonding shall be minimized.

3.2.12.13 Only the following welding methods may be used for welding of stainless steel. The method chosen shall take into account all other requirements of this specification.

3.2.12.13.1 Tungsten non-consumable electrode with inert gas shielding, using direct current and straight polarity (work positive). This method is commonly known as "TIG" or "HELIARC."

3.2.12.13.2 Base metal consumable electrode with inert gas shielding, using direct current and straight polarity (work positive). This method is commonly known as "MIG" or, when straight polarity is used, "SIGMA."

3.2.13 Services in Air Passages

3.2.13.1 Wires, tubing, cables, conduits, pipes, etc., shall not be located or routed within the air passages of the cabinet with the exception of fan electrical connections.

3.2.13.2 Exception construction shall have connectors installed between the interior and exterior sections of the cabinet.

3.2.13.3 Exception construction shall be routed in plenums and low velocity air passages. Routing in sections of the air passages with design air velocities in excess of 1000 LFPM shall not be allowed.

3.2.13.4 Exception construction shall be designed to minimize the build-up of contamination. Wiring to the fan motor shall either be via a power cord to a junction box or by insulated spade connectors located near the fan. Individual wires from the control center to the fan shall not be allowed. The wiring from the junction box or spade connectors to the fan motor shall be insulated cable or individual shielded wires sealed in an insulated tube.

3.2.13.5 Internal perforated metal diffusers in the fan discharge plenum are prohibited.

3.2.14 Service Areas

3.2.14.1 Accessories, such as lamp ballasts, pressure gages, switches, relays, motor controllers, ground fault circuit interrupter, etc, shall be housed in the cabinet in an organized fashion. The service areas shall be in ventilated compartment(s) which are a part of the main structure of the cabinet. One electric power cord shall originate from the service area.

3.2.14.2 The blower switch shall be rated for 15 ampere service and should have a red pilot light provided to indicate that the blower motor has been energized. The recommended switch should be a hospital grade type as manufactured by Hubbel with UL listing, CSA Certification and meet Federal Standard WS 000896. If the cabinet control switches are low voltage this requirement shall not apply.

3.2.14.3 Wiring in the service control center shall be orderly and systematically laid out using wire terminal blocks, plastic ties on wiring runs of two or more wires, C-clip wiring connectors and tie anchors.

3.2.14.4 If printed circuit boards are used, the boards shall be secured the cabinet electrical system with re-useable fasteners to facilitate field replacement of these components. No soldered terminal connectors between the circuit board and the cabinet interconnecting wiring shall be allowed.

3.3 Dimensions

3.3.1 Overall dimensions Overall dimensions shall include all protrusions through and/or from the outside walls of the cabinet such as pipe nipples, side door assemblies, electrical connection boxes, cabinet seams, etc. Sample figures with dimension requirements are included in Appendix B.

3.3.1.1 **Four foot, clean air devices**

3.3.1.1.1 Overall Length-console 58 inches (±1")

3.3.1.1.2 Overall Depth-console 33 inches (±1")

3.3.1.1.3 Overall Height-console 77 inches (-1", +11")

3.3.1.2 **Five foot, clean air devices**

3.3.1.2.1 Overall Length-console 70 inches (±1")

3.3.1.2.2 Overall Depth-console 33 inches (±1")

3.3.1.2.3 Overall Height-console 77 inches (-1", +11")

3.3.2 Inner Dimensions of Work Area

3.3.2.1 **Four foot, clean air devices**

3.3.2.1.1 Inside wall to front edge of work zone 48 inches (±1")

3.3.2.1.2 Outer rear wall to inner sidewall width shall be no more than 8 inches (±1")

3.3.2.1.3 Depth (side edge to side edge) 30 inches (±1")

3.3.2.1.4 Height (work surface to supply air diffuser) 21 inches (±1")

3.3.2.2.5 Height (floor elevation to work surface) 33 inches (-1", +11")

3.3.2.2 **Five foot, clean air devices**

3.3.2.2.1 Inside wall to front edge of work zone 60 inches (±1")

3.3.2.2.2 Outer rear wall to inner sidewall width shall be no more than 8 inches (±1")

3.3.2.2.3 Depth (side edge to side edge) 30 inches (±1")

3.3.2.2.4 Height (work surface to supply air diffuser) 21 inches (±1")

3.3.2.2.5 Height (floor elevation to work surface) 33 inches (-1", +11")

3.4 Assembly

3.4.1 The cabinet shall be capable of being moved through a doorway nominally 6'7" high, 35" wide. The unit shall be restricted to less than 550 pounds for the four foot model uncrated and 600 pounds for the five foot model uncrated.

3.4.2 The work zone and lower section of the clean air device shall be bolted together to form a structural unit.

3.4.3 The work tray surface height from floor shall be adjustable from 38 inches, ±6.0 inches.

3.4.4 The work access opening height shall be 14 inches (±0.25 inches).

3.4.5 The cabinet should have no knee space because operators will stand at the unit.

3.4.6 If the unit work zone is provided with perforated perimeter intake grills specific to the location in the work surface, the manufacturer shall design the work tray so that it can not be installed by operators in other positions which could jeopardize containment. The work surface shall be designed to allow work tray position only in that position that the unit containment was verified.

3.4.7 Bumpers 4 Required: The device shall be provided with left and right front and rear corner bumpers to reduce damage to the workstation and vivarium walls. Bumpers shall be at least 1 inch thick gray rubber attached with 1/4-20 stainless bolts or welded studs directly to the liner.

3.4.8 Wheels: Four, wide tread 5 inch diameter full swivel casters with stainless bodies with foot-operated locks. The tread shall be rubber. If stem wheels are used, the stems shall be steel and bolted into steel adaptors coarse thread. Fine thread adaptors in aluminum stock are prohibited.

3.4.9 Lift Mechanism: An electric lift hydraulic mechanism shall be provided to assist operators in adjusting the work zone elevation using a fixed moment switch. The switch shall have clearly labeled “on” and “off” positions. The electric lift hydraulics shall be warranted for parts and labor for three years by the manufacturer.

3.4.10 The work zone shall be open on three sides with no support members creating obstructions. Two metal shipping struts to support the supply and exhaust filter assembly shall be stainless steel and bolted to the cabinet members. These struts located in the front of the work zone may be left by the university as additional pull handles to assist work station operators in moving the work station into position. Therefore the struts must be designed as cleanable members of the workstation.

3.5 Materials and Components

3.5.1 All cabinet surfaces, interior and exterior, shall be constructed of, or finished with, materials which are corrosion, flame and moisture resistant.

3.5.2 Exception: The interior foam pre-filter shall be fire retardant and UL approved material and cleanable.

3.5.3 The cabinet cannot exhaust any air at floor level. Floor discharge will result in purchase cancellation.

3.5.4 The cabinet blower plenum shall be designed with a lower plenum panel of sufficient rigidity to allow an owner supplied lift to raise the unit without any damage occurring in terms of permanent under panel or side wall metal deformation.

3.5.5 Sheet Metal and Finishes

3.5.5.1 The thickness of metals used for cabinet construction shall not be a lesser thickness than U.S.S. Gauge No. 18. The work surface and sidewalls shall not be a lesser thickness than U.S.S. Gage No.16.

3.5.5.2 Stainless Steel Finish: All cabinet interior work surfaces shall be fabricated with corrosion-resistant steel that shall conform to Federal Specification QQ-S-766, Class 304, No. 4 satin finish.

3.5.5.2.1 The work zone scavenger slots shall be fabricated from punched metal stock. The manufacturing process shall ensure that the work zone side of this construction is tear resistant to laboratory gloves.

3.5.5.3 Steel sheet used in the cabinet fabrication shall be prime grade, cold rolled carbon steel. Carbon steel sheet shall be used where Paragraph 3.5.2.2 does not apply.

3.5.5.4 Carbon Steel Finish Before applying finish, surfaces shall be cleaned of dirt, oil, and grease. The carbon steel shall be given a phosphate coating treatment in accordance with Federal Specification TT-C-490. Enamel finish shall be a uniform satin luster white. Prime and finish coats shall be applied by spraying or dipping, and baked after each coat for a minimum of 15 minutes at 300 degrees Fahrenheit. A total thickness of not less than one mil shall be achieved. Concealed surfaces or hollow metal sections shall be protected by the finish previously specified, by a suitable method, after welding, but before assembly. Epoxy coatings can be used to coat all carbon steel surfaces and they shall conform to TT-C-001224 and shall be a uniform satin luster white. A polyurethane coating can be used to coat all carbon steel surfaces and it shall conform to TT-C-001227 and shall be a uniform satin luster white.

3.5.5.4.1 All interior plenums shall be free of fabrication debris. Fabrication debris shall be defined as detached particles such as metal filings and wiring greater than 0.0625 inches in size.

3.5.5.4.2 All exterior metal plates, all interior work zone metal surfaces, all metal diffusers, the hinged metal spill panel, all interior metal surfaces within six inches of each HEPA filter, and the fan/motor assembly(s) and compartment shall have no exposed metal edges, seams or corners that will puncture or tear a vinyl examining glove when advanced across these surfaces with a maximum force not to exceed one pound per square inch of glove surface area. The vinyl glove cited in this requirement shall be Fisher Scientific brand, number 19-050-550C, marketed by Fisher Scientific 2000 Park Lane Drive, Pittsburgh, PA 1-800772-6733. Punctures and tears will be deemed as poor workmanship and result in a 1.2.1 notification and field repair as specified in Paragraph 6.3.4. More than five areas in the cabinet having tear and puncture will result in cabinet rejection and request for a replacement.

3.5.5.4.3 All exterior surfaces shall have a flat painted application. A flat painted surface shall be defined as a continuous surface in either the horizontal or vertical plane with no surface distortion in excess of ± .001 inches. Paint runs from either over spray or paint purposely designed with an irregular surface shall be a cause for rejection of the device and result in a 1.2.1 notification.

3.5.5.4.4 All electric welded stud construction shall be protected from paint over spray. The method of protection shall be a rubberized cap fitted over each stud prior to painting.

3.5.5.4.5 Finish Color: White: All University clean air devices shall be painted white. Alternate colors may be specified on individual clean air devices for additional cost.

3.5.5.4.6 Drain Valve: The work zone stainless liner shall have a welded 1 inch NPT stainless pipe nipple and stainless 1 inch NPT drain valve.

3.5.5.5 Internal Air Balancing Damper. No internal damper has been required in this specification.

3.5.5.6 Transitions: No transitions are required in this specification.

3.5.5.7 Supply Air Grill (SAG) and Air Curtain

3.5.5.7.1 The SAG shall be stainless steel and constructed in accordance with specifications. The edges of the SAG shall be designed to produce a perimeter air curtain to prevent room particulates from entering the workspace.

3.5.5.7.2 The SAG shall be mounted approximately 1 to 1.5 inches from the filter media.

3.5.5.7.3 The SAG shall be easily removed from the attachment points with the fastener holes in the diffuser at least 40 percent larger than the fastener shaft.

3.5.5.7.3.1 The supplier shall design the SAG with ergonomic consideration for the repair and maintenance of the filter surfaces and gasket. The SAG should be easily removed without the need to use tools. Stainless thumb screws should be used.

3.5.5.7.4 No open cell foam shall be allowed on the SAG.

3.5.5.7.5 The space between the SAG and HEPA filter shall be a smooth and continuous. No cavities or structural reinforcement in this critical area shall be allowed, due to the necessity for field filter repairs and prevention of contamination by induction.

3.5.5.7.6 The edges on the SAG shall be smooth and will not tear or puncture a laboratory glove, Paragraph 3.5.5.4.2.

3.6 View Screen: The view screens shall be hinged panels of 1/4 inch Lexan plastic sized to allow a 14 inch work zone opening and 21 inch(-1", +3") opening when raised. Each hinged view screen shall have a latch to hold the view screen in the raised position, or equivalent. Safety glass is prohibited to conserve weight.

3.7 Filters and Clamps

3.7.1 High Efficiency Particulate Air (HEPA) filters zero probed, 99.99 percent efficiency, shall be required for both supply and exhaust air systems of all clean air devices.

3.7.2 The supply and exhaust filters shall be high efficiency, fire resistant, particulate air filters, in conformance with MIL-F-51079B, Type 1C with fire retardant treated plywood frames, self-extinguishing type adhesives and sealant, and glass fiber media. No filter shall have factory test patching greater than one percent of the open face area. Filter sizes not listed in MIL-F-51079B shall be acceptable. Paragraph 3.4.7 of the MIL-F-51079B covering the environmental testing shall not apply. Metal frame filters are an acceptable alternate.

3.7.3 The supply and exhaust filters shall conform to IEST Standard IEST-RP-CC-001.5. Each filter shall be construction Grade 3 or 4, performance Type C or J. A label shall be affixed to each filter frame detailing testing requirements, ratings, manufacturers test results, date tested and name of the factory test agent. The test results shall indicate aerosol scan leak rate, airflow in CFM, and pressure drop across the filter during filter testing.

3.7.4 Filter mounting(s) tolerances shall be for openings up to 20 inches (+0.0625, -0.0 inches), and for openings over 20 inches (+0.125, -0.0 inches). The squareness of the filter mountings shall have diagonals within 0.0625 inch total allowance. Width of the gasket seating area shall be 0.75 inches (±0.25, -0.0 inches).

3.7.4.1 Filter mountings which provide a knife-edge seal between the gasketed face of the filter and the sealing edge of the frame are prohibited and will result in purchase cancellation.

3.7.5 Clamps: Filter clamps shall create uniform gasket compression to 50 percent of the new gasket depth or that pressure that results in no aerosol leaks upon challenge. For clamps requiring special extended reach with hand tools, a variable pressure clamp may be used. If a T bar clamp tool is required in order to remove the supply filter, the supplier shall attach the tool to the cabinet frame with a fastening system that holds the tool in place between filter changes. The tool shall be attached in such a manner that removal of the tool can be done by hand without the need for additional hand tools.

3.8 Gaskets and Seals

3.8.1 HEPA filter seals using fluid seal systems are prohibited.

3.8.2 HEPA filters using permanently attached assemblies which are screwed or cemented to the filters are prohibited. HEPA filters received from the filter manufacturer with protective screens in place are acceptable.

3.8.3 The HEPA filter gasket materials shall be cellular sheet or molded rubber, EPDM, or closed cell expanded neoprene gasket materials, as described in MIL-F-51068, Paragraph 3.2.2, Gasket Material; and shall be mounted in the manner described in MIL-F-51068, Paragraph 3.3.3, Gasket Assembly.

3.8.3.1 All HEPA filters should be clamped to the cabinet frame. Clamps shall be designed with sufficient rigidity to compress the filter gasket material. The method of choice for filter clamps will be constant pressure filter clamps used to clamp supply and exhaust HEPA filters in place. The clamping mechanism should be designed to apply a minimum of 10 pounds of pressure per lineal inch of filter frame.

3.8.4 Neoprene or EPDM gasket or solid silicone gasket shall be used in cabinet joints, seams, and on the facing of all air panels of the cabinet. The structural strength of the joints and connections of the service panels should be independent of the seal produced by the gasket.

3.8.4.1 Gasketing shall have a minimum width of 0.50 inches and be 0.25 inches thick on all joints and panels which form a barrier between contaminated areas of the cabinet and ambient environment. Gaskets shall deform at least 50% in thickness from the perpendicular force applied from the fastening unit. Filter gaskets shall be by the filter manufacturer.

3.8.4.2 The use of open cell gasketing and/or sheeting shall be prohibited in the air passages of the cabinet plenum systems.

3.8.5 All exterior, non contaminated joints or assemblies made with sealant bonding shall be made by one of the following methods. The structural strength of the joints or assemblies shall be independent of sealants.

3.8.5.1 Two-part accelerated synthetic rubber (polysulfide type) sealing compound, temperature resistant, high adhesion aircraft specification grade, MIL-S-8802 or PR-1422 Class B-2, Products Research Company or equal shall be acceptable.

3.8.5.2 One part silicone-base sealant compound, such as Dow Corning RTV 732 Adhesive Sealant, Dow Corning RTV 781 Building Sealant or equal shall be acceptable.

3.8.5.3 All joints formed using fasteners and gaskets and made to conform to leak tight construction (Paragraph 3.11) shall seal because of gasket compression and exterior silicone sealant if necessary.

3.9 Fan(s)

3.9.1 The cabinet shall have one motor driven fan system for both the recirculated and discharged work zone air.

3.9.2 The fan shall be labeled in accordance with Bulletin 211 of the Air Moving and Conditioning Association. Manufacturer's name and nameplate data shall be labeled on each fan scroll, indicated on permanent label on the outside of the device, and in the operations manual. Fan housing and blades shall be fabricated of or protected with corrosion resistant materials and as specified in Paragraph 3.5.1.

3.9.3 Total fan delivery shall fall off no more than 10 percent as a result of 100 percent increase in the pressure drop or 0.3 inches water column whichever is greater, across the filters without readjusting the fan speed control. The supplier shall provide a graph and data table of the test results for the automatic airflow compensation for filter loading from 0 percent to 100 percent. No manual adjustment shall be required to compensate for filter loading.

3.9.4 The fan shall be direct connected forward curved centrifugal fan in conformance with AMCA standards. The fan performance curve or performance graphs/data tables shall be provided with each cabinet in the operations manual with a format as detailed in Paragraph 3.1.1.

3.9.5 Each fan installed shall be balanced within the following vibration limits.

3.9.5.1 The maximum displacement of the work tray of the cabinet shall not exceed 100 micro inches R.M.S., in any direction as per Paragraph 3.14.9.

3.9.5.2 The maximum field vibration limits for the centrifugal fan shall not exceed the following specified limits:

RPM	MILS DEFLECTION
900	1.00
1200	0.75
1800	0.50

3.9.5.3 These limits in section 3.9.6.2 shall apply to the top and side of the motor shaft/fan wheel connection and the fan scroll.

3.9.6 The fan/motor assembly shall be mechanically isolated from the cabinet by means of energy absorbing motor struts and isolating bonded rubber platform mounts or equivalent. The fan shall be bolted to the rubber plates riveted to metal channels which are bolted to the cabinet frame. Bolts and associated metal materials should be stainless steel. The fan/sleeve connection to the cabinet shall be such that air leakage is less than 0.5 percent of the total airflow.

3.9.6.1 A flexible fan/cabinet sleeve greater than 2 inches of air stream length is prohibited.

3.9.6.1.1 The motor that shall be used in the fan system shall be designed that the motor winding temperature shall not exceed a temperature of 105 degrees Centigrade in a maximum ambient temperature of 48 degrees Centigrade (120 degrees Fahrenheit) under any maximum load condition. The thermal protector shall not trip at 115 percent of the rated voltage under maximum load and ambient temperature conditions. The motor shall be rated for 24 hour continuous operation. Nuisance trips shall not be allowed. The motor shall not trip GFCI wall outlets. The motor shall conform to Federal Specification CC-M-636.

3.9.6.1.1.1 The motor capacitor shall contain no derivatives of polychlorinated biphenyls (PCBs).

3.9.6.1.1.2 The motor performance curve shall be provided with each cabinet in the operations manual with a format as detailed in Paragraph 3.1.1.

3.9.6.1.1.3 The motor should be rated by the motor supplier for a continuous running time of 50000 hours (5.7 years).

3.9.6.1.2 The motor shall be sized to operate the fan at airflow and face velocity in accordance with Paragraph 3.14.1 with a total fan delivery requirement as specified in Paragraph 3.9.3.

3.9.6.1.3 Electrical Requirements The motor shall be equal to or less than 0.5 HP and shall be 230 volts, 3-phase, 60 hertz AC. A dual rated voltage motor shall not be acceptable. The motor shall have a power factor of 0.75 or greater at a full load condition. Full load is defined as that condition associated with the fan operating at a static pressure condition necessary to overcome at least a 100 percent increase in filter static pressure with up to a maximum of a 10 percent drop in total airflow in CFM, Paragraph 3.9.3.

3.9.6.1.4 Motor controllers shall be an adjustable Variable Frequency Drive (VFD). The VFD will be 115V AC, single phase input 230V, three phase output capable of running a 0.5 hp motor. The VFD will be programmed with an algorithm that automatically adjusts the motor control frequency/speed to compensate for changes in normal filter loading.

3.9.6.1.4.1 A permanent designated service entrance into the VFD to allow measurement of the motor running amperage shall be considered by the supplier to allow certification personnel a method to safely measure amperage. The service entrance, if installed, shall be indicated on the electrical circuit diagram.

3.9.6.1.5 Motor and lights should be on separate/independent switches. However, lights shall not operate unless the motor is operating. Circuit breaker/fuse shall be provided and shall comply with the National Electrical Code. The fuse or circuit breaker shall be located in a recessed area to avoid damaged from operators moving the workstation. Exterior circuit breaker and fuse holders, if provided, shall be protected using a removable stainless steel cap mounted over the exterior portion of the circuit breaker or fuse holder.

3.9.6.1.6 The cabinet retractable power cord shall be at least a 25 foot length three wire with ground wire and the minimum size in accordance with the National Electrical Code for the specified design load. The plug shall be 15 ampere design. It shall be labeled in accordance with UL Standard(s) UL 817 and/or UL 62.

3.10 Electrical Wiring, Switches, etc.

3.10.1 Cable and wire shall conform to Federal Specification Cable Power, Electrical and Wire (Weather Resistant) J-C-145. The power cord shall be at least three wire 14 gauge with a 15 ampere cap plug. At least 25 feet of exterior power cord shall be provided on four foot and five foot clean air devices.

3.10.2 Switches should conform to Federal Specifications W-S-000893 and W-S-00896.

3.10.3 Plugs should conform to Federal Specification W-C-00596.

3.10.4 Ballasts/drivers shall be UL and/or CSA approved electronic type. Each unit shall be designed to satisfactorily start and operate the type of fluorescent/LED lamp in the particular fixture and shall meet the current practice and requirements of the "Certified Ballast Supplier." Ballast/driver design voltage shall suit the circuit voltage from which the fixtures are to be operated. Two lamp ballasts for operation of rapid start types of fluorescent lamps may be series-sequence type. Ballasts/drivers shall be securely fastened in place with the mounting surface of the ballast/driver making a complete contact with the surface of the ballast/driver mounting plate of the fixture as practical. All ballasts operating lamp sizes 40 watt or larger shall be protected against overheating by a built-in, thermally activated, automatic reclosing device, sensitive to winding temperatures and current, which will prevent winding temperatures from exceeding 120 degrees Centigrade, with the exception that the peak temperatures in the first few operating cycles may exceed this. The protector must allow the winding temperature to reach 105 degrees Centigrade ambient environment without opening the circuit to the primary windings and after opening shall reclose at a cast temperature less than 85 degrees Centigrade.

3.10.4.1 No ballast(s)/drivers shall contain any derivative of polychlorinated biphenyls (PCB's).

3.10.4.2 All wiring insulation must be in excellent condition with no damage to the insulation or any conductor strands or solder touching other connectors. Poor wiring fabrication shall result in either a 1.2.1 notice or 6.3.4 penalty.

3.10.4.3 All electrical components and wiring shall conform to the latest edition of the National Electrical Code and the National Electrical Manufacturer's Association (NEMA). The entire cabinet must be listed as certified by Underwriters' Laboratories or the Canadian Standards Association.

3.10.4.4 Separate metal parts of the cabinet shall be inter-connected and grounded to the common ground with the electrical components. These inter-connections shall be made on the inside of the cabinet.

3.10.4.5 Electrical parts may be located in the air passage from the work surface to the filter.

3.10.4.6 Two up-to-date wiring diagrams showing connection of all electrical components shall be provided. One diagram permanently attached to the cabinet at the service control center compartment access door inside and the other provided in the service manual.

3.11 Lighting

3.11.1 The light source shall be obscured from direct view of the operator.

3.11.2 The fluorescent/LED lamps shall be cool white (CW), rapid start type. Lamps shall be located outside the workspace and their reflection shall not interfere with visibility. The lamp assembly shall be removable from the cabinet interior.

3.11.3 UV lamps are prohibited.

3.12 Plumbing

3.12.1 Option: Edstrom watering unit with gooseneck sprayer shall be offered by the manufacturer.

3.12.2 Aerosol Sampling Port Assembly

3.12.2.1 An external port connected to the positive interior plenum shall be provided upstream of the HEPA filter(s) for aerosol testing.

3.12.2.2 The port shall be located on the upper horizontal metal plate of the cabinet, or equivalent.

3.12.2.3. The port connection into the positive exterior plenum shall be located such that a uniformly mixed air sample can be withdrawn for testing. Uniformly mixed shall mean that sample which produces no more than a 10 percent variance in 100 percent aerosol measurement when the aerosol is introduced into the cabinet work zone in accordance with requirements detailed in Paragraph 3.14.2.

3.12.2.4 Drain Valve: Exterior work zone trough liquid collection drain valve. The unit shall be provided with a 1 inch NPT stainless drain valve located at the lowest elevation of the internal drain trough. The valve body handle shall rotate to the 270 degree position for closure and 180 degree position for open. The valve body shall connect to a stainless steel welded nipple located directly to the work zone liner such that the valve can be field installed without handle contact to the cabinet members when the handle is in the open position. Once installed the handle closure will rest in a closed position and recessed under the exterior work zone liner.

3.13 Ergonomic Features

3.13.1 Stainless steel side handles shall be provided to facilitate the movement of the workstation. The handles shall be designed to withstand the force of either pushing or pulling the workstation.

3.13.2 Side handles shall be recessed to prevent handle damage and facilitate movement through doorways

3.13.3 Stainless steel rear handle and storage shelf is required.

3.13.4 Workstation Lift Required: A lift handle/switch shall be provided and the handle/switch shall be designed to be recessed in order to prevent movement damage to the handle/switch during transport. The handle, if provided, shall be stainless steel or designed to withstand repeated exposure to chlorine in the form of a disinfectant. Electric lift shall be provided standard.

3.13.5 The electric lift hydraulic mechanism shall be designed to easily adjust the work surface elevation with a method to secure the lift mechanism in the event that the electric lift hydraulic mechanism is damaged and the oil escapes the lifters. The lift mechanism switch shall be stationary. The Operator manual shall have details on the safe use of either mechanism.

3.13.6 Retractable cord reel shall be required and located on the under side of the blower plenum. The retractable mechanism shall be bolted to the plenum wall using 1/4x20 thread corrosion resistant bolts. Small fasteners less than 1/4-20 to attach the reel set are prohibited.

3.14 Required Performance and Acceptance Criteria The following tests shall be performed on the prototype and unit being supplied.

3.14.1 Airflow Velocity

3.14.1.1 To establish velocity levels in a clean air device provided with clean HEPA filters and pre-filters using a calibrated hot wire thermal anemometer.

3.14.1.2 The velocity grid shall be no more than 7 inches by 7 inches.

3.14.1.3 The average measured velocity shall be 50 fpm, ±10 percent. Individual readings shall fall within 20 percent of the average.

3.14.1.4 The average air curtain velocity shall be 175 fpm on the three open sides, ±20 percent. Individual readings shall fall within 40 percent of the curtain average. Acceptable alternative: As an alternative to airflow readings, pressure readings can also be taken around the opening. Pressure readings shall be ≥0.05”.

3.14.2 Filter Leak Test

3.14.2.1 HEPA filters shall be scan tested to ensure that these filters are free of defects and pinhole leaks using cold generated aerosol at an upstream concentration of greater than or equal to 20 µg/l and using a calibrated aerosol photometer.

3.14.2.2 The filter(s) and cabinet seals shall show no leak greater than 0.01 percent of the specified upstream challenge concentration.

3.14.3 Induction Leak and Back Streaming Test-Prototype Performance Only

3.14.3.1 The supplier shall run the test for verification of compliance with IEST-RP-CC-002. The results shall be submitted with the original bidding and be available on request during the contract period.

3.14. 3.2 The measured leak rate shall not exceed 0.01 percent of the of the specified upstream challenge concentration from paragraph 3.14.2.

3.14.4 Motor/Fan Design Capacity with Loaded Filters

3.14.4.1 The supplier shall preload the HEPA filters on a selected prototype unit (all model sizes) to determine reserve capacity in the selected motor/fan equipment. Unless the system design is changed and increases the system resistance curve or the motor/fan equipment is changed, no further initial testing will be required for compliance with this specification.

3.14.4.2 The filter(s) shall be preloaded to at least 100 percent of the initial HEPA filter pressure drop at the required airflow velocity, paragraph 3.14. The average airflow velocity shall not be less than 90 percent of the average airflow velocity prior to loading.

3.14.5 Temperature Rise

3.14.5.1 The supplier shall determine the maximum rise in temperature in the clean air device work zone due to motor/fan(s) and cabinet fluorescent lamps.

3.14.5.2 The temperature shall not exceed 10 degrees F after four hours of continuos operation of the motor/fan(s) and fluorescent lights.

3.14.5.3 The manufacturer shall provide BTU/Hour heat rejection values for all mobile animal transfer stations offered in this specification. The data shall be provided to the university agent in the bid submittal.

3.14.6 Lighting

3.14.6.1 The supplier shall test the illumination level of the work surface using a calibrated photoelectric meter.

3.14.6.2 A minimum uniform light intensity of 75 foot candles average shall be provided at the work surface centerline provided that no individual readings are less than 40 foot candles with a background illumination of 20 foot candles or less.

3.14.6.3 Germicidal Radiance: Prohibited

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3.14.7 Structural Stability

3.14.7.1 The supplier shall test the clean air device for resistance to overturning, distortion, deflection of the work surface, and tipping per Section 10 of IEST-RP-CC-002. Assuming no cabinet modifications are made to the dimensions and weight of each cabinet size, the test shall be run once per size and the results made available to the University by written request.

3.14.8 Noise Level

3.14.8.1 The overall noise level one foot in front of the work opening of the cabinet shall not exceed 65 dbA, at a reference sound-pressure value of 20 micronewtons per meter squared (re: 0.0002 dynes per centimeter squared) when measured with the background not over 55 dbA. In addition, there shall be no objectionable pure tone noise component present during the operation of the cabinet.

3.14.8.2 Noise level of the cabinet with the blower motor running at a filter loaded condition shall be no more than 70 dbA. The supplier shall verify this level and be prepared to present this information on demand as requested by the University agent.

3.14.8.3 The supplier shall research the control of sound to achieve a sound pressure level of less than 60 dbA, 12-inches in front of any working opening and 15 inches above the work surface of the cabinet for all models covered in this specification.

3.14.9 Vibration

3.14.9.1 The supplier shall run a vibration analysis of all clean air devices at the geometric center of the work surface using a calibrated vibration analyzer according to IEST-RP-CC-002.

3.14.9.2 The clean air device shall not exceed 100 micro-inches RMS amplitude at 10 to 200 Hertz when the cabinet is operated at the set point air velocity.

3.14.10 Electrical Leakage and Ground Fault Resistance and Polarity

3.14.10.1 The supplier should consult NSF-49 1992, Annex A, Test Method XIV before running this required performance test. The supplier shall run electrical leakage and ground fault resistance to cabinet ground connection on all models. The cabinet under test shall be set to operational air velocity as specified in section 3.14.1 using a calibrated electrical safety tester with 1 K input impedance.

3.14.10.2 The electrical leakage shall not exceed 3,500 microamperes single fault; normal and reverse polarity and the ground circuit resistance shall not exceed 0.15 ohms. Ground fault circuit interrupters shall also be tested for correct polarity and tripping at 5.0 milliamperes.

3.14.11 Filter Pressure Drop

3.14.11.1 The Supplier shall measure and record the supply filter pressure drop as inches water column.

3.14.11.2 The supply filter pressure drop shall be recorded at the airflow velocity as required in section 3.14.1. The value shall be reported in the factory certification report, section 4.2.

3.14.12 Particle Test

3.14.12.1 The supplier may be called upon to test the cabinet for particle concentration. The test shall be run according to IEST-RP-006, Testing Cleanrooms.

3.14.12.2 The cabinet particle count can not exceed ISO 5 conditions and may be required to comply with more stringent particle containment.

3.15 Labels

3.15.1 Restricted Substances Label: The cabinet shall have a permanently affixed (cemented) label with at least ¼ inch high letters colored white on a red background. The label shall have the following phrase: "DO NOT USE TOXIC, EXPLOSIVE OR FLAMMABLE SUBSTANCES IN THIS CABINET." This label shall be affixed directly above the work zone.

3.15.1.1 The exterior face of the sign shall have a plastic coating overlay to protect the sign from cleaning agents.

3.15.2 Manufacturer Label: The manufacturer shall install a label, permanently affixed to the front of the cabinet. The label shall be located on the operator's right side. The label shall contain:

(1) The supplier's name and address

(2) The cabinet model number

(3) The cabinet serial number

(4) Velocity range in LFPM and recommended grid in inches

(5) Supply HEPA filter size and quantity

(6) Exhaust HEPA filter size and quantity

(7) Factory Certification/Manufacture Date

3.15.2.1 Details regarding the supply and exhaust HEPA filter size, rating, and quantity can be provided via an electronic means.

3.15.3 Certification Plate: The cabinet shall have a permanently affixed stainless steel, Class 304, No. 4 satin finish plate, minimum U.S.S. Gauge No. 26, 4 inches vertical by 5 inches horizontal. This plate shall be installed at eye level (60 to 70 inches above floor elevation). This plate shall be used to affix subsequent field certification labels.

3.15.4 UL and/or CSA Label

3.15.5 Operator Instruction Label

3.15.5.1 The supplier shall affix an abbreviated set of operator instructions to the clean air device detailing instructions on the start up, use and shut down of the device.

3.15.5.2 The operator instruction sign shall be plastic laminated and located 60 to 70 inches above floor elevation on the front panel of the cabinet.

3.16 Operations Manual and Service Manual

3.16.1 One copy of the operations manual containing the following information shall be furnished with each clean air device. If an electronic version of this information is to be provided, instructions as to its location and how to access it shall be provided.

(a) Unpacking procedure, purpose, location within the laboratory, device function and description.

(b) Instructions for installing, operating and performing preventive maintenance on the cabinet. A detailed set of operating instructions shall also be included concerning the startup, operation and shut down procedure.

(c) Trouble shooting procedures.

(d) List of service parts (identified by manufacturer’s part number) and quantity required for preventive maintenance purposes.

(e) HEPA Filters - definition, chemical effects, filter life, procedure for HEPA filter replacement.

(f) An up-to-date wiring diagram of all electrical components shall be provided in the service manual.

(g) The fan/motor and motor performance curves and/or data tables and graphs should be provided with each device as an attachment to the operations manual.

(h) A hard copy of the factory test results for all of the Production Quality Control Tests listed in Section 4.2 should be provided with each device to be included in the operations manual.

(i) List of Tools and Instruments required for Field Tests. Tool and Instrument manufacturer addresses and phone numbers should be listed.

3.16.2 One copy of the manufacturer's operations manual for the clean air device shall be submitted to the University Biological Safety Officer and the University Agent, 30 days from contract award.

3.17 Pressure Gauge for Monitoring Filter Pressure Drop

3.17.1 Each Clean Air Device shall be equipped with one front mounted diaphragm operated, mechanical differential pressure gauge rated for ±2 percent full-scale accuracy. The gauge shall measure plenum pressure relative to the atmospheric pressure surrounding the device. The gauge scale shall read at least 200 percent of the initial filter plenum pressure.

3.17.2 The gauge shall be prominently displayed in the rear upper section of the device at 48 to 60 inch elevation.

3.17.3 The gauge should have a front adjustable screw to adjust the needle to zero without disassembly of the gauge or removal of any cabinet assemblies to access this adjustment screw.

3.18 Parts List and Required Parts Discount

3.18.1 The supplier shall provide a parts list by part name, part number and current price for the contract year. The parts list shall be provided to the University Purchasing Department and the University Agent in electronic format.

3.18.2 The parts list should be listed alphabetically and numerically.

3.18.3 The supplier shall have available, parts for each cabinet sold under the contract for at least ten years from the last production date of the cabinet model. This shall include but not be limited to motors, ballasts/drivers, wiring, etc. Replaceable parts, such as HEPA filters shall be available for 20 years from the date of unit manufacture.

3.18.4 Replacement Parts and Labor: The supplier shall agree to warranty parts for no cost and no shipping charge, FOB UW Environment, Health & Safety Loading Dock for 3 years starting from the date of delivery at the job site. UW-EH&S Biological Safety Cabinet program and the University Agent shall have final authority to make the decision regarding warrantee adjustment and the supplier shall agree to this condition. In the even that any installer on the job, in the sole opinion of the University Agent, has damaged the clean air device, the installer shall be liable for replacement parts, shipment, and the labor to install said parts and if necessary recertification or replacement of any clean air device. Regardless of which person or contactor has actually caused the problem, the General Contractor shall have the final responsibility for payment of damages in the event a subcontractor or any job employee cannot be proven to be the source of the damages.

3.18.5 Parts Discount: Required: The supplier shall agree to sell non-warranted parts under this contract for 25 percent off the retail price. Non-warranted parts will be warranted for (3) three years.

3.19 Options and Requirements The supplier is requested to review the stated requirements to make sure these items are included in the bid offer. Requirements will be field inspected and the manufacturer called as necessary.

3.19.1 Required: Rear Pull bar with fixed tray

3.19.2 Option: Rear Pull bar with no tray

3.19.3 Required: Pull bar on front end

3.19.4 Option: Pull bar on front end with tray

3.19.5 Required: switch operated electric hydraulic lift

3.19.6 Required: Work surface hanger or equivalent to hold work surface during cleaning

3.19.7 Required: Fluorescent/LED lamp assembly

3.19.8 Required: Bottom mounted cord reel

3.19.9 Option: Edstrom unit with gooseneck watering sprayer

3.19.10 Required: The work station shall be provided with corner bumper rails, front and rear to protect the workstation from moving damage.

3.20 Drawings

3.20.1 Drawings shall be provided on request for the front, side view and plan view. Drawings may be in PDF or CAD form.

4.0 QUALITY ASSURANCE PROVISIONS

4.1 Qualifications

4.1.1 Procedure for Obtaining Qualification Applicants submitting bids shall submit to the University of Wisconsin a statement on the applicant's willingness to furnish a clean air device in conformance with this specification. As proof of compliance with the above statements the applicant must agree to submit test results, if called upon, for all prototype models. If corrections and/or modifications have been made since the prototype tests, these changes shall be listed and detailed along with the test results.

4.1.1.1 UL and CSA Seals In the event that an individual purchase calls for an option that invalidates the UL or CSA Seal, the supplier shall note this in the drawing submittal in half inch block letters directly on the drawing, black on white: This design, if approved shall not be listed under UL and/or CSA seal because of user requirements.

4.1.2 Prototype Tests: The supplier shall conduct test procedures according to IEST-RP-CC0-02 Laminar Flow Clean Air Devices, at the manufacturing facility for prototype models. This shall include electric tests outlined in section 3.14.10. If requested, the test results shall be provided in written form for review by the University Agent.

4.2 Production Quality Control Tests Each production clean air device unit shall meet the following required tests performed by the supplier on the unit at the factory. One signed factory test report, hard copy, shall accompany the operations manual for that cabinet. Approved Alternative: A digital copy of the factory test report can be provided with each device. Additional tests may be specified under specific specifications for a particular unit.

4.2.1	HEPA Filter Leak Test	IEST-RP-CC0-02	Unidirectional-Flow Clean Air Devices
4.2.2	Airflow Velocity	IEST-RP-CC0-02	Unidirectional-Flow Clean Air Devices
4.2.3	Temperature Rise	IEST-RP-CC0-02	Unidirectional-Flow Clean Air Devices
4.2.4.	Lighting Intensity	IEST-RP-CC0-02	Unidirectional-flow Clean Air Devices
4.2.5	Noise Level	IEST-RP-CC0-02	Unidirectional-flow Clean Air Devices
4.2.6	Vibration	IEST-RP-CC002	Unidirectional-flow Clean Air Devices
4.2.7	Structural Stability	IEST-RP-CC002	Unidirectional-flow Clean Air Devices

4.2.8 Electrical Leakage and Ground Circuit Resistance and Polarity PER NSF-49 1992 Edition

4.2.9 Filter Pressure Drop Per Section 3.14.11 of this specification

4.2.10 Particle Test Per Section 3.14.12

5.0 PREPARATION FOR DELIVERY

5.1 Packaging

5.1.1 All indicators, gauges and dials shall be covered with cushioning material conforming to PPP-C-843 and the cushioning material shall be secured in place with the tape conforming to PPP-T-60, Type II, Class 1.

5.1.2 All switch boxes, outlets, connections and drain line openings shall be sealed with the tape specified in Paragraph 5.1.1.

5.1.3 Instruction books, a copy of the test report, and parts lists shall be packaged together in accordance with MIL-P-116, method IC-1, and secured to the clean air devices in a protected location.

5.1.4 The work tray, hinged sashes, front perforated area, air and/or light diffuser, and fluorescent/LED light tube(s) shall be secured in position by taping, tying, blocking or bracing to prevent movement during transit.

5.2 Packing

5.2.1 Each clean air device shall be packed in a container conforming to PPP-B-621, Class 2, style optional; or to PPP-B-601, overseas type; or PPP-B-640, Class 2, Grade A, Style optional. Approved Alternative: The deice shall be alternatiely packed on a wooden skid rated for the shipping load, protected with cardboard walls and top with reinforcement members. The manufacturer shall be responsible for taping all moveable, unsecured device components to protect against movement and breakage during transport.

5.2.2 The shipping container shall be marked on all four sides with warning labels not to drop the contents.

5.2.3 The entire shipping container shall be wrapped in 6 mil construction grade plastic sheeting and/or hardboard to protect against rain damage.

5.2.4 Building Address and Room Number Requirement: The cabinet shall be tagged with the building address and room number of the campus laboratory where the unit is going to be installed

6.0 NOTES

6.1 Guarantee The supplier guarantees the clean air device against defective material, workmanship and performance for three years, said guarantee to run from the date of delivery. The supplier agrees to furnish, without cost to the University, replacement of all parts which are found to be defective during the guarantee period. Cost of installation (labor and decontamination if necessary) of replacement parts and material shall be borne by the supplier, exclusive of transportation charges on returned parts.

6.1.1 Limited Warrantee The supplier warrantees the clean air device against defective parts for three years from the date of delivery.

6.1.2 Filters and lamp bulbs are perishable and may not be covered under 6.1.1 in the second and third years. The University Agent in conjunction with certification personnel will investigate filter and lamp parts to determine responsibility for replacement. The University will be the sole judge on requiring the guarantee on defective filters and lamp bulbs in the three year period; the supplier shall be consulted.

6.2 Qualification With respect to products requiring UL/CSA certification, awards will be made only for such products as have, prior to the bid opening date, been tested and approved for inclusion in the respective Products List, whether or not such products have actually been so listed by that date. The attention of suppliers is called to this requirement, and suppliers are urged to arrange to have products that they propose to offer to the University tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products covered by this specification may be obtained from the University Agent, UW-Environment, Health & Safety Department, University of Wisconsin-Madison, 30 East Campus Mall, Madison, Wisconsin 53715.

6.3 Inspection and Certification of Cabinet Delivered FOB Site

6.3.1 Notification of Delivery Supplier shall notify the University of Wisconsin-Madison – Biological Safety Cabinet Program, 30 East Campus Mall, Madison, Wisconsin 53715, telephone: (608) -262-1809, 10 days prior to date of expected delivery at designated FOB site Madison, Wisconsin.

6.3.1.1 Building Address and Room Number: Required: Attached to the clean air device underneath the packing plastic or written on cardboard will be a paper label attached with a string. The label shall have the room number and building or address that the cabinet is being delivered to, to assist university loading dock personnel, certifiers and moving and transfer personnel in the final resting location of the clean air device. Current program needs for data management require that the location of the clean air device be identified by the manufacturer PRIOR to shipment.

6.3.1.2 Direct Delivery Option to the Laboratory: Alternative shipment: FOB Room: The supplier, upon request, shall arrange delivery of the clean air device to the lab space of the designated room at the University. The supplier shall therefore list as an option direct delivery cost to the laboratory and assume all delivery and moving liability. This cost shall not be changed during the term of the contract unless prior approval has been received from the University Agent or Biological Safety Cabinet Program. A 90 day notice of intent to change shall be provided.

6.3.2 Dock Inspection User/Purchaser will notify the UW Environment, Health & Safety – Biological Safety Cabinet Program of the cabinet's arrival. Gross inspection will be made for punctures, breakage or other signs of damage to packaging material and/or cabinet. Notation will be made of defects observed. Supplier will be promptly notified of any defects or deficiencies in the device. Following disassembly of outer packing and further inspection for damages, completeness of cabinet and options, authorization (by the UW-Environment, Health & Safety – Biological Safety Cabinet Program) will be given to the user to arrange for transfer to the designated laboratory. The user, the supplier's representative, and the Biological Safety Cabinet Program will have previously arranged the site, utility proximity and other installation considerations for the clean air device.

6.3.2.1 Hidden Damage The University shall not be liable for hidden damage. It will be the responsibility of the supplier, shipper and/or moving and transfer agent to correct any hidden/undisclosed damages. The University shall notify the interested party(s) of any damage that is discovered. The device supplier shall have the primary liability for resolving hidden damages with all parties concerned including replacing parts, the costs for labor or the cabinet itself.

6.3.2.2 Replacement Parts or Cabinet The cabinet is a custom made unit manufactured to controlled University specifications. Therefore, if standard replacement parts are called for the supplier shall have 14 days to ship the parts to the University. If custom made parts or the entire cabinet is damaged the supplier has 60 days in order to replace these parts or cabinet.

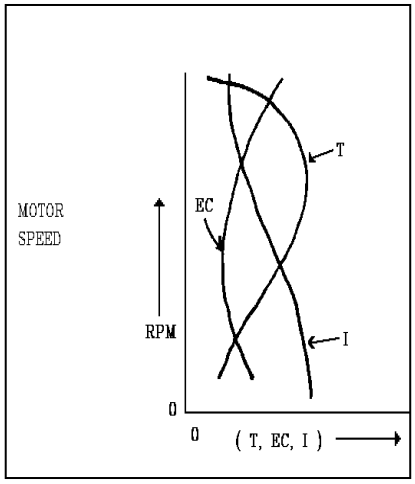
6.3.3 Certification Tests Upon installation, cabinet certification tests (paid by user) will be performed on the installed device. These tests will follow those outlined in Paragraph 4.2, both in scope and method of performance. In addition, a filter-load test to determine fulfillment of the "10/100" requirement as stipulated in Paragraph 3.9.3 may be made by the Biological Safety Cabinet Program on selected clean air devices if there is some question of the fan/motor performance graphs cited in Paragraph 3.1.1. Clean air device site tests will be compared to results of factory control tests, which accompany the operator's manual for the device supplied.

6.3.3.1 Contact the UW-Environment, Health & Safety – Biological Safety Cabinet Program at 608-262-1809 or bscservices@fpm.wisc.edu for certification and inspection service.

6.3.4 Penalties for Noncompliance Labor for minor corrections needed to achieve certification beyond 30 minutes normally allotted will be charged to the supplier at the rate of $200.00 per hour. Failure of the device to meet any of the tests specified (unless only minor correction suffices) or structural material requirements shall constitute grounds for rejection. The device will be returned at the supplier's expense unless remedial action (including parts and labor) is provided within 30 days. This corrective action must be appropriate and satisfactory in the opinion of the Biological Safety Cabinet Program and purchaser and enable the cabinet to pass the specified certification tests. At the option of the supplier, corrective labor necessary to satisfy the performance can be performed by the Biological Safety Cabinet Program at the rate stipulated above ($200.00/hour).

6.4 Fabrication and Delivery Time Once drawing approval is given on a cabinet, the supplier shall commence fabrication within thirty days. Shipment shall be made within sixty days of drawing approval. The supplier shall complete an individual cabinet order no later than three months from the time the drawing approval is issued. Three months from the time of approval to shipment from the supplier's loading dock is considered the maximum time and shall not occur more than three times per twelve month rolling period. The supplier shall contact the University Agent in order to clarify any conflicts in shipping and specification compliance to ensure acceptable delivery time.

APPENDIX A
GRAPH 1
Example Motor Performance Graph (Specification 3.1.1.1)



MOTOR MANUFACTURER:
MOTOR MODEL NUMBER:
MOTOR HORSEPOWER:_____(HP)
CAPACITOR SIZE:_____(MFD)

T= MOTOR TORQUE OUNCE FEET
EC= VOLTAGE ACROSS CAPACITOR
I= MOTOR AMPERES
RPM= REVOLUTIONS PER MINUTE
MFD= MICROFARAD

T - OUNCE FEET x MULT. _____
EC - x MULT. _____
I - x MULT. _____

APPENDIX A
GRAPH 2
Example Fan Motor Performance Graph (Specification 3.1.1.2)

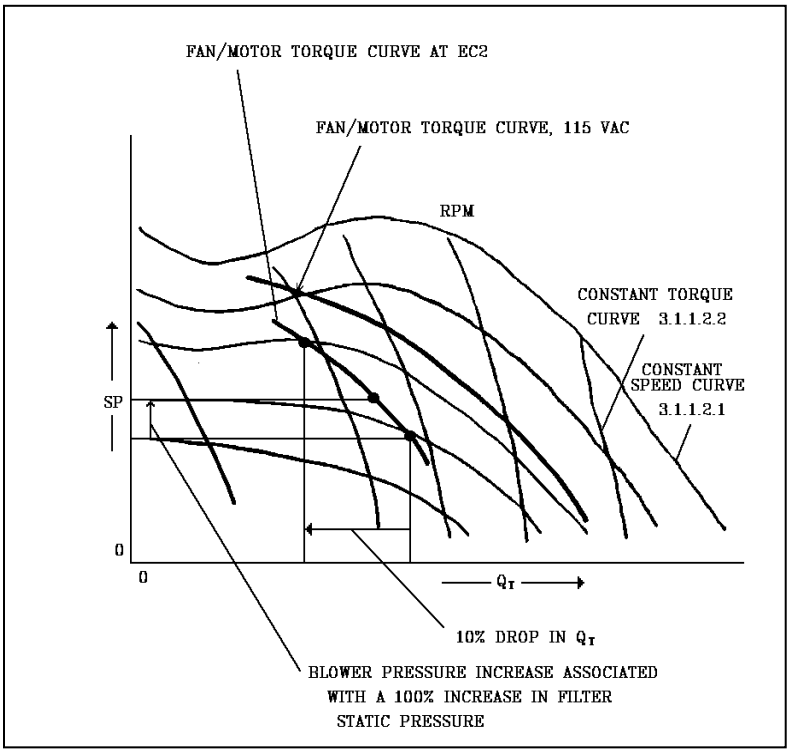
3.1.1.2.4.4 Clean filters with cabinet air velocities required under Paragraph 3.7.
QT = ___ CFM, Motor Speed = ___ RPM, Filter Pressure Drop = ___ IWC

3.1.1.2.4.5 Loaded filters to produce a 10 percent reduction in total airflow.
QT = ___ CFM, Motor Speed = ___ RPM, Filter Pressure Drop = ___ IWC

FAN MANUFACTURER:
FAN MODEL NUMBER:
MOTOR MANUFACTURER:
MOTOR MODEL NUMBER:

OPERATIONAL TORQUE DEFINED BY
THE EXPRESSION:

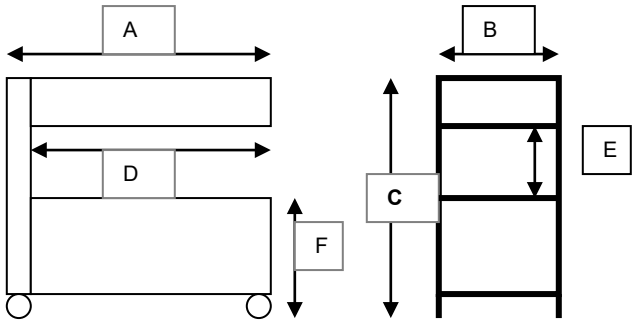
T2 = T1/(EC1/EC2)e2
T2 = OPERATIONAL TORQUE - OUNCE FEET
T1 = TORQUE AT 115 VOLTS AC-OUNCE FEET
EC1 = 115 VOLTS AC
EC2 = OPERATIONAL VOLTAGE



QT=FAN AIRFLOW-CFM-STANDARD AIR
SP=FAN STATIC PRESSURE-IWC
IWC=INCHES WATER COLUMN

Required minimum load factor is 100% as reported in paragraph 3.9.3

APPENDIX B
FIGURE 1
SPECIFICATION UW-MDN-09-SATS-2010
THREE SIDE ACCESSIBLE MOBILE CLEAN AIR ANIMALTRANSFER STATION
(Taken from Paragraph 3.3)



NOT TO SCALE

DIMENSIONAL REQUIREMENTS IN INCHES

	A (RANGE)	B (RANGE)	C (RANGE)	D (RANGE)	E (RANGE)	F (RANGE)
4 ft Bench	58 (57-59)	33 (32-34)	77 (76-88)	48 (47-49)	21 (20-22)	33 (32-44)
5 ft Bench	70 (69-71)	33 (32-34)	77 (76-88)	60 (59-61)	21 (20-22)	33 (32-44)