END OF SECTION

Part 1 General

1.1 REFERENCES

.1 National Building Code of Canada (NBC) 2010 including all amendments up to bid closing date.

.2 National Fire Code of Canada.

.3 Provincial Government Act and Regulations; including, but not limited to:

- .1 Provincial Building Code Act
- .2 Occupational Health and Safety Act revised Statutes of Nova Scotia 1996, Chapter 7 and regulations
- .3 Worker's Compensation Act
- .4 Fire Protection Act
- .5 Dangerous Goods Transportation Act
- .6 Builder's Lien Act

.4 The provisions of all Sections of Division 1 shall apply to each Section of this Project Manual.

1.2 REFERENCE STANDARDS

.1 Where edition date is not specified, consider that references to manufacturer's and published codes, standards and specifications approved by the issuing organization, current at the date of this Project Manual.

.2 Reference standards and specifications are quoted in this Project Manual to establish minimum standards. Work which in quality exceeds these minimum standards shall be considered to conform.

.3 Should the Contract Documents conflict with specified reference standards or specifications the General Conditions of the Contract shall govern.

.4 Where reference is made to manufacturer's directions, instructions or specifications they shall include full information on storing, handling, preparing, mixing, installing, erecting, applying, or other matters concerning the materials pertinent to their use and their relationship to materials with which they are incorporated and written to suit this specific project.

.5 Have a copy of each code, standard and specification, and manufacturer's directions, instructions and specifications, to which reference is made in this Project Manual, always available at construction site, when requested by the Departmental Representative.

.6 Standards, specifications, associations, and regulatory bodies are generally referred to throughout the Project Manual by their abbreviated designations. These are:

AABC	Associated Air Balance Council
ACI	American Concrete Institute
AMCA	Air Moving & Air Conditioning Assoc.
ANSI	American National Standards Institute
ARI	Air Conditioning & Refrigeration Institute
ASTM	American Society for Testing and Materials

ASHRAE	American Society of Heating, Refrigeration & Air Conditioning Engineers
CGSB	Canadian General Standards Board
CPMA	Canadian Paint Manufacturers Association
CSA	Canadian Standards Association
CSSB	Canadian Sheet Building Institute
DTIR	Department of Transportation and Infrastructure Renewal Province of Nova Scotia
IAO	Insurers Advisory Organization
NAAMM	National Association of Architectural Metal Manufacturers
NBCC	National Building Code of Canada
NFPA	National Fire Protection Association
NRC	National Research Council, Canada
CANS	Construction Association of Nova Scotia
SMACNA	Sheet Metal & Air-Conditioning Contractors National Association
ULC	Underwriters Laboratories of Canada

1.3 AFFIDAVITS

.1 Submit affidavits which are required in other Sections of the Project Manual.

.2 Submit affidavits in duplicate and signed and notarized by a responsible officer of the certifying company.

.3 For Work incorporating structural, mechanical and electrical design validation, affix seal of design engineer registered to practice in Nova Scotia and who is a specialist in the applicable Work.

1.4 PROJECT MANUAL

.1 Sections of the Project Manual are numbered in conformance with the Master List of Section Titles and Numbers, Master Format 2010, published jointly by Construction Specifications Canada. Sections are arranged in their standard 50 Division format.

.2 Sections are written as units of the Work which have been assigned numbers in conformance with the CSC/CSI system. They are arranged in sequence for this Manual. Gaps in the order of numerical sequence do not indicate that a section has been inadvertently omitted from this Project Manual, but rather, that a section is not required for completion of the Work.

.3 Sections are not intended to identify absolute contractual limits between Subcontractors, nor between the Contractor and his Subcontractors. The Contractor shall organize division of labour and supply of the materials essential to complete the Work in all its parts and provide a total enclosure and protection from weather of interior spaces.

.4 Wherever in the Contract Documents the word “provide” is used in any form, it shall mean that the Work concerned shall include both supply and installation of the products required for completion of that part of the Work.

1.5 DESCRIPTION OF WORK INCLUDED

.1 Work of this Contract comprises the following additions and alterations to room 523 at the Katherine Ellis Laboratory Building at the Bedford Institute of Oceanography in Dartmouth, NS.

.2 Work is to include the installation of a new hydrofluoric acid (HF) VAV fume hood with associated PVC ducting and laboratory air valve in room 523.

.3 Work is to include the complete upgrade of room 523 from the existing constant air volume laboratory airflow control system to a variable air flow (VAV) laboratory airflow control system.

.4 Upgrading the room to VAV includes the replacement of 3 existing laboratory air valves (2 supply, 1 general exhaust) and upgrading the C2 digital kits for the two existing fume hood air valves. Control of the new fume hood, air valves, and existing fume hoods is to be fully integrated.

.5 Upgrading the room to VAV also includes providing fume hood VAV monitors, sash sensors, and zone presence sensors for the two existing hoods and the new HF fume hood.

1.6 CODES STANDARDS

.1 Meet or exceed requirements of:

.1 contract documents,

.2 specified standards, codes and referenced documents.

1.7 TOLERANCES

.1 Unless acceptable tolerances are otherwise specified in a Section:

.1 “Plumb and level” shall mean plumb or level within 3mm in 3m.
.2 “Square” shall mean not in excess of 10 seconds less or greater than 90.
.3 “Straight” shall mean within 3mm under a 3m long straightedge.

1.8 SUBMITTALS

.1 Refer to Section 01 33 00 - Submittal Procedures

1.9 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy each of following:

.1 Contract drawings.
.2 Project Manual.
.3 Addenda.
.4 Reviewed shop drawings.
.5 Change Orders.
.6 Other modifications to Contract.
.7 Field test reports.
.8 Copy of approved work schedule.
.9 Manufacturers’ installation and application instructions.

.10 List of outstanding shop drawings
.11 Health and Safety Plan and other safety related documents.

1.10 TEMPORARY FACILITIES

.1 Include in the work construction and temporary facilities required as construction aids or by jurisdictional authorities, or as otherwise specified. Install to meet needs of construction as Work progresses. Maintain construction and temporary facilities during use, relocate them as required by the Work, remove them at completion of need and make good adjacent Work and property affected by their installation.

.2 Construct temporary Work of new materials unless use of previously -used materials is approved prior to commencement of Work.

.3 Ensure that structural, mechanical, and electrical characteristics of temporary facilities are suitable and adequate for use intended. Be responsible that no harm is caused to persons and property by failure of temporary facilities because of placing, location, stability, protection, structural sufficiency, removal, or any other cause. Provide for any fees or charges for shutting down, restarting or modifying electrical, mechanical or fire protection services required to complete the work.

.4 Power (except for heating and welding) is available at site during construction**.**

.5 Facilities Manager will provide assigned sanitary facilities for Workers on the work site. The Facilities Manager may at any time revoke these permissions should they deem that the facilities are not being used appropriately. At that point, the Contractor shall be responsible to install temporary facilities and maintain in appropriate condition, and bear all associated costs.

.6 Facilities:

.1 Contractor's Field Office:
.1 Provide temporary furnished office and facilities for accommodating site project meetings as required for the Work.
.2 Storage Sheds:
.1 Erect secure weathertight sheds in which to store construction materials that require protection from the elements. Include construction and operating hardware, with security locks, as required.
.2 Build with floors clear of grade and so that no damage is suffered by stored materials from flooding.
.3 Install lighting in storage areas and heat in those storage areas containing materials damaged by low temperature.
.4 Separate storage of painter's materials and tools from other storage areas.
.5 Locate all sheds where directed.
.6 Each Subcontractor shall provide his own shed, including heat and light, for his employees, and his storage.

1.11 WORK SCHEDULE

.1 Provide at start-up meeting or within ten (10) Working Days after award of contract, whichever occurs first, proposed schedule showing anticipated progress stages and final completion of work within time period required by Contract documents.

.1 The schedule shall be based upon a detailed, complete and itemized work breakdown structure of the Work. All construction resources including time duration as well as labour, equipment and material costs etc. will be allocated to all relevant components of the work breakdown structure.

.2 The proposed construction schedule will be submitted to the Departmental Representative for approval**.**

.3 The construction schedule will form the baseline for comparison with proposed schedules for calculating extensions of Contract Time, if applicable.

.4 Schedule will show dates for submission of shop drawings, material lists and samples.

.5 Schedule will show dates for delivery of items of equipment and materials such as major mechanical equipment, major electrical equipment, etc.

.6 Schedule will show confirmation of date of Substantial Performance

.7 Schedule will show final completion date within time period required by Contract documents.

.8 Schedule will show dates for commissioning and functional performance testing.

.2 Interim reviews of work progress based on work schedule will be conducted as decided by Departmental Representative and schedule updated by Contractor in conjunction with and to approval of the Departmental Representative.

.1 As construction proceeds, record the progress for each of the items in the work breakdown structure, including, but not limited to, document submissions, deliverables, items in schedule of values, and milestone deadlines.

.2 The above schedule information is to be submitted monthly or more often if necessary.

1.12 PRODUCT REQUIREMENT

.1 Products specified by manufacturer's name, brand name or catalogue reference shall be the basis of the bid and shall be supplied for the Work without exception in any detail, subject to allowable substitutions as specified.

.2 Where several proprietary products are specified, any one of the several will be acceptable.

.3 For products specified by reference standards, the onus shall be on the supplier to establish that such products meet reference standard requirements. The Departmental Representative may require affidavits from the supplier, or inspection and testing at the expense of the supplier, or both, to prove compliance. Products exceeding minimum requirements established by reference standards will be accepted for the Work if such products are compatible with and harmless to Work with which they are incorporated.

1.13 SUBSTITUTION OF PRODUCTS

.1 Products substituted for those specified or approved, or both, shall be permitted only if the listed product cannot be delivered to maintain construction schedule and if the delay is caused by conditions beyond the Contractor's control.

.2 The contractor shall obtain approval for substitutions. Application for approval of substitutions shall be made only by the Contractor. Applications for substituted Work shall be in accordance with procedures established for changes in the work.

.3 Submit, with request for substitution, documentary evidence that substituted products are

equal to, or superior to, approved products, and a comparison of price and delivery factors for both specified or approved products, and proposed substitute.

1.14 PROGRESSIVE CLEANING

.1 Maintain the Work in tidy condition, free from accumulation of waste products and debris, other than that caused by the Departmental Representative or other Contractors.

.2 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.3 Remove waste material and debris from the site and deposit in waste container at the end of each working day.

.4 Clean interior areas prior to start of finish work, maintain areas free of dust and other contaminants during finishing operations.

1.15 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

.1 Refer to Section 01 74 21 - Waste Management and Disposal.

1.16 PARTIAL OCCUPANCY OR USE

.1 Occupant's Use of Existing Building:

.1 The existing building will remain in full use and occupancy throughout the duration of construction of the new Work.

.2 Provide and maintain continuation of fire protection in existing building.

.3 Maintain existing exits and ensure that proper and safe means of egress from all parts of existing building to open spaces are provided at all times to the approval of jurisdictional authorities. Mark, install exit lights, and illuminate temporary means of egress.

.2 Coordinate Work in existing building with Facility's Administration, so not to inconvenience the occupants or in any manner hinder building use.

.3 Give Facility's Administration 48 hours notice of intention to Commence Work in an occupied room or area of existing building.

.4 Execute Work as quietly as possible in and around existing building during times building is occupied. Schedule noisy operation with Facility's Administration to achieve least disturbance to occupants.

.5 Schedule activities which may result in odor dispersal throughout occupied areas of building for unoccupied times. Consider direction of prevailing wind, location of fans and air handling equipment to minimize odor dispersal throughout the building.

1.17 COST BREAKDOWN

1. Before submitting first progress claim submit breakdown of Contract price in detail as directed by Departmental Representative and aggregating contract price. After approval by

Departmental Representative cost breakdown will be used as basis for progress payment.

1.18 USE OF SITE

.1 Ensure that construction personnel perform Work in existing building only as required under the Contract; and that they do not use it as access to Work areas, except for Work in existing building, or for other purposes.

.2 Construction personnel shall use areas of the existing building for their purposes only as directed and only while Work is in progress. Prohibit lounging and smoking in assigned areas. Keep assigned areas clean under Work of Contract, and return them to an "as was" condition at completion of construction. Make good damage to building, fixtures and fittings caused during use by construction personnel by replacement with new Work. Include cost of installation and making good of other Work thereby affected in replacement.

.3 Do not obstruct existing exits.

1.19 PRECONSTRUCTION AND PROJECT MEETINGS

.1 Departmental Representative will arrange project meetings and assume responsibility for setting times and recording and distributing minutes.

1.20 WARRANTY MEETINGS

.1 The contractor and sub-contractors that he feels are required, shall meet with the Departmental Representative on a quarterly basis (4 times) during the warranty period to review any and all deficient, maintenance and/or warranty work.

.2 Date of warranty meetings to be established by the Departmental Representative at substantial performance.

.3 These meetings shall be separate and in addition to any other meetings with the contractor to respond to specific problems or concern with the project during the warranty period.

.4 Minutes of all such meetings are to be prepared by the contractor and issued to all related parties.

1.21 SETTING OUT OF WORK

.1 Assume full responsibility for and execute complete layout of work.

.2 Provide devices needed to lay out and construct work.

1.22 CONCEALMENT

.1 Conceal pipes, ducts and wiring affected by Work in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.23 CUTTING AND PATCHING

.1 Obtain Departmental Representative's approval before cutting, boring or sleeving load-

bearing members.

.2 Cut and patch as required to make work fit.

.3 Make cuts with clean, true, smooth edges.

.4 Where new work connects with existing and where existing work is altered, cut, patch and make good to match existing work.

.5 Make good materials, and prepare surfaces and refinish all finished surfaces damaged, marred, replaced, or otherwise remedied in the existing building.

.6 Finish new surfaces flush with existing surfaces. Make junctions between existing and new work, or at replaced or remedial Work undetectable under conditions of normal vision. Make surfaces adjacent to one another of the same material, unit sizes, colour, and texture. If this is impossible, make a proposal of intended method of making good for approval, before installation.

1.24 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

.1 Execute work with least possible interference or disturbance to occupants, public and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

.2 Provide temporary dust screens, barriers, warning signs in locations where renovation and alteration work is adjacent to areas used by public or government staff.

1.25 PROJECT SITE SECURITY

.1 Where security has been reduced by work of Contract, provide temporary means to maintain security.

.2 Maintain security of construction site by control of access.

.3 Maintain security at all times construction is shut down because of a strike or a lockout.

1.26 SECURITY REGULATIONS

.1 Perform Work in conformance to the security regulations of the facility as directed by the Departmental Representative. Subject to more stringent regulations imposed by the facility administrator conform to the following:

.1 Maintain an accurate inventory of tools and equipment at all times. When Work is not in progress all tools and equipment shall be stored in a secure place. Report loss of any tools or equipment immediately.

.2 Workers shall be prepared to identify themselves at any time they are requested while on the work site.

.3 Restrict workers to only their particular areas of work where they shall neither converse nor fraternize with the occupants of the facility.

.4 Arrange for suitable escort of personnel at the site if required by facility's administrator.

.5 Facility's administrator will issue keys only to Contractor's representative when required and when requested by the Departmental Representative. Return such keys to the administrator by the same person who obtained them at the completion of their need.

1.27 ADDITIONAL DRAWINGS

.1 Departmental Representative may furnish additional drawings for clarification. These additional drawings have same meaning and intent as if they were included with plans referred to in Contract documents.

1.28 PROJECT IDENTIFICATION

.1 Place only signs and notices regarding safety, caution, or instructions on or near site.

1.29 RECORD DOCUMENTS

.1 Record information on a set of opaque drawings, provided by Departmental Representative.

.2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Provide information concurrently with construction progress. Do not conceal work until required information is recorded.

.4 Specifications: legibly mark each item to record actual construction, including manufacturer, trade name, and catalog number of each project actually installed.

.5 Other Documents: Maintain manufacturer's and required by individual specification sections.

1.30 OPERATION AND MAINTENANCE MANUALS

.1 Submit two (2) paper copies and three (3) electronic copies (PDF format on CD) of complete O&M Manuals. Submit in final form at times indicated in Section 01 70 00 - Contract Closeout. PDF's shall NOT contain scanned images or text.

.2 Paper Format: Organize data in the form of an instructional manual in D-ring binder of commercial quality, 8½" x 11" maximum ring size of 3", with contents not to exceed 75% of the size of each volume.

.3 Electronic Format: Submit duplicate copies of O & M Manuals as referenced above with all data organized as per the paper copy and in PDF format with the exception of audio and video files which will remain in native format.

.4 Cover: Identify binder and CD with typed or printed title "Project Record Documents"; list title of Project, identify subject matter of contents and volume identifier.

.5 Arrange content by systems under Section numbers and sequence of Table of Contents.

.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

.7 Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

.8 For Each Product or System: List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.9 Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

Part 2 Products

2.1 NOT USED

.1 Not Used

Part 3 Execution

3.1 NOT USED

.1 Not Used

Sample Form of Warranty

Date:_____, 20___

Client: _____
Project: _____

_____

_____

_____

Warranty: _____
(Title of Work)

We hereby undertake to warrant all materials supplied and installed under our Contracts and include the providing of necessary materials and labour to cover the result of faulty materials or workmanship. Upon written notification from Client or the Departmental Representative that the above work is defective any repair or replacement work required shall be to the Departmental Representative's satisfaction at no cost to the Client. This warranty shall not apply to defects caused by the work of others, maltreatment of materials, negligence or Acts of God. This Warranty shall remain in effect for the following period [_____] years from the date of Substantial Performance of the Work as certified by the Departmental Representative and approved by the Departmental Representative.

Signature: _____

Authorized
Signing Officer: _____

Firm: _____

Address: _____

_____

_____

END OF SECTION

Part 1 General

1.1 SITE AND LOCATION

.1 The location of work is at the Ellis Laboratory Building at the Bedford Institute of Oceanography, 1 Challenger Drive, Dartmouth, N.S.

1.2 EXAMINATION OF ALL DRAWINGS AND SPECIFICATIONS

.1 The Contractor shall examine all drawings and specifications in order to determine the full Scope of this Work.

.2 It is the intention of the drawings and specifications to provide for the work installed complete and ready for the purpose for which they are intended.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

.1 The work of this Project, is as described in the attached specifications and drawings.

.2 A Departmental Representative will act as a point person and assist with the coordination of work

.3 The Contractor shall, within seven (7) calendar days after notification of acceptance, work with Engineering Services to develop a detailed Construction Schedule.

.4 Demolition to be completed by this contractor and includes the removal of the existing casework and countertop in the proposed location of the new HF fume hood and to turn over to Departmental Representative.

.5 Work is to include the installation of a new hydrofluoric acid (HF) VAV fume hood with associated PVC ducting and laboratory air valve in room 523.

.6 Contractor will be responsible for purchasing, all handling, installing, connecting, testing, commissioning, etc. of the new fume hood.

.7 Work is to include the complete upgrade of room 523 from the existing constant air volume laboratory airflow control system to a variable air flow (VAV) laboratory airflow control system.

.8 Upgrading the room to VAV includes the replacement of 3 existing laboratory air valves (2 supply, 1 general exhaust) and upgrading the C2 digital kits for the two existing fume hood air valves. Control of the new fume hood, air valves, and existing fume hoods is to be fully integrated.

.9 Upgrading the room to VAV also includes providing fume hood VAV monitors, sash sensors, and zone presence sensors for the two existing hoods and the new HF fume hood.

1.4 CONTRACTOR USE OF PREMISES

.1 Contractor shall limit use of premises for work, for storage, and for access, to allow:

.1 Building occupancy

.2 Public usage

.2 Coordinate use of premises under direction of Departmental Representative.

.3 Because adjacent areas will be occupied during construction, the General Contractor will need to plan the timing of some major noisy or intrusive activities through consultation with Multi-disciplinary Team (MDT) and Nova Scotia Health Authority Project coordinator.

1.5 BUILDING OCCUPANCY

.1 The building occupants will occupy premises during entire construction period for execution of normal operations.

.2 Cooperate with Departmental Representative in scheduling operations to minimize conflict and to facilitate occupant usage.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

1.2 ACCESS AND EGRESS

.1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

1.3 USE OF SITE AND FACILITIES

.1 Air handling systems serving the lab run 24 hours per day. They are shut down once a month (first Wednesday of the month) for a 3 or 4 hr period. Any tie-ins to the main ducting systems will have to be done during this time.

.2 Maintain existing services to building and provide for personnel and vehicle access.

.3 Where security is reduced by work provide temporary means to maintain security.

.4 Departmental Representative will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.

.5 Use only elevators, dumbwaiters, conveyors or escalators existing in building for moving workers and material.

.1 Protect walls of passenger elevators, to approval of Departmental Representative prior to use.

.2 Accept liability for damage, safety of equipment and overloading of existing equipment.

.6 Closures: protect work temporarily until permanent enclosures are completed.

1.4 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

.1 Execute work with least possible interference or disturbance to building operations occupants, public and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

1.5 EXISTING SERVICES

.1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.

.3 Provide for personnel pedestrian and vehicular traffic.

.4 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.6 SPECIAL REQUIREMENTS

.1 Paint and carpet public or Departmental Representative occupied areas Monday to Friday from 18:00 to 07:00 hours only and on Saturdays, Sundays, and statutory holidays.

.2 Carry out noise generating Work Monday to Friday from 18:00 to 07:00 hours and on Saturdays, Sundays and statutory holidays:.

.3 Submit schedule in accordance with Section 01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM) 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.

.4 Ensure that Contractor personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

.5 Keep within limits of work and avenues of ingress and egress.

.6 Ingress and egress of Contractor vehicles at site is limited to.

.7 Deliver materials outside of peak traffic hours 17:00 to 07:00 and 13:00 to 15:00 unless otherwise approved by Departmental Representative.

1.7 SECURITY CLEARANCES

.1 Personnel employed on this project will be subject to security check. Obtain clearance for each individual who will require to enter premises.

.2 Personnel will be checked daily at start of work shift and provided with pass which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.

.3 During the process of obtaining Contractor security clearances, contractors and sub-contractors will be escorted at all times by designated commissionaires, while working within the facility and for accessing the facility.

1.8 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions. Smoking is not allowed only in areas indicated .

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 This section specifies general requirements and procedures for Contractor's submissions of shop drawings and product data for review. Additional specific requirements for submissions are specified in individual sections.

.2 Do not proceed with work until relevant submissions are reviewed by the Departmental Representative.

.3 Contractor's responsibility for errors and omissions in submission is not relieved by the Departmental Representative's review of submissions.

.4 Notify the Departmental Representative, in writing, at time of submission identifying deviations from requirements of the Contract Documents stating reasons for deviations.

.5 Contractor's responsibility for deviations from requirements of Contract Documents is not relieved by the Departmental Representative's review of submission, unless the Departmental Representative gives written acceptance of specific deviations.

.6 Make any changes in submissions which the Departmental Representative may require consistent with the Contract Documents and re-submit as directed by the Departmental Representative.

.7 Notify the Departmental Representative, in writing, when re-submitting of any revisions other than those requested by the Departmental Representative.

1.2 SUBMISSION REQUIREMENT

.1 Coordinate each submission with requirements of work and Contract Documents. Individual submissions will not be reviewed until all related information is available.

.2 Allow ten (10) days for Departmental Representative's review of each submission.

.3 Accompany submissions with transmittal letter containing:

- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.
- .6 Submissions shall include:
  - .1 Date and revision dates.
  - .2 Project title and number
  - .3 Name and address of:
    - .1 Sub-Contractor
    - .2 Supplier
    - .3 Manufacturer

.4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions certification of field measurements and compliance with Contract Documents.

.5 After Departmental Representative's review, distribute copies.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Refer to CCDC 2 GC 3.11.

.2 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

.3 Submit shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in Provinces of Canada.

.4 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.5 Allow days for Departmental Representative's review of each submission.

.6 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.7 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.

.8 Accompany submissions with transmittal letter, in duplicate, containing:

- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

.9 Submissions include:

- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.

.3 Setting or erection details.
.4 Capacities.
.5 Performance characteristics.
.6 Standards.
.7 Operating weight.
.8 Wiring diagrams.
.9 Single line and schematic diagrams.
.10 Relationship to adjacent work.

.10 After Departmental Representative's review, distribute copies.

.11 Submit an electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.

.12 Submit an electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

.13 Submit an electronic copy of test reports for requirements requested in specification Sections and as requested by the Departmental Representative.

.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
.2 Testing must have been within 3 years of date of contract award for project.

.14 Submit an electronic copy of certificates for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
.2 Certificates must be dated after award of project contract complete with project name.

.15 Submit an electronic copy of manufacturer’s instructions for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.16 Submit an electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.17 Submit an electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

.18 Delete information not applicable to project.

.19 Supplement standard information to provide details applicable to project.

.20 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, transparency copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

.21 The review of shop drawings by the Departmental Representative is for sole purpose of ascertaining conformance with general concept.

.1 .1 This review shall not mean that the Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.

.2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Section 01 35 29.06 - Health and Safety Requirements.

1.2 REFERENCES

.1 Fire Protection Standards issued by Fire Protection Services of Human Resources Development Canada as follows:
- .1 FCC No. 301 Standard for Construction Operations.
- .2 FCC No. 302 Standard for Welding and Cutting.
- .3 FCC standards

1.3 DEFINITIONS

.1 Hot Work defined as:
- .1 Welding work
- .2 Cutting of materials by use of torch or other open flame devices
- .3 Grinding with equipment which produces sparks.
- .4 Use of open flame torches such as for roofing work.

1.4 SUBMITTALS

.1 Submit copy of Hot Work Procedures and sample of Hot Work permit to Departmental Representative for review, within [14] calendar days after contract award.

.2 Submit in accordance with Section 01 33 00 - Submittal Procedures.

1.5 FIRE SAFETY REQUIREMENTS

.1 Implement and follow fire safety measures during Work. Comply with following:
- .1 National Fire Code, 2010.
- .2 Fire Protection Standards FCC 301 and FCC 302.
- .3 Federal and Provincial Occupational Health and Safety Acts and Regulations.

.2 In event of conflict between any provisions of above authorities the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, Departmental Representative will advise on the course of action to be followed.

1.6 HOT WORK AUTHORIZATION

.1 Obtain Departmental Representative's written "Authorization to Proceed" before conducting any form of Hot Work on site.

.2 To obtain authorization submit to Departmental Representative:
- .1 Contractor's typewritten Hot Work Procedures to be followed on site as specified below.
- .2 Description of the type and frequency of Hot Work required.
- .3 Sample Hot Work Permit to be used.

.3 Upon review and confirmation that effective fire safety measures will be implemented and followed during performance of hot work, Departmental Representative will give authorization to proceed as follows:
- .1 Issue one written "Authorization to Proceed" covering the entire project for duration of work or;
- .2 Subdivide the work into pre-determined, individual activities, each activity requiring a separately written authorization to proceed.

.4 Requirement for individual authorization will be based on:
- .1 Nature or phasing of work;
- .2 Risk to Facility operations;
- .3 Quantity of various trades needing to perform hot work on project or;
- .4 Other situation deemed neccessary by Departmental Representative to ensure fire safety on premises.

.5 Do not perform any Hot Work until receipt of Departmental Representative's written "Authorization to Proceed" for that portion of work.

.6 In tenant occupied Facility, coordinate performance of Hot Work with Facility Manager through the Departmental Representative. When directed, perform Hot Work only during non-operative hours of the Facility. Follow Departmental Representative's directives in this regard.

1.7 HOT WORK PROCEDURES

.1 Develop and implement safety procedures and work practices to be followed during the performance of Hot Work.

.2 Hot Work Procedures to include:
- .1 Requirement to perform hazard assessment of site and immediate work area beforehand for each hot work event in accordance with Safety Plan specified in section [01 35 28].
- .2 Use of a Hot Work Permit system with individually written permit issued by Contractor's Superintendent to specific worker or subcontractor granting permission to proceed with Hot Work.
- .3 Permit required for each Hot Work event.
- .4 Designation of a person on site as a Fire Safety Watcher responsible to conduct a fire safety watch for a minimum duration of [30] minutes immediately following the completion of the Hot Work.
- .5 Compliance with fire safety codes, standards and occupational health and safety regulations specified.
- .6 Site specific rules and procedures in force at the site as provided by the Facility Manager.

.3 Generic procedures, if used, must be edited and supplemented with pertinent information tailored to reflect specific project conditions. Label document as being the Hot Work Procedures for this contract.

.4 Procedures shall clearly establish responsibilities of:
- .1 Worker performing hot work,
- .2 Person issuing the Hot Work Permit,
- .3 Fire Safety Watcher,
- .4 Subcontractor(s) and Contractor.

.5 Brief all workers and subcontractors on Hot Work Procedures and of Permit system. Stringently enforce compliance.

.6 Failure to comply with fire safety procedures may result in the issue of a Non-Compliance notification as specified in Section 01 35 29.06 - Health and Safety Requirements.

1.8 HOT WORK PERMIT

.1 Hot Work Permit to include the following:

- .1 Project name and project number;
- .2 Building name and specific room or area where hot work will be performed;
- .3 Date of issue;
- .4 Description of hot work type needed;
- .5 Special precautions to be followed, including type of fire extinguisher needed;
- .6 Name and signature of permit issuer.
- .7 Name of worker to which the permit is issued.
- .8 Permit validity period not to exceed 8 hours. Indicate start time/date and termination time/date.
- .9 Worker's signature with time/date of hot work completion.
- .10 Stipulated time period of safety watch.
- .11 Fire Safety Officer's signature with time/date.

.2 Permit to be typewritten form. Industry Standard forms shall only be used if all data specified above is included on form.

.3 Each Hot Work Permit to be completed in full, signed and returned to Contractor's Superintendent for safe keeping on site.

1.9 FIRE PROTECTION AND ALARM SYSTEMS

.1 Fire protection and alarm systems shall not be:
- .1 Obstructed.
- .2 Shut-off, unless approved by Departmental Representative.

.3 Left inactive at the end of a working day or shift.

.2 Do not use fire hydrants, standpipes and hose systems for purposes other than fire fighting.

.3 Costs incurred, from the fire department, Facility owner [and tenants], resulting from negligently setting off false alarms will be charged to the Contractor in the form of financial progress payment reductions and holdback assessments against the Contract.

1.10 DOCUMENTS ON SITE

.1 Keep Hot Work Permits and Hazard assessment documentation on site for duration of Work.

.2 Upon request, make available to Departmental Representative or to authorized safety Representative for inspection.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Section 01 35 29.06 - Health and Safety Requirements.

1.2 REFERENCES

.1 CSA C22.1-2012 - Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.

.2 CSA C22.3 No. 1-2010 - Overhead Systems.

.3 CSA C22.3 No. 7-2010 - Underground Systems.

.4 COSH: Canada Occupational Health and Safety Regulations made under Part II of the Canada Labour Code.

1.3 DEFINITIONS

.1 Electrical Facility: means any system, equipment, device, apparatus, wiring, conductor, assembly or part thereof that is used for the generation, transformation, transmission, distribution, storage, control, measurement or utilization of electrical energy, and that has an amperage and voltage that is dangerous to persons.

.2 Guarantee of Isolation: means a guarantee by a competent person in control or in charge that a particular facility or equipment has been isolated.

.3 De-energize: in the electrical sense, that a piece of equipment is isolated and grounded, e.g. if the equipment is not grounded, it cannot be considered de-energized (DEAD).

.4 Guarded: means that an equipment or facility is covered, shielded, fenced, enclosed, inaccessible by location, or otherwise protected in a manner that, to the extent that is reasonably practicable, will prevent or reduce danger to any person who might touch or go near such item.

.5 Isolate: means that an electrical facility, mechanical equipment or machinery is separated or disconnected from every source of electrical, mechanical, hydraulic, pneumatic or other kind of energy that is capable of making it dangerous.

.6 Live/alive: means that an electrical facility produces, contains, stores or is electrically connected to a source of alternating or direct current of an amperage and voltage that is dangerous or contains any hydraulic, pneumatic or other kind of energy that is capable of making the facility dangerous to persons.

1.4 COMPLIANCE REQUIREMENTS

.1 Comply with the following in regards to isolation and lockout of electrical facilities and equipment:

.1 Canadian Electrical Code
.2 Federal and Provincial Occupational Health and Safety Acts and Regulations.
.3 Regulations and code of practise as applicable to mechnical equipment or other machinery being de-energized.
.4 Procedures specified herein.

.2 In event of conflict between any provisions of above authorities the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, Departmental Representative will advise on the course of action to be followed.

1.5 SUBMITTALS

.1 Submit copy of proposed lockout procedures and sample of [lockout permit] [or] [lockout tags] to Departmental Representative for review, within [14] calendar days after contract award.

.2 Submit in accordance with section 01 33 00 - Submittal Procedures.

1.6 ISOLATION OF EXISTING SERVICES

.1 Obtain Departmental Representative's written authorization prior to working on existing live or active electrical facilities and equipment and before proceeding with isolation of such item.

.2 To obtain authorization, submit to Departmental Representative the following documentation:
.1 Written request to isolate the particular service or facility and;
.2 Copy of Contractor's Lockout Procedures.

.3 Make a Request for Isolation for each event, unless directed otherwise by Departmental Representative, as follows:
.1 Fill-out standard form in current use at the Facility as provided by Departmental Representative or;
.2 Where no form exist, make written request indicating:
.1 The equipment, system or service to be isolated and it's location;
.2 Duration of isolation period (ie: start time & date and completion time & date).
.3 Voltage of service feed to system or equipment being isolated.
.4 Name of person making the request.

.4 Do not proceed with isolation until receipt of written notification from Departmental Representative granting the Isolation Request and authorizating to proceed with the work.
.1 Note that Departmental Representative may designate another person at the Facility being authorized to grant the Isolation Request.

.5 Conduct safe, orderly shut down of equipment or facility. De-energize, isolate and lockout power and other sources of energy feeding the equipment or facility.

.6 Determine in advance, as much as possible, in cooperation with the Departmental

Representative, the type and frequency of situations which will require isolation of existing services.

.7 Plan and schedule shut down of existing services in consultation with the Departmental Representative and the Facility Manager. Minimize impact and downtime of Facility operations. Follow Departmental Representative's directives in this regard.

.8 Conduct hazard assessment as part of the process in accordance with health and safety requirements specified Section 01 35 29.06 - Health and Safety Requirements.

1.7 LOCKOUTS

.1 De-energize, isolate and lockout electrical facility, mechanical equipment and machinery from all potential sources of energy prior to working on such items.

.2 Develop and implement clear and specific lockout procedures to be followed as part of the Work.

.3 Prepare typed written Lockout Procedures describing safe work practices, procedures, worker responsibilities and sequence of activities to be followed on site by workforce to safely isolate an active piece of equipment or electrical facility and effectively lockout and tagout it's sources of energy.

.4 Include as part of the Lockout Procedures a system of lockout permits managed by Contractor's Superintendent or other qualified person designated by him/her as being "in-charge" at the site.

- .1 A lockout permit shall be issued to specific worker providing a Guarantee of Isolation before each event when work must be performed on a live equipment or electrical facility.
- .2 Duties of person managing the permit system to include:
  - .1 Issuance of permits and lockout tags to workers.
  - .2 Determining permit duration.
  - .3 Maintaining record of permits and tags issued.
  - .4 Making a Request for Isolation to Departmental Representative when required as specified above.
  - .5 Designating a Safety Watcher, when one is required based on type of work.
  - .6 Ensuring equipment or facility has been properly isolated.
  - .7 Collecting and safekeeping lockout tags returned by workers as a record of the event.

.5 Clearly establish, describe and allocate responsibilities of:

- .1 Workers.
- .2 Person managing the lockout permit system.
- .3 Safety Watcher.
- .4 Subcontractor(s) and General Contractor.

.6 Generic procedures, if used, must be edited and supplemented with pertinent information

to reflect specific project requirements.

.1 Incorporate site specific rules and procedures in force at site as provided by Facility Manager through the Departmental Representative.

.2 Clearly label the document as being the Lockout procedures applicable to work of this contract.

.7 Use energy isolation lockout devices specifically designed and appropriate for type of facility or equipment being locked out.

.8 Use industry standard lockout tags.

.9 Provide appropriate safety grounding and guards as required.

1.8 CONFORMANCE

.1 Brief all workers and subcontractors on requirements of this section. Stringently enforce use and compliance.

.2 Failure to follow lockouts procedures specified herein may result in the issuance of a Non-Compliance notification as specified in section 01 35 29.06 - Health and Safety Requirements.

1.9 DOCUMENTS ON SITE

.1 Post Lockout Procedures on site in common location for viewing by workers.

.2 Keep copies of Request for Isolation forms and lockout permits and tags issued to workers on site for full duration of Work.

.3 Upon request, make available to Departmental Representative or to authorized safety Representative for inspection.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.3 Province of Nova Scotia

.1 Occupational Health and Safety Act, S.N.S. 1996.

1.2 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:

.1 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.

.3 Submit copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative and/or authority having jurisdiction, weekly.

.4 Submit copies of reports or directions issued by Provincial health and safety inspectors.

.5 Submit copies of incident and accident reports.

.6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within days after receipt of comments from Departmental Representative.

.7 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

.8 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.

.9 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.3 FILING OF NOTICE

.1 File Notice of Project with Provincial Territorial authorities prior to beginning of Work.

1.4 SAFETY MEASURES

.1 Observe and enforce construction safety measures required by National Building Code, 2010, Part 8, Canada Labour Code, Nova Scotia Occupational Health and Safety Act and Regulations, Guidelines and Codes of Practice, Worker’s Compensation Board and municipal statues and authorities.

.2 In event of conflict between any provisions of above authorities, the most stringent provision governs.

.3 Occupational Health and Safety Act and regulations, guidelines and codes of practice, stipulate standard equipment applicable to construction sites such as protective clothing, safety hats and boots, gloves, eye protection.

.4 Provide and maintain first aid equipment, supplies and medications appropriate to the work and its location in accordance with the First Aid Regulations. Obtain and implement recommendations from Occupational Health and Safety Division specified to the project work site.

.5 Comply with all applicable safety guidelines included in the Nova Scotia Health Authority Safety & Contractor's Handbook.

1.5 GENERAL REQUIREMENTS

.1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.

.2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.6 RESPONSIBILITY

.1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

.2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.7 COMPLIANCE REQUIREMENTS

.1 Comply with Occupational Health and Safety Act, Occupational Safety General Regulations, N.S. Reg.

.2 Comply with Occupational Health and Safety Regulations, 1996.

.3 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.8 POTENTIAL HAZARDS

.1 Potential hazards that exist on site for this project include:

.1 Potential for slips, trips and falls;

.2 Space constraints due to existing equipment and conditions;

.3 Ongoing laboratory usage in adjacent rooms involving chemical experiments and fume hoods.

.2 Hazardous materials used or stored at BIO include:

.1 Petroleum products;

.2 Glycol;

.3 Halocarbons;

.4 Asbestos Containing Materials;

.5 Maintenance and Operation Chemicals;

.6 Laboratory Chemicals.

.3 The Contractor shall become familiar with all potential hazards associated with the work, and shall take necessary measures to avoid injury or damage of any kind.

.4 All workers shall be trained and be familiar with the Health and Safety Plan and the use of personal protective equipment.

.5 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

1.9 HEALTH AND SAFETY CO-ORDINATOR

.1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:

.1 Have site-related working experience specific to activities associated with.

.2 Have working knowledge of occupational safety and health regulations.

.3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.

.4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.

.5 Be on site during execution of Work and report directly to and be under direction of Registered Occupational Hygienist Certified Industrial Hygienist and or site supervisor.

1.10 POSTING OF DOCUMENTS

.1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province Territory having jurisdiction, and in consultation with Departmental Representative.

1.11 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.

.2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.

.3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.12 OVERLOADING

.1 Ensure no part of work is subjected to load or procedure which will endanger its safety or the safety of project personnel.

1.14 HANDLING AND TRANSPORTATION OF DANGEROUS GOODS

.1 Observe and enforce all measures required by the regulatory agencies including but not limited to Environment Canada, Nova Scotia Department of Environment, and Transportation Canada.

.2 Most current regulatory Guidelines and Acts will apply to the work.

.3 In the case of any conflict, the more stringent requirements will apply.

1.15 TESTING AND MONITORING

.1 Test and monitor for hazardous conditions, as required to demonstrate compliance with provincial regulations.

.2 If multiple locations are being worked simultaneously, provide monitoring at all locations where work is being carried out, including providing additional monitoring instruments.

1.16 PERSONAL PROTECTIVE EQUIPMENT

.1 Use personal protection equipment as specified.

.2 Training of workers in the proper use, fitting inspection and storage of personal protective equipment shall be done prior to use of the equipment.

1.17 SANITATION/DECONTAMINATION PRACTICES

.1 After each use, all disposable protective equipment shall be collected in a dedicated container for disposal.

.2 All respiratory equipment shall be decontaminated daily after use.

.3 All tools, pumps and equipment used during clean-up should be dedicated to the handling of contaminants and labelled as such and thoroughly decontaminated at the completion of the project.

.4 Contaminated work clothing shall not be worn outside of regulated areas.

.5 Workers shall wash their hands and exposed skin before eating, drinking, smoking or using toilet facilities during the work shift, and at the completion of a work shift.

.6 Food and drink shall not be permitted in regulated areas.

1.18 WORK PRACTICES AND ENGINEERING CONTROLS

.1 Regulated Areas:

1. Access to work areas shall be regulated and limited to authorized persons. A daily roster shall be kept of persons entering such areas.
2. Handling Contaminants and General Work Practices:
    1. Transportation and handling of contaminants applicable local, provincial and federal regulations.
    2. Emergency respiratory equipment shall be located in readily accessible locations which will remain minimally contaminated with contaminants in an emergency.
    3. Containers and systems shall be handled and opened with care. Approved protective clothing shall be worn by all employees engaged in regulated areas.
    4. All wastes and residues containing contaminants shall be collected in

appropriate containers.

1.19 RECORD KEEPING

.1 All activities associated with Health and Safety shall be recorded daily in a bound notebook. Include as a minimum: activity date, time, location of occurrence, mitigation action taken and results. Records shall be assessed by the Departmental Representative and Hazardous Materials Departmental Representative.

1.20 OPEN FLAMES, SPARKS, EXPLOSION PROTECTION

.1 Keep open flames and sparks to a minimum. When flame or sparks are required, follow proper procedures to prevent fire or explosion.

1.21 VENTILATION OF WORKING AREAS

.1 There will be potential for accumulation of hazardous chemical agents in the working area. Vent to atmosphere, or otherwise control, in accordance with environmental regulations, the vapours in building to avoid nuisance, health, safety or other hazards to the satisfaction of provincial regulatory requirements.

1.22 SUSPENSION OF ACTIVITIES

.1 Exposure to contaminants shall be controlled so that no worker is exposed to contaminants at a concentration greater than the Time Weighted Average (TWA) concentration for the contaminant, for up to a 10 hour workday, 40 hour work week.

.2 The Contractor will halt activities immediately during unsafe conditions. All costs relating to suspension of work for Contractor's failure to maintain Health and Safety procedures shall be borne by the Contractor.

.3 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.

1.2 REFERENCES

.1 Canadian Construction Documents Committee (CCDC)

.1 CCDC 2-94, Stipulated Price Contract.

1.3 INSPECTION

.1 Refer to CCDC 2, GC 2.3.

.2 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.3 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.

.4 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

.5 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

1.4 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.

.2 Provide equipment required for executing inspection and testing by appointed agencies.

.3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and re-inspection.

1.5 ACCESS TO WORK

.1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

1.6 PROCEDURES

.1 Notify appropriate agency, Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

.3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.7 REJECTED WORK

.1 Refer to CCDC, GC 2.4.

.2 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

.3 Make good other Contractor's work damaged by such removals or replacements promptly.

.4 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Departmental Representative will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

1.8 REPORTS

.1 Submit 4 copies of inspection and test reports to Departmental Representative.

.2 Provide copies to subcontractor of work being inspected or tested manufacturer or fabricator of material being inspected or tested.

1.9 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

.2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Departmental Representative and may be authorized as recoverable.

1.10 MOCK-UPS

.1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.

.2 Construct in locations acceptable to Departmental Representative as specified in specific Section.

.3 Prepare mock-ups for Departmental Representative's review with reasonable promptness and in orderly sequence, to not cause delays in Work.

.4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.5 Remove mock-up at conclusion of Work or when acceptable to Departmental Representative.

1.11 MILL TESTS

.1 Submit mill test certificates as requested required of specification Sections.

1.12 EQUIPMENT AND SYSTEMS

.1 Submit Testing, Adjustment and Balancing (TAB) reports for mechanical, electrical and building equipment systems in accordance with Section 23 05 93 – Testing Adjusting and Balancing for HVAC.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Construction Documents Committee (CCDC)

.1 CCDC 2-94, Stipulated Price Contract.

1.2 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including other than that caused by Departmental Representative or other Contractors.

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.

.3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.4 Provide on-site containers for collection of waste materials and debris.

.5 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Waste Management and Disposal.

.6 Dispose of waste materials and debris at designated dumping areas.

.7 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.

.8 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

.9 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

.10 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

.11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.3 FINAL CLEANING

.1 Refer to CCDC 2, GC 3.14.

.2 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.3 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

.4 Prior to final review remove surplus products, tools, construction machinery and equipment.

.5 Remove waste products and debris other than including that caused by Departmental Representative or other Contractors.

.6 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.

.7 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.8 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

.9 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.

.10 Clean lighting reflectors, lenses, and other lighting surfaces.

.11 Vacuum clean and dust building interiors, behind grilles, louvres and screens.

.12 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.13 Remove dirt and other disfiguration from exterior surfaces.

.14 Sweep and wash clean paved areas.

.15 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.

.16 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 WASTE MANAGEMENT GOALS

.1 Prior to start of Work conduct meeting with Departmental Representative to review and discuss Departmental Representative's Waste Management Plan and Goals.

.2 Departmental Representative's Waste Management Goal 75 percent of total Project Waste to be diverted from landfill sites. Provide Departmental Representative documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced.

.3 Accomplish maximum control of solid construction waste.

.4 Preserve environment and prevent pollution and environment damage.

1.2 DEFINITIONS

.1 Class III: non-hazardous waste - construction renovation and demolition waste.

.2 Cost/Revenue Analysis Workplan (CRAW): based on information from WRW, and intended as financial tracking tool for determining economic status of waste management practices.

.3 Demolition Waste Audit (DWA): relates to actual waste generated from project.

.4 Inert Fill: inert waste - exclusively asphalt and concrete.

.5 Materials Source Separation Program (MSSP): consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.

.6 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.

.7 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.8 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

.9 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:

.1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.

.2 Returning reusable items including pallets or unused products to vendors.

.10 Salvage: removal of structural and non-structural materials from deconstruction/ disassembly projects for purpose of reuse or recycling.

.11 Separate Condition: refers to waste sorted into individual types.

.12 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.

.13 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill. Refer to Schedule A.

.14 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.

.15 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. Refer to Schedule B. WRW is based on information acquired from WA (Schedule A).

1.3 DOCUMENTS

.1 Maintain at job site, one copy of following documents:

.1 Waste Audit.

.2 Waste Reduction Workplan.

.3 Material Source Separation Plan.

.4 Schedules A B C D E completed for project.

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Prepare and submit following prior to project start-up:

.1 Submit 2 copies of completed Waste Audit (WA): Schedule A.

.2 Submit 2 copies of completed Waste Reduction Workplan (WRW): Schedule B.

.3 Submit 2 copies of completed Demolition Waste Audit (DWA): Schedule C.

.4 Submit 2 copies of Cost/Revenue Analysis Workplan (CRAW): Schedule D.

.5 Submit 2 copies of Materials Source Separation Program (MSSP) description.

.3 Submit before final payment summary of waste materials salvaged for reuse, recycling or disposal by project using deconstruction/disassembly material audit form.

.1 Failure to submit could result in hold back of final payment.

.2 Provide receipts, scale tickets, waybills, and show quantities and types of materials reused, recycled, co-mingled and separated off-site or disposed of.

.3 For each material reused, sold or recycled from project, include amount in tonnes quantities by number, type and size of items and the destination.

.4 For each material land filled or incinerated from project, include amount in tonnes of material and identity of landfill, incinerator or transfer station.

1.5 WASTE AUDIT (WA)

.1 Conduct WA prior to project start-up.

.2 Prepare WA: Schedule A.

.3 Record, on WA - Schedule A, extent to which materials or products used consist of recycled or reused materials or products.

1.6 WASTE REDUCTION WORKPLAN (WRW)

.1 Prepare WRW prior to project start-up.

.2 WRW should include but not limited to:

.1 Destination of materials listed.

.2 Deconstruction/disassembly techniques and sequencing.

.3 Schedule for deconstruction/disassembly.

.4 Location.

.5 Security.

.6 Protection.

.7 Clear labelling of storage areas.

.8 Details on materials handling and removal procedures.

.9 Quantities for materials to be salvaged for reuse or recycled and materials sent to landfill.

.3 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.

.4 Describe management of waste.

.5 Identify opportunities for reduction, reuse, and recycling of materials. Based on information acquired from WA.

.6 Post WRW or summary where workers at site are able to review content.

.7 Set realistic goals for waste reduction, recognize existing barriers and develop strategies to overcome these barriers.

.8 Monitor and report on waste reduction by documenting total volume and cost of actual waste removed from project.

1.7 DEMOLITION WASTE AUDIT (DWA)

.1 Prepare DWA prior to project start-up.

.2 Complete DWA: Schedule C.

.3 Provide inventory of quantities of materials to be salvaged for reuse, recycling, or disposal.

1.8 COST/REVENUE ANALYSIS WORKPLAN (CRAW)

.1 Prepare CRAW: Schedule D.

1.9 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)

.1 Prepare MSSP and have ready for use prior to project start-up.

.2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Departmental Representative.

.3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.

.4 Provide containers to deposit reusable and recyclable materials.

.5 Locate containers in locations which do not hinder daily operations.

.6 Locate separated materials in areas which minimize material damage.

.7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.

.1 Transport to approved and authorized recycling facility to users of material for recycling.

.8 Collect, handle, store on-site, and transport off-site, salvaged materials in combined condition.

.1 Ship materials to site operating under Certificate of Approval premises of Departmental Representative.

.2 Materials must be immediately separated into required categories for reuse or recycling.

1.10 STORAGE, HANDLING AND PROTECTION

.1 Store, materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.

.2 Unless specified otherwise, materials for removal do not become Contractor's property.

.3 Protect, stockpile, store and catalogue salvaged items.

.4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.

.5 Protect structural components not removed for demolition from movement or damage.

.6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Departmental Representative.

.7 Protect surface drainage, mechanical and electrical from damage and blockage.

.8 Separate and store materials produced during dismantling of structures in designated areas.

.9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.

.1 On-site source separation is recommended.

.2 Remove co-mingled materials to off-site processing facility for separation.

.3 Provide waybills for separated materials.

1.11 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste volatile materials mineral spirits oil paint thinner into waterways, storm, or sanitary sewers.

.3 Keep records of construction waste including:

.1 Number and size of bins.

.2 Waste type of each bin.

.3 Total tonnage generated.

.4 Tonnage reused or recycled.

.5 Reused or recycled waste destination.

.4 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

.5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

1.12 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises.

.2 Maintain security measures established by existing facility provide temporary security measures approved by Departmental Representative.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 SELECTIVE DEMOLITION

.1 Reuse of Building Elements: this project has been designed to result in end of project rates for reuse of building elements as follows: do not demolish building elements beyond what is indicated on Drawings without approval by Departmental Representative's.

.1 Interior Non-Shell Elements: 50 percent.

3.2 APPLICATION

.1 Do Work in compliance with WRW.

.2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.3 CLEANING

.1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.

.2 Clean-up work area as work progresses.

.3 Source separate materials to be reused/recycled into specified sort areas.

3.4 DIVERSION OF MATERIALS

.1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Departmental Representative, and consistent with applicable fire regulations.

.1 Mark containers or stockpile areas.

.2 Provide instruction on disposal practices.

.2 On-site sale of salvaged recovered reusable recyclable materials is permitted is not permitted.

.3 Demolition Waste:

Material Type	Recommended Diversion %	Actual Diversion %
Acoustic Tile	50	
Acoustical Insulation	100	
Carpet	100	

Material Type	Recommended Diversion %	Actual Diversion %
De-mountable Partitions	80	
Doors and Frames	100	
Electrical Equipment	80	
Furnishings	80	
Marble Base	100	
Mechanical Equipment	100	
Metals	100	
Rubble	100	
Wood (uncontaminated)	100	
Other		

.4 Construction Waste:

Material Type	Recommended Diversion %	Actual Diversion %
Cardboard	100	
Plastic Packaging	100	
Rubble	100	
Steel	100	
Wood (uncontaminated)	100	
Other		

3.5 WASTE AUDIT (WA)

.1 Schedule A - Waste Audit (WA):

Material Category	Material Quantity Unit	Estimated Waste %	Total Quantity of Waste (unit)	Generation Point	% Recycled	% Reused
Wood and Plastics Material Description						
Off-cuts						
Warped Pallet Forms						
Plastic Packaging						
Cardboard Packaging						
Other						
Doors and Windows Material Description						
Painted						

Material Category	Material Quantity Unit	Estimated Waste %	Total Quantity of Waste (unit)	Generation Point	% Recycled	% Reused
Frames						
Glass						
Wood						
Metal						
Other						

3.6 WASTE REDUCTION WORKPLAN (WRW)

.1 Schedule B:

Material Category	Person(s) Respon-sible	Total Quantity of Waste (unit)	Reused Amount (units) Projected	Actual	Recycled Amount (unit) Projected	Actual	Material(s) Destination
Wood and Plastics Material Description							
Chutes							
Warped Pallet Forms							
Plastic Packaging							
Card- board Packaging							
Other							
Doors and Windows Material Description							
Painted Frames							
Glass							
Wood							
Metal							
Other							

3.7 DEMOLITION WASTE AUDIT (DWA)

.1 Schedule C - Demolition Waste Audit (DWA):

Material Description	Quantity	Unit	Total	Volume (cum)	Weight (cum)	Remarks and Assumptions
Wood						

Material Description	Quantity	Unit	Total	Volume (cum)	Weight (cum)	Remarks and Assumptions
Wood Stud						
Plywood						
Baseboard-Wood						
Door Trim - Wood						
Cabinet						
Doors and Windows						
Panel Regular						
Slab Regular						
Wood Laminate						
Byfold - Closet						
Glazing						

3.8 COST/REVENUE ANALYSIS WORKPLAN (CRAW)

.1 Schedule D - Cost/Revenue Analysis Workplan (CRAW):

Material Description	Total Quantity (unit)	Volume (cum)	Weight (cum)	Disposal Cost/ Credit $(+/-)	Category Sub-Total $(+/-)
Wood					
Wood Stud					
Plywood					
Baseboard - Wood					
Door Trim - Wood					
Cabinet					$
Doors and Windows					
Panel Regular					
Slab Regular					
Wood Laminate					
Byfold - Closet					
Glazing					$
		Cost (-) / Revenue (+)			$

3.9 PROVINCIAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

.1 Schedule E - Government Chief Responsibility for the Environment:

Province	Address	General Inquires	Fax
Nova Scotia	Dept. of the Environ. 5151 Terminal Road, 5th Floor, P.O Box 2107 Halifax, NS, B3J 3B7	902-424-5300	902-424-0503

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

1.2 DESCRIPTION

.1 Demonstrate scheduled operation and maintenance of equipment and systems to Departmental Representative's personnel two weeks prior to date of final inspection substantial performance interim completion.

.2 Departmental Representative will provide list of personnel to receive instructions, and will co-ordinate their attendance at agreed-upon times.

1.3 QUALITY CONTROL

.1 When specified in individual Sections require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Departmental Representative's personnel, and provide written report that demonstration and instructions have been completed.

1.4 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Departmental Representative's approval.

.3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

.4 Give time and date of each demonstration, with list of persons present.

1.5 CONDITIONS FOR DEMONSTRATIONS

.1 Equipment has been inspected and put into operation in accordance with Section.

.2 Testing, adjusting, and balancing, has been performed in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements and equipment and systems are fully operational.

.3 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.6 PREPARATION

.1 Verify that conditions for demonstration and instructions comply with requirements.

.2 Verify that designated personnel are present.

1.7 DEMONSTRATION AND INSTRUCTIONS

.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at scheduled agreed upon times, at the equipment designated location.

.2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.

.3 Review contents of manual in detail to explain aspects of operation and maintenance.

.4 Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.

1.8 TIME ALLOCATED FOR INSTRUCTIONS

.1 Ensure amount of time required for instruction of each item of equipment or system as follows:

.1 Section - Ventilation System: 2 hours of instruction.

.2 Section - Control System: 2 hours of instruction.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 Acronyms:

.1 AFD - Alternate Forms of Delivery, service provider.
.2 BMM - Building Management Manual.
.3 Cx - Commissioning.
.4 EMCS - Energy Monitoring and Control Systems.
.5 O&M - Operation and Maintenance.
.6 PI - Product Information.
.7 PV - Performance Verification.
.8 TAB - Testing, Adjusting and Balancing.

.2 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:

.1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.
.2 Ensure appropriate documentation is compiled into the BMM.
.3 Effectively train O&M staff.

.3 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.

.1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactive with each other as intended in accordance with Contract Documents and design criteria.
.2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.

.4 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.

1.2 COMMISSIONING OVERVIEW

.1 Cx to be a line item of Contractor's cost breakdown.

.2 Cx activities supplement field quality and testing procedures described in relevant technical sections.

.3 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.

.4 Departmental Representative will issue Interim Acceptance Certificate when:

.1 Completed Cx documentation has been received, reviewed for suitability and approved by Departmental Representative.

.2 Equipment, components and systems have been commissioned.

.3 O&M training has been completed.

1.3 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

.1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the non-functioning system, including related systems as deemed required by Departmental Representative, to ensure effective performance.

.2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

1.4 PRE-CX REVIEW

.1 Before Construction:

.1 Review contract documents, confirm by writing to Departmental Representative.

.1 Adequacy of provisions for Cx.

.2 Aspects of design and installation pertinent to success of Cx.

.2 During Construction:

.1 Co-ordinate provision, location and installation of provisions for Cx.

.3 Before start of Cx:

.1 Have completed Cx Plan up-to-date.

.2 Ensure installation of related components, equipment, sub-systems, systems is complete.

.3 Fully understand Cx requirements and procedures.

.4 Have Cx documentation shelf-ready.

.5 Understand completely design criteria and intent and special features.

.6 Submit complete start-up documentation to Departmental Representative.

.7 Have Cx schedules up-to-date.

.8 Ensure systems have been cleaned thoroughly.

.9 Complete TAB procedures on systems, submit TAB reports to Departmental Representative for review and approval.

.10 Ensure "As-Built" system schematics are available.

.4 Inform Departmental Representative in writing of discrepancies and deficiencies on finished works.

1.5 CONFLICTS

.1 Report conflicts between requirements of this section and other sections to Departmental Representative before start-up and obtain clarification.

.2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.6 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.1 Submit no later than 4 weeks after award of Contract:

.1 Name of Contractor's Cx agent.

.2 Draft Cx documentation.

.3 Preliminary Cx schedule.

.2 Request in writing to Departmental Representative for changes to submittals and obtain written approval at least 8 weeks prior to start of Cx.

.3 Submit proposed Cx procedures to Departmental Representative where not specified and obtain written approval at least 8 weeks prior to start of Cx.

.4 Provide additional documentation relating to Cx process required by Departmental Representative.

1.7 COMMISSIONING DOCUMENTATION

.1 Departmental Representative to review and approve Cx documentation.

.2 Provide completed and approved Cx documentation to Departmental Representative.

1.8 COMMISSIONING SCHEDULE

.1 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:

.1 Approval of Cx reports.

.2 Verification of reported results.

.3 Repairs, retesting, re-commissioning, re-verification.

.4 Training.

1.9 COMMISSIONING MEETINGS

.1 Convene Cx meetings following project meetings and as specified herein.

.2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.

.3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.

.4 At 60% construction completion stage. Departmental Representative to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:

.1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.

.2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.

.5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.

.6 Meeting will be chaired by Departmental Representative, who will record and distribute minutes.

.7 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

1.10 STARTING AND TESTING

.1 Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.

1.11 WITNESSING OF STARTING AND TESTING

.1 Provide 14 days notice prior to commencement.

.2 Departmental Representative to witness of start-up and testing.

.3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

1.12 MANUFACTURER'S INVOLVEMENT

.1 Factory testing: manufacturer to:

.1 Coordinate time and location of testing.

.2 Provide testing documentation for approval by Departmental Representative.

.3 Arrange for Departmental Representative to witness tests.

.4 Obtain written approval of test results and documentation from Departmental Representative before delivery to site.

.2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Departmental Representative.

.1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.

.2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.

.3 Integrity of warranties:

.1 Use manufacturer trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.

.2 Verify with manufacturer that testing as specified will not void warranties.

.4 Qualifications of manufacturer's personnel:

.1 Experienced in design, installation and operation of equipment and systems.

.2 Ability to interpret test results accurately.

.3 To report results in clear, concise, logical manner.

1.13 PROCEDURES

.1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.

.2 Conduct start-up and testing in following distinct phases:

.1 Included in delivery and installation:

.1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.

.2 Visual inspection of quality of installation.

.2 Start-up: follow accepted start-up procedures.

.3 Operational testing: document equipment performance.

.4 System PV: include repetition of tests after correcting deficiencies.

.5 Post-substantial performance verification: to include fine-tuning.

.3 Correct deficiencies and obtain approval from Departmental Representative after distinct phases have been completed and before commencing next phase.

.4 Document require tests on approved PV forms.

.5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Departmental Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:

.1 Minor equipment/systems: implement corrective measures approved by Departmental Representative.

.2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Departmental Representative.

.3 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.

.1 Rejected equipment to be remove from site and replace with new.

.2 Subject new equipment/systems to specified start-up procedures.

1.14 START-UP DOCUMENTATION

.1 Assemble start-up documentation and submit to Departmental Representative for approval before commencement of commissioning.

.2 Start-up documentation to include:

.1 Factory and on-site test certificates for specified equipment.

.2 Pre-start-up inspection reports.

.3 Signed installation/start-up check lists.

.4 Start-up reports,

.5 Step-by-step description of complete start-up procedures, to permit Departmental Representative to repeat start-up at any time.

1.15 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

.1 After start-up, operate and maintain equipment and systems as directed by equipment/ system manufacturer.

.2 With assistance of manufacturer develop written maintenance program and submit Departmental Representative for approval before implementation.

.3 Operate and maintain systems for length of time required for commissioning to be completed.

.4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

1.16 TEST RESULTS

.1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.

.2 Provide manpower and materials, assume costs for re-commissioning.

1.17 START OF COMMISSIONING

.1 Notify Departmental Representative at least 21 days prior to start of Cx.

.2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

1.18 INSTRUMENTS / EQUIPMENT

.1 Submit to Departmental Representative for review and approval:

.1 Complete list of instruments proposed to be used.

.2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.

.2 Provide the following equipment as required:

.1 2-way radios.

.2 Ladders.

.3 Equipment as required to complete work.

1.19 COMMISSIONING PERFORMANCE VERIFICATION

.1 Carry out Cx:

.1 Under actual accepted simulated operating conditions, over entire operating range, in all modes.

.2 On independent systems and interacting systems.

.2 Cx procedures to be repeatable and reported results are to be verifiable.

.3 Follow equipment manufacturer's operating instructions.

.4 EMCS trending to be available as supporting documentation for performance verification.

1.20 WITNESSING COMMISSIONING

.1 Departmental Representative to witness activities and verify results.

1.21 AUTHORITIES HAVING JURISDICTION

.1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.

.2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.

.3 Provide copies to Departmental Representative within 5 days of test and with Cx report.

1.22 REPEAT VERIFICATIONS

.1 Assume costs incurred by Departmental Representative for third and subsequent verifications where:

.1 Verification of reported results fail to receive Departmental Representative's approval.

.2 Repetition of second verification again fails to receive approval.

.3 Departmental Representative deems Contractor's request for second verification was premature.

1.23 SUNDRY CHECKS AND ADJUSTMENTS

.1 Make adjustments and changes which become apparent as Cx proceeds.

.2 Perform static and operational checks as applicable and as required.

1.24 DEFICIENCIES, FAULTS, DEFECTS

.1 Correct deficiencies found during start-up and Cx to satisfaction of Departmental Representative.

.2 Report problems, faults or defects affecting Cx to Departmental Representative in writing. Stop Cx until problems are rectified. Proceed with written approval from Departmental Representative.

1.25 COMPLETION OF COMMISSIONING

.1 Upon completion of Cx leave systems in normal operating mode.

.2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.

.3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Departmental Representative.

1.26 ACTIVITIES UPON COMPLETION OF COMMISSIONING

.1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

1.27 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

.1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.

1.28 OCCUPANCY

.1 Cooperate fully with Departmental Representative during stages of acceptance and occupancy of facility.

1.29 INSTALLED INSTRUMENTATION

.1 Use instruments installed under Contract for TAB and PV if:

.1 Accuracy complies with these specifications.

.2 Calibration certificates have been deposited with Departmental Representative.

.2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

1.30 PERFORMANCE VERIFICATION TOLERANCES

.1 Application tolerances:

.1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 10% of specified values.

.2 Instrument accuracy tolerances:

.1 To be of higher order of magnitude than equipment or system being tested.

.3 Measurement tolerances during verification:

.1 Unless otherwise specified actual values to be within +/- 2% of recorded values.

1.31 PERFORMANCE TESTING

.1 Performance testing of equipment or system by Departmental Representative will not relieve Contractor from compliance with specified start-up and testing procedures.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 Before beginning Work at the site, where possible, and throughout the course of the Work, inspect and verify the location and condition of every item affected by the Work under this Contract and report discrepancies, errors, inconsistencies and omissions to Departmental Representative before doing Work related to that being inspected. Do not proceed with work in areas where errors, discrepancies, inconsistencies or omissions were found without Departmental Representative's instructions.

.2 Before beginning work at the site, become familiar with the existing operations of the facility, the required fire and operations separations: inspect the existing building and determine the extent of existing structure partitions, finishes, specialities, equipment, and other items which must be removed and reinstalled or relocated in order to perform the Work under this Contract.

.3 Determine location of partitions not dimensioned by their relation to column face or centre, window jamb or mullion, or other similar fixed item.

.4 Dismantle and remove components as generally noted on drawings and described in this Section, and where otherwise required to complete work.

.5 Remove debris from site as work progresses in clean, covered carts. Removal to be carried out after 5:00 pm and weekends. Route through hospital to be approved by Departmental Representative.

.6 Retain in full operational condition at all times all fire protection systems, alarm and fire separations. Coordinate bypass of existing smoke and heat detectors with Departmental Representative, daily, as required.

1.2 CODES AND STANDARDS

.1 Carry out demolition work in accordance with Canadian Construction Safety Code (latest edition), provincial and local codes, regulations and requirements of insurance carriers providing coverage for this work.

.2 Comply with CSA S350 Code of Practice for Safety in Demolition of Structures.

1.3 EXISTING CONDITIONS

.1 Take over structures to be demolished regardless of their condition, when and as directed by the Departmental Representative.

1.4 REGULATORY REQUIREMENTS

.1 Ensure work is performed in compliance with all applicable regulations, Federal, Provincial, and Municipal.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Provide waste management and disposal plan.

.2 Pay all required fees including dumping fees.

1.6 PROTECTION

.1 Protection of Persons and Property to remain:

.1 General: Be solely responsible for safety of persons and property. Requirements of this section supplement requirements specified in other contract documents.

.2 Provide temporary barricades, fences, shoring lights, barriers, chutes, closures, and other protection. Ensure safe passage of people around area of demolition. Prevent injury to adjacent facilities, and to people. Erect temporary covered passageways if required by authorities having jurisdiction. Provide shoring, bracing, or support to prevent movement, settlement or collapses of structures to be demolished and adjacent facilities to remain.

.2 Make good damage caused by alteration or demolition.

.3 Protection of Existing Features:

.1 Prior to commencing any demolition work, notify Departmental Representative and establish location and confirm use of existing utilities, piping, plumbing, conduits, ductwork, etc. Clearly mark such locations and take whatever action necessary to prevent disturbance or damage to active systems during work.

.2 Confirm locations of concealed utilities by careful test demolitions.

.3 Maintain and protect from damage, water, sewer, rainwater, gas, electric, telephone and other utilities and structure encountered. Obtain direction of Departmental Representative before moving or otherwise disturbing utilities.

.4 Advise Departmental Representative to re-route existing lines interfering with work.

.5 Protect existing building features which may be affected by work from damage while work is in progress and repair damage resulting from work.

.6 Take measure to minimize dust as a result of this work. Ensure ventilation ducts in areas of demolition are sealed dust tight.

.4 Take precautions to properly support existing structure and, if safety of building being demolished or part of existing building to remain, or services, etc. appear to be endangered, cease operations and notify Departmental Representative.

.5 Existing exits and access to exits are to remain accessible and operational during all stages of demolition and construction.

.6 Post signs in conspicuous locations to warn persons that demolition is in progress.

.7 Barricade all access by unauthorized persons to areas in which demolition is in progress. Barricades to consist of dust tight gypsum wall board on steel stud with hinged door complete with closer and pad locking devise.

.8 Temporarily weatherproof openings made in walls of existing buildings left remaining, immediately when they are opened.

.9 Repair, patch and finish, or refinish as applicable, to match adjacent existing finishes, those existing surfaces damaged or newly exposed during performance of the Work under this Contract.

Part 2 Products

.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 GENERAL

.1 Verify that spaces to remain unaltered adjacent to areas of Work under this Contract are completely secured and rendered dustproof before beginning such Work.

.2 Additional requirements to those specified in this section are noted on the Contract drawings.

3.2 DEMOLITION AND REMOVAL

.1 Execute demolition and removal carefully. Minimize interference with building operations and site operations, inconvenience to occupants and the public, danger to persons, and damage to existing materials to remain.

.2 Noise and speed: perform demolition and removals as quietly as practicable and with deliberate speed once demolition work has begun.

.3 Extent and methods of demolition: demolish, remove for salvage, or remove and reinstall as applicable, all, or parts of, as indicated: masonry, walls and partitions, doors, frames, finish hardware, plaster, gypsum board, acoustical ceilings, suspensions systems, finishes, cabinetry, ventilation items, plumbing fixtures, mechanical and electrical equipment, piping, lighting, and other materials and items as necessary to do the Work under this Contract and, in addition, where removal is indicated.

.1 Use methods required to complete Work within limitations of governing regulations.
.2 Proceed systematically.
.3 Demolish masonry in small sections.
.4 Remove materials so as to not collapse, install temporary struts, bracing, or shoring; leave in place until new Work provides adequate bracing and support.

3.2 WORK COVERED BY CONTRACT DOCUMENTS

.1 This Work description is a summary only, is general in nature, does not include every type of Work involved in the Project, is not a complete listing of the Work required under this Contract, and does not limit Contract Work as stipulated in other parts of the Contract documents. Contractor is responsible for every part of

the Work indicated in Contract documents whether or not included in the following limited summary. Refer to every part of the Contract documents for the total Work included in this Contract.

.2 Dispose of demolished materials except where noted otherwise and in accordance with authorities having jurisdiction.

.3 Remove all assemblies and components where indicated in documents.

.4 Remove electrical fixtures, wiring, outlets, panels, etc. as indicated on drawings.

.5 Operation of fire protection and alarm systems are to be maintained at all times during demolition. Coordinate with Nova Scotia Health Authority and Maintenance staff.

.6 Required fire separations are to be maintained at all times during demolition.

.7 Removal and reinstallation of existing ceiling assemblies, with all required repair, required for mechanical and associated work at the floor area below.

3.3 SALVAGE ITEMS

.1 Remove items indicated on drawings, complete with fasteners. Turn over to Departmental Representative on site except where required for re-installation under this or other Sections of the specification or where indicated on the drawings.

.2 Clearly label, package where necessary to safeguard finish or accessories and fastenings.

.3 Protect from damage by the removal operation.

.4 Provide safe, clean, neat storage for items to be re-installed. Turn over to appropriate section where needed for re-installation.

3.4 DISPOSAL

.1 Selling or burning of materials on site is not permitted.

.2 Dispose of materials not designated for salvage or re-use in the work, off of property. Comply with authorities having jurisdiction.

.3 Remove all debris from site; leave site in a neat, orderly condition.

.4 Stockpile and store materials to be reinstalled at location(s) approved by the Departmental Representative.

.5 Turn items over to the Departmental Representative, where indicated, at site. Comply with Departmental Representative's direction.

.6 Remove items from building in designated area only or as directed by Departmental Representative. Provide disposal chutes and dumpsters with suitable tarp coverings only where indicated and/or where approved by Departmental Representative.

3.5 MISCELLANEOUS REMOVALS AND RE-INSTALLATION

.1 Remove all miscellaneous items as noted, and as required to carry out the work of this and other sections. Take precautions to prevent damage to items being re-installed. Remove fastenings. Patch fastener holes prior to the installation of new finishes.

.2 Co-ordinate with painting trade for re-painting prior to reinstallation where necessary.

.3 Provide required fastenings. Reinstall unless noted otherwise. Use existing fastener holes where practical. Drill new holes where required, do not use impact type tools. Reinstall items square, plumb and aligned true to building lines.

.4 Where noted or specified, turn items over to other trades for re-installation.

3.6 MECHANICAL AND ELECTRICAL ITEMS

.1 Mechanical and electrical disconnections, removal and reinstallation shall be carried out by their respective trades to the requirements of this Section.

3.7 REMOVAL OF EXISTING INTERIOR FINISHES

.1 Remove existing finishes to extent indicated, and as required by the work. Patch surfaces which will be exposed in finished work and make good.

3.8 GENERAL PATCHING AND MAKING GOOD

.1 Carry out patching and making good of assemblies and finish surfaces to remain in the completed work. Include all openings and damage caused by demolition work of all trades.

.2 Blend patching with existing surfaces.

.3 Patch and restore openings and damage to sound rated assemblies caused by the demolition work to maintain the assembly sound rating.

.4 Patch and restore openings and damage to fire rated assemblies caused by the demolition work to maintain the assembly fire rating.

.5 Patch and restore openings and damage to finish surfaces which will remain exposed in the completed work.

.6 Firestop all openings in fire rated assemblies to match the required existing fire rating.

3.9 REINSTALLATION OF REMOVED ITEMS

.1 Reinstall existing items as indicated except where specified to be reinstalled under other sections.

.2 Protect items for reinstallation. Restore finish where damaged. Re-adjust operating parts for correct operation. Modify as required to suit new work.

.3 Use original fasteners or suitable replacements.

3.10 SAFETY CODE

.1 Carry out demolition work in accordance with local building codes, construction and labour safety codes and in accordance with the requirements of authorities having jurisdiction.

3.11 RESTORATION

.1 Upon completion of work, remove surplus materials and debris, and correct defects noted by Departmental Representative.

.2 Clean and reinstate areas affected by work as directed by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 23 05 00 - Common Work Results for HVAC

.3 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCES

.1 ULC S115-05, Standard Method of Fire Tests of Firestop Systems.

1.3 QUALITY ASSURANCE

.1 Provide manufacturer's direct representative (not distributor or agent) on site during initial installation of firestopping systems, to train personnel in proper selection and installation procedures.

.2 For firestopping applications where no ULC or cUL tested systems exist, submit manufacturer's engineering judgement derived from similar ULC or cUL system design or other tests to local authority having jurisdiction for their review and approval before installation.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures

.2 Submit ULC design system for each type of joint and service penetration.

.1 Show proposed material, fire rating, reinforcement, anchorage, fastenings and method of installation. Construction details should accurately reflect actual job conditions.

.2 Where more than one product is acceptable for a component, clearly indicate the product being supplied on this Project.

.3 When no ULC or cUL system is available for an application, submit manufacturer's engineered judgement identification number and drawing details. Engineered judgement shall include both project name and contractor's name who will install firestopping system a described in drawing.

.4 Submit manufacturer's product data for materials and prefabricated devices. Include manufacturer's printed instructions for installation.

Part 2 Products

2.1 GENERAL

.1 Fire stopping and smoke seal systems: in accordance with ULC S115.

.1 Asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gases, in compliance with requirements of ULC S115

and not to exceed opening sizes for which they are intended.

.2 Firestopping system rating: not less than the fire-resistance rating of surrounding floor and wall assembly.

.2 Service penetration assemblies: certified by ULC in accordance with ULC S115 and listed in ULC Guide No. 40 U19.

.3 Service penetration firestopping components: certified by ULC in accordance with ULC S115 and listed in ULC Guide No. 40 U19.13 and ULC Guide No. 40 U19.15 under the Label Service of ULC.

2.2 FIRESTOPPING / SMOKE SEAL MATERIALS

.1 Mineral wool: ULC listed, semi-rigid, non-combustible, capable of being compressed 75% of original width; precut to required width and depth required, complete with impaling clips for use in horizontal fire separations; product as recommended by Firestopping manufacturer and listed in applicable ULC design.

.2 Firestopping sealant: ULC listed.

.1 Silicone: one-part silicone based, non-sag or self-levelling for floor; movement capabilities minimum 25%.

.1 Standard of acceptance: Firebarrier Silicone/Silicone SL by A/D Fire Protection System, CP604/601S by Hilti, Fire Barrier Silicone Sealants by 3M Fire Protection Products, TREMstop Fyre-Sil by Tremco.

.2 Acrylic: one-part, water-based, flexible to accommodate movement.

.1 Standard of acceptance: Firebarrier Seal by A/D Fire Protection System, CP606 by Hilti, Fire Barrier water-based sealants by 3M Fire Protection Products, TREMstop Acrylic by Tremco.

.3 Miscellaneous firestopping products:

.1 Other products, such as mortar, fire blocks, collars, putty, intumescent sealants and foams, may be used provided such products are ULC listed.

.2 At combustible piping, in addition to firestopping sealant, provide intumescent tape and retaining collar.

.4 Primers: in accordance with manufacturer's recommendation for specific material, substrate, and end use.

.5 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.

.6 Damming and backup materials, supports and anchoring devices: to firestopping manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

Part 3 Execution

3.1 PREPARATION

.1 Examine sizes and conditions of openings to be filled to establish correct thicknesses and installation of materials.

.2 Remove combustible materials and loose impediment from penetration opening and involved surfaces.

.3 Ensure that substrates and surfaces are clean, dry and free from oil, grease and other deleterious matter.

.4 Prepare surfaces in contact with fire stopping materials in accordance with manufacturer's instructions.

.5 Maintain insulation around pipes and ducts penetrating fire separation.

.6 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.2 INSTALLATION

.1 Install fire stopping material and components in accordance with ULC certification and manufacturer's instructions.

.2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.

.3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.

.4 Tool or trowel exposed surfaces to a neat finish.

.5 Remove excess compound promptly as work progresses and upon completion.

3.3 INSTALLATION LIMITATIONS

.1 When air or surface temperature is below 5°C, use silicone sealant only. Latex permitted only when temperatures are 5°C or above.

3.4 INSPECTION

.1 Notify Departmental Representative when ready for inspection and prior to concealing or enclosing firestopping materials and service penetration assemblies.

3.5 ADJUSTING AND CLEANING

.1 Remove equipment, excess materials and debris and clean adjacent surfaces immediately after application.

.2 Trim excess cured foam, if necessary, with a sharp knife or blade.

.3 Remove temporary dams after initial set of fire stopping materials.

3.6 SCHEDULE

.1 Firestopping and smoke seal at:

.1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.

.2 Top of fire-resistance rated masonry and gypsum board partitions.

.3 Intersection of fire-resistance rated masonry and gypsum board partitions.

.4 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.

.5 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.

.6 Openings and sleeves installed for future use through fire separations.

.7 Around mechanical and electrical assemblies penetrating fire separations.

.8 Rigid ducts: greater than 129 cm^2: firestopping to consist of bead of firestopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

.2 Maintain fire rating of assembly.

3.7 CLEAN UP

.1 Remove excess materials and debris and clean adjacent surfaces immediately after application.

.2 Remove temporary dams after initial set of firestopping and smoke seal materials.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal

.3 Section 22 42 01 - Plumbing Specialties and Accessories

.4 Section 23 05 00 – Common Work Results for HVAC

1.2 REFERENCES

.1 National Building Code of Canada - 2010.

.2 National Plumbing Code of Canada - 2010.

1.3 GENERAL CONDITIONS

.1 Sections of Division 01 - General Requirements and Section 23 05 00 – Common Work Results for HVAC, are both a part of this Section and shall apply as if repeated here.

1.4 DESCRIPTION OF SYSTEMS

.1 Provide plumbing system including:

.1 Sanitary and vent, domestic hot and cold piping systems, including fixtures and equipment, as shown on the drawings.

1.5 SHOP DRAWINGS

.1 Submit shop drawings in accordance with sections of Section 01 33 00 – Submittal Procedures.

.2 Clearly indicate roughing-in dimensions and all other physical characteristics pertinent to installation.

.3 Shop drawings are required for the following equipment:

.1 Section 22 42 01 - Plumbing Specialties

.4 Submit shop drawings only on materials and equipment specified or approved by Departmental Representative.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal and coordinate with the General Contractor.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Separate for reuse and recycling and place in designated containers Steel Metal Plastic waste in accordance with Waste Management Plan.

.5 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Departmental Representative.

.6 Fold up metal banding, flatten and place in designated area for recycling.

1.6 MAINTENANCE DATA

.1 Provide maintenance data in English for incorporation into maintenance manual specified in sections of Division 01 - General Requirements.

1.7 FIXTURES AND FITTINGS

.1 In case of discrepancy between architectural and mechanical drawings as to number and location of fixtures; the architectural drawings shall govern.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.3 Section 01 35 29.06 - Health and Safety Requirements.

.4 Section 01 78 00 - Closeout Submittals.

.5 Section 01 91 13 - General Commissioning (Cx) Requirements.

.6 Section 22 05 00 - Common Work Results for Plumbing.

.7 Section 23 05 05 - Installation of Pipework.

.8 Section 23 05 23.01 - Valves - Bronze.

.9 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME).

.1 ANSI/ASME B16.15-02, Cast Bronze Threaded Fittings, Classes 125 and 250.

.2 ANSI/ASME B16.18-01, Cast Copper Alloy Solder Joint Pressure Fittings.

.3 ANSI/ASME B16.22-01, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

.4 ANSI/ASME B16.24-01, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.

.2 American Society for Testing and Materials International, (ASTM).

.1 ASTM A307-03, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 ASTM B88M-03, Standard Specification for Seamless Copper Water Tube (Metric).

.3 ASTM F492-95, Standard Specification for Propylene and Polypropylene (PP) Plastic-Lined Ferrous Metal Pipe and Fittings.

.3 American Water Works Association (AWWA).

.1 AWWA C111-00, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.4 Canadian Standards Association (CSA International).

.1 CSA B242-M1980(R1998), Groove and Shoulder Type Mechanical Pipe Couplings.

.5 Department of Justice Canada (Jus).

.1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).

.6 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).

.1 MSS-SP-67-02, Butterfly Valves.
.2 MSS-SP-70-98, Cast Iron Gate Valves, Flanged and Threaded Ends.
.3 MSS-SP-71-97, Cast Iron Swing Check Valves, Flanged and Threaded Ends.
.4 MSS-SP-80-03, Bronze Gate, Globe, Angle and Check Valves.

.7 National Research Council (NRC)/Institute for Research in Construction.

.1 NRCC 38728, National Plumbing Code of Canada (NPC) - 1995.

.8 Transport Canada (TC).

.1 Transportation of Dangerous Goods Act, 1992, c. 34 (TDGA).

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit product data for following: valves.

.3 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 HEALTH AND SAFETY

.1 Do construction occupational health and safety in accordance with Section 01 35 39.06 - Health and Safety Requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Separate for reuse and recycling and place in designated containers Steel, Metal, Plastic waste in accordance with Waste Management Plan.

.4 Place materials defined as hazardous or toxic in designated containers.

.5 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

.6 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 PIPING

.1 Domestic hot, cold and recirculation systems, within building.

.1 Above ground: copper tube, hard drawn, type L: to ASTM B88M.

2.2 FITTINGS

.1 Bronze pipe flanges and flanged fittings, Class 150 and 300: to ANSI/ASME B16.24.

.2 Cast bronze threaded fittings, Class 125 and 250: to ANSI/ASME B16.15.

.3 Cast copper, solder type: to ANSI/ASME B16.18.

.4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.

.5 T-Drill system is acceptable.

2.3 JOINTS

.1 Rubber gaskets, latex-free 1.6mm thick: to AWWA C111.

.2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.

.3 Solder: 95/5 tin copper alloy.

.4 Teflon tape: for threaded joints.

2.4 BALL VALVES

.1 NPS 2 and under, soldered:

.1 To ANSI/ASME B16.18, Class 150.

.2 Bronze body, chrome plated brass, stainless steel ball, PTFE adjustable packing, brass gland and PTFE BunaN seat, steel lever handle, with NPT to copper adaptors as specified Section 23 05 22 - Valves - Bronze.

.3 Standard of acceptance: Crane 9302, Jenkins 901A, Red & White 5044, Kitz 58, Milwaukee BA-100, Newman Hattersley 1969, Nibco T-FP600

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with NPC 2010 Edition and local authority having jurisdiction.

.2 Install pipe work in accordance with Section 23 05 05 - Installation of Pipework, supplemented as specified herein.

.3 Assemble piping using fittings manufactured to ANSI standards.

.4 Install DCW piping below and away from HWS and HWR and other hot piping so as to maintain temperature of cold water as low as possible.

.5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

.6 Install piping close to building structure to minimize furring and to conserve headroom and space. Group exposed piping and run parallel to walls.

.7 Cut square, ream and clean tubing and tube ends, clean recesses of fittings and assemble without binding

.8 Ensure that copper tubing does not come in contact with concrete grouting, mortar, etc. to prevent chemical reaction between dissimilar materials.

.9 Install dielectric unions where piping of dissimilar metals is joined.

.10 Where pipe sizes differ from connection sizes of equipment, install reducing fittings close to equipment, reducing bushings are not permitted.

3.2 VALVES

.1 Isolate equipment, fixtures and branches with ball valves.

3.3 PRESSURE TESTS

.1 Conform to requirements of Section 22 05 00 - Common Work Results for Plumbing.

.2 Test pressure: greater of 1.5 times maximum system operating pressure or 860 kPa.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 ASTM D4104 – Standard Specification for Propylene Plastic Injection and Extrusion Materials.Copper incoming domestic water service, up to NPS 2 1/2.

.2 ASTM F1412 – Standard Specification for Polyolefin Pipe and fittings for Corrosive Waste Drainage Systems

.3 CAN/CSA B181.3 – Polyolefin Laboratory Drainage Systems.

1.2 SHOP DRAWINGS

.1 Submit Shop Drawings in accordance with Section 01 33 00 – Submittal Procedures.

1.3 SCOPE

.1 Provide laboratory drainage piping for all traps and branch runs in labs from fixture to point of connection to main drain line.

Part 2 Products

2.1 PIPING AND FITTINGS

.1 Flame-retardant polypropylene Schedule 40 piping with threaded glued solvent weld joints.

Standard of Acceptance:

- Watts pHpro
- IPEX Labline
- Zurn

.2 Bottle Traps: Polypropylene bottle trap with 1 litre bottle.

Standard of Acceptance:

- Orion BT1

Part 3 Execution

3.1 INSTALLATION

.1 Above ground piping shall be fire stopped at all fire separations. Method of fire stopping shall be submitted to Departmental Representative for approval

.2 Ensure all compression joints are adequately tightened to prevent any leakage.

.3 Test complete laboratory drainage and vent systems with water to withstand a 3m head for a minimum of 15 minutes without any leakage.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Related Sections:

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 45 00 - Quality Control.

.3 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.4 Section 01 78 00 - Closeout Submittals.

.5 Section 23 05 00 - Common Work Results for HVAC

1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME)

.1 ASME Boiler and Pressure Vessel Code Section VIII Pressure Vessels.

.1 BPVC-VIII B - 2004, BPVC Section VIII - Rules for Construction of Pressure Vessels Division 1.

.2 BPVC-VIII-2 B - 2004, BPVC Section VIII - Rules for Construction of Pressure Vessels Division 2 - Alternative Rules.

.3 BPVC-VIII-3 B - 2004, BPVC Section VIII - Rules for Construction of Pressure Vessels Division 3 - Alternative Rules High Press Vessels.

.2 ASME B16.5-03, Pipe Flanges and Flanged Fittings.

.3 ASME B16.11-01, Forged Fittings, Socket-Welding and Threaded.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM A53/A53M-04, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A181/A181M-01, Standard Specification for Carbon Steel Forgings for General Purpose Piping.

.3 Canadian Standards Association (CSA International)

.1 CSA B51-03, Boiler, Pressure Vessel, and Pressure Piping Code.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet for piping, fittings and equipment.

.3 Shop Drawings:

.1 Submit shop drawings to indicate project layout including layout, dimensions and extent of piping system.

.1 Vertical and horizontal piping locations and elevations and connections details.

.2 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Instructions: submit manufacturer's installation instructions.

.5 Closeout Submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 QUALITY ASSURANCE

.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard and packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan (WMP).

.4 Separate for reuse and recycling and place in designated containers Steel, Metal and Plastic waste in accordance with Waste Management Plan (WMP).

.5 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

.6 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.

Part 2 Products

2.1 PIPING

.1 Piping: to ASTM A53/A53M, schedule 80 seamless black steel.

.2 Fittings:

.1 NPS2 and smaller: to ASME B16.11, schedule 80 steel, socket welded.

.3 Couplings: to ASME B16.11, socket welded or threaded half coupling type.

.4 Unions: 1000 kPa malleable iron with brass-to-iron ground seat.

.5 Dissimilar metal junctions: use dielectric unions.

.6 Flanges:

.1 NPS2 and smaller: to ASME B16.5, forged steel, raised face and socket welded.

.7 Joints:

.1 NPS2 and smaller: socket welded.

.2 NPS2 1/2 and larger: butt welded.

2.2 BALL VALVES

.1 Three piece design or top entry for ease of in-line maintenance.

.1 To ASTM A181/A181M, Class 70, carbon steel body screwed ends, carbon steel ball and associated trim suitable for compressed air application.

.2 To withstand 1034 kPa maximum pressure.

2.3 COUPLERS/CONNECTORS

.1 Industrial interchange series, full-bore.

.2 Maximum inlet pressure: 1207kPa.

.3 Valve seat: moulded nylon.

.4 Body: zinc plated steel.

.5 Threads: NPT.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 COMPRESSED AIR PIPING CONNECTIONS AND INSTALLATION

.1 Install shut-off valves at outlets, major branch lines and in locations as indicated.

.2 Install quick-coupler chucks and pressure gauges on drop pipes.

.3 Install unions to permit removal or replacement of equipment.

.4 Install tees in lieu of elbows at changes in direction of piping. Install plug in open ends of tees.

.5 Grade piping at 1% slope minimum.

.6 Install compressed air trap and pressure equalizing pipe at moisture collecting points. Drain pipe to nearest floor drain.

.7 Make branch connections from top of main.

.8 Install compressed air trap at bottom of risers and at low points in mains, piped to nearest drain. Distance between drain points to be 30 m maximum.

.9 Provide drain from refrigerated air dryer.

.10 Weld steel piping in accordance;

.1 To ASME code and requirements of authority having jurisdiction.

.2 Weld concealed and inaccessible piping regardless of size.

3.3 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:

.1 Testing: pressure test in accordance with requirements of Section 23 05 00 - Common Work Results for HVAC for 4 h minimum, to 1100 kPa, with outlets closed and with compressor isolated from system. Pressure drop not to exceed 10 kPa.

3.4 CLEANING

.1 Cleaning: blow out piping to clean interior thoroughly of oil and foreign matter.

.2 Check entire installation is approved by authority having jurisdiction.

.3 Perform cleaning operations in accordance with manufacturer's recommendations.

.4 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Related Sections:

.1 Section 01 33 00 - Submittal Procedures

.2 Section 01 78 00 - Closeout Submittals

.3 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC

1.2 TRIAL USAGE

.1 Departmental Representative may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Trial usage to apply to following equipment and systems:

.1 HVAC Systems

.2 Controls.

1.3 DEMONSTRATION, OPERATING AND MAINTENANCE INSTRUCTIONS

.1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.2 Where specified elsewhere in Mechanical Sections, manufacturers to provide demonstrations and instructions.

.3 Use operation and maintenance manual, as-built drawings, audio visual aids, etc. as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

.5 Where deemed necessary, Departmental Representative may record these demonstrations on video tape for future reference.

1.4 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

.2 Operation and maintenance manual to be approved by, and final copies deposited with, Departmental Representative before final inspection.

.3 Operation data to include:

.1 Control schematics for each system including environmental controls.

.2 Description of each system and its controls.

.3 Description of operation of each system at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for each system and each component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.7 Colour coding chart.

.4 Maintenance data shall include:

.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.5 Performance data to include:

.1 Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified elsewhere.

.4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.6 Approvals:

.1 Submit three (3) copies of draft O&M Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless so directed by Departmental Representative.

.2 Make changes as required and re-submit as directed by Departmental Representative.

.7 Additional data:

.1 Prepare and insert into operation and maintenance manual when need for same becomes apparent during demonstrations and instructions specified above.

1.5 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop drawings and product data shall show:

.1 Mounting arrangements.

.2 Operating and maintenance clearances. eg. access door swing spaces.

.3 Shop drawings and product data shall be accompanied by:

.1 Detailed drawings of bases, supports, and anchor bolts.

.2 Acoustical sound power data, where applicable.

.3 Points of operation on performance curves.

.4 Manufacturer to certify as to current model production.

.5 Certification of compliance to applicable codes.

.4 List of Requested Shop Drawings:

.1 Pipe hangers and supports

.2 Laboratory Air Valves

.3 Each type of thermometer and pressure gauge

.4 Laboratory ventilation controls

.5 EMCS system controls and components

1.6 AS-BUILT DRAWINGS

.1 Site Records:

.1 Provide sets of white prints as required for each phase of the work. Mark changes as work progresses and as changes occur. This shall include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 On a weekly basis, transfer information to reproducibles, revising reproducibles to show all work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection at all times.

.2 As-built Drawings:

.1 Prior to start of Testing, Adjusting and Balancing (TAB), finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least ½" high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).

.3 Submit to Departmental Representative for approval and make corrections as directed.

.4 TAB to be performed using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.3 Submit copies of as-built drawings for inclusion in Final TAB Report.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 – Waste Management and Disposal.

.2 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.

.3 Dispose of unused paint material at official hazardous material collections site approved by Departmental Representative.

.4 Do not dispose of unused paint material into sewer system, into streams, lakes, onto ground or in other locations where it will pose health or environmental hazard.

.5 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.6 Dispose of corrugated cardboard, polystyrene and/or plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program

1.8 AS INDICATED

.1 Means that the item or items specified are shown on the drawings.

.2 The word "provide" shall mean "Supply and Install".

Part 2 Products

2.1 NOT USED

.1 Not Used

Part 3 Execution

3.1 EQUIPMENT REQUIREMENTS AND INSTALLATION

.1 Provide unions and flanges to permit equipment maintenance and disassembly and to minimize disturbance to connecting piping and duct systems and without interference from building structure or other equipment.

.2 Equipment, cleanouts, floor drains and like equipment shall be on the axis of the building.

.3 Equipment, valves, dampers, etc, shall be located within 30" above ceiling and all equipment shall have a minimum of 24" clearance for servicing.

3.2 PROTECTION OF OPENINGS

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

3.3 TESTS

.1 Provide the following supplementary requirements to tests specified in the mechanical work sections of this document.

.1 Departmental Representative must have three (3) days written notice to date when tests will be made.

.2 Insulate and conceal work only after testing and approval by the Mechanical Departmental Representative. Conduct tests in presence of Departmental Representative. All tests results shall be recorded on appropriate typewritten forms and be signed and dated by the person carrying out the test as well as or the person authorized by the Departmental Representative.

.3 Bear cost including retesting and making good. Replace defective material or equipment and repair joints using new material.

.4 Prior tests, isolate all equipment or components which are not designed to withstand test pressures or test medium.

.5 Pipe Pressure:

.1 General – maintain test pressure without loss for a minimum of two (2) hours unless otherwise specified.

.2 Test all hydronic systems at 1½ times the system operating pressure or

minimum 125 psi, whichever is greater.

.3 Test natural gas system to CSA B149 and Authorities Having Jurisdiction.

.6 Conduct all other tests as specified in other Sections of Division 21, 22, 23 and 25.

.7 Replace defective material or equipment and repair joints using new material.

.8 Compile all completed test reports upon completion of all tests in a 3-ring binder and submit to the Departmental Representative.

3.4 PAINTING

.1 Apply at least one (1) coat of corrosion resistant primer paint to ferrous supports and site fabricated equipment.

.2 Prime and touch-up all damaged paint on the equipment. Touch-up to match original paint. Do not paint over nameplates.

.3 Restore to new condition, finishes which have been damaged too extensively to be merely primed and touched-up.

3.5 INSTRUCTION OF OPERATING STAFF

.1 Provide certified personnel to instruct operating staff on maintenance. Provide maintenance specialist personnel to instruct operations staff on maintenance and adjustment of mechanical equipment and any changes or modification in equipment made under terms of guarantee.

.2 Provide instruction during regular work hours prior to acceptance.

.3 Use operation and maintenance data manuals for instruction purposes. On completion of instruction turn the manuals over to the Departmental Representative.

.4 Instructions in maintenance and operation of the following equipment shall be given by factory trained personnel and for a period of one (1) working day for each of the following systems:

.1 Ventilation Systems - Lab Ventilation Controls

3.6 CLEANING AND FINAL ADJUSTMENT

.1 Keep all mechanical systems and equipment clean as per the requirements of Division 01.

.2 Clean interior and exterior of all systems; including strainers, and vacuuming of interior of ductwork and air handling units.

.3 Clean and refurbish all equipment and leave in first class operating condition including replacement of all filters in all air and piping systems.

.4 Balance and adjust all systems and each piece of equipment to operate efficiently.

3.7 PENETRATION OF WALLS AND FLOOR SLABS

.1 Wherever pipes and ducts penetrate non-fire rated walls and floor slabs, tightly pack the space between the wall/floor and the ducts/pipes the full depth with acoustic filler material and seal both sides with acoustic sealant. Where pipes pass through fire rated walls and floor slabs,

pack space between the pipe and sleeve with approved fire rated and ULC approved sealant.

.2 Acoustic Filler:

.1 Filler material shall be glass fibre or inorganic mineral.

.2 Filler material shall not have higher combustion rating than the following:

.1 Flame Spread Rating = 25
.2 Smoke Development Rating = 0
.3 Fuel Contribution Rating = 0

.3 Acoustic Sealant:

.1 Concealed Application:

.1 Non-shrinking, non-straining, non-drying and permanently elastic type.

.2 Exposed Application:

.1 Permanently elastic, paintable acoustic sealant, latex acrylic or acrylic latex type.

3.8 DRAWINGS

.1 Mechanical drawings are not intended to show structural details or architectural features.

.2 The Mechanical drawings are not to be scaled.

.3 Except where dimensioned, mechanical drawings indicate general Mechanical layouts only. Because of the small scale of Mechanical drawings, it is not possible to show all offsets, fittings and accessories which may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves and accessories which are required to meet the conditions.

3.9 CUTTING AND PATCHING

.1 Any cutting, coring and patching shall be done by the Trade Contractor required for Division 22, 23 or 25 work. Any cutting, coring and patching required for Division 22, 23 or 25 work shall be the responsibility of Division 22, 23 or 25.

.2 If the location proposed by the Trade-Contractor is rejected by the Departmental Representative and Trade Contractor will meet on site to determine a mutually agreeable location.

3.10 PROTECTION OF DUCTWORK DURING CONSTRUCTION

.1 The interior of all ductwork shall be protected from construction dust and dirt by sealing all open ends of the ducts.

3.11 INSTALLATION OF CONTROL INSTRUMENTS AND DEVICES

.1 All control valves and dampers supplied by Division 25 shall be installed by the respective Sections of Division 23.

.2 Divisions 23 shall install wells supplied by Division 25 for all control instrumentation and devices installed in piping.

.3 Division 23 shall provide access doors in ductwork for all control instrumentation and devices installed in ductwork.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

.2 Section 01 74 11 - Cleaning.

.3 Section 07 84 00 - Firestopping.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 CONNECTIONS TO EQUIPMENT

.1 In accordance with manufacturer's instructions unless otherwise indicated.

.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

3.2 CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, components.

3.3 DIELECTRIC COUPLINGS

.1 General: Compatible with system, to suit pressure rating of system.

.2 Locations: Where dissimilar metals are joined.

.3 NPS 2 and under: isolating unions or bronze valves.

.4 Over NPS 2: Isolating flanges.

.5 Victaulic Style 47.

3.4 PIPEWORK INSTALLATION

.1 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.2 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

.3 Slope piping, except where indicated, in direction of flow for positive drainage and venting.

.4 Install, except where indicated, to permit separate thermal insulation of each pipe.

.5 Group piping wherever possible and as indicated.

.6 Ream pipes, remove scale and other foreign material before assembly.

.7 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.

.8 Provide for thermal expansion as indicated.

.9 Valves:

.1 Install in accessible locations.

.2 Remove interior parts before soldering.

.3 Install with stems above horizontal position unless otherwise indicated.

.4 Valves accessible for maintenance without removing adjacent piping.

.5 Use gate or ball valves at branch take-offs for isolating purposes except where otherwise specified.

3.5 EXISTING SYSTEMS

.1 Connect into existing piping systems at times approved by Departmental Representative.

.2 Request written approval 10 days minimum, prior to commencement of work.

.3 Be responsible for damage to existing plant by this work.

.4 Ensure daily clean-up of construction areas.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-1.60-97, Interior Alkyd Gloss Enamel.

.2 CAN/CGSB-24.3-92, Identification of Piping Systems.

.2 National Fire Protection Association (NFPA):

.1 NFPA 13-2002, Standard for the Installation of Sprinkler Systems.

.2 NFPA 14-2003, Standard for the Installation of Standpipe and Hose Systems.

1.2 SUBMITTALS

.1 Product Data:

.2 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.3 Product data to include paint colour chips, other products specified in this section.

.4 Samples:

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Samples to include nameplates, labels, tags, lists of proposed legends.

1.3 QUALITY ASSURANCE

.1 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.2 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Dispose of unused material at official hazardous material collections site approved by Departmental Representative.

.3 Do not dispose of unused paint coating material into sewer system, into streams, lakes, onto ground or in locations where it will pose health or environmental hazard.

Part 2 Products

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:

.1 Equipment: manufacturer's name, model, size, serial number, capacity.

.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

.1 Colours:

.1 Hazardous: red letters, white background.

.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:

.1 3 mm thick laminated plastic or white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.2

.3 Sizes:

.1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

.2 Use maximum of 25 letters/numbers per line.

.4 Locations:

.1 Terminal cabinets, control panels: use size # 5.

.2 Equipment in Mechanical Rooms: use size # 9.

.5 Identification for PWGSC Preventive Maintenance Support System (PMSS):

.1 Use arrangement of Main identifier, Source identifier, Destination identifier.

.2 Equipment in Mechanical Room:

.1 Main identifier: size #9.

.2 Source and Destination identifiers: size #6.

.3 Terminal cabinets, control panels: size #5.

.3 Equipment elsewhere: sizes as appropriate.

2.3 EXISTING IDENTIFICATION SYSTEMS

.1 Apply existing identification system to new work.

.2 Where existing identification system does not cover for new work, use identification system specified this section.

.3 Before starting work, obtain written approval of identification system from Departmental Representative.

2.4 IDENTIFICATION OF PIPING SYSTEMS

.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.

.2 Pictograms:

.1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.

.3 Legend:

.1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.

.4 Arrows showing direction of flow:

.1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.

.2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.

.3 Use double-headed arrows where flow is reversible.

.5 Extent of background colour marking:

.1 To full circumference of pipe or insulation.

.2 Length to accommodate pictogram, full length of legend and arrows.

.6 Materials for background colour marking, legend, arrows:

.1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.

.2 Other pipes: pressure sensitive plastic-coated cloth vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C.

.7 Colours and Legends:

.1 Where not listed, obtain direction from Departmental Representative.

.2 Colours for legends, arrows: to following table:

Background Colour:	Legend, Arrows:
Yellow	BLACK
Green	WHITE
Red	WHITE

.3 Background colour marking and legends for piping systems to match existing.

2.5 IDENTIFICATION DUCTWORK SYSTEMS

.1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.

.2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

2.6 VALVES, CONTROLLERS

.1 Brass tags with 12 mm stamped identification data filled with black paint.

.2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

2.7 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.

.2 Inscriptions to include function and (where appropriate) fail-safe position.

2.8 LANGUAGE

.1 Identification in English.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC and or CSA registration plates as required by respective agency.

.3 Identify systems, equipment to conform to PWGSC PMSS.

3.3 NAMEPLATES

.1 Locations:

.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:

.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:

.1 Do not paint, insulate or cover.

3.4 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification easily and accurately readable from usual operating areas and from access points.

.1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.5 VALVES, CONTROLLERS

.1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.

.2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Departmental Representative. Provide one copy (reduced in size if required) in each operating and maintenance manual.

.3 Number valves in each system consecutively.

3.6 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 QUALIFICATIONS OF TAB PERSONNEL

.1 Submit names of personnel to perform TAB to Departmental Representative within 90 days of award of contract.

.2 Provide documentation confirming qualifications, successful experience.

.3 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:

.1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1-2002.

.2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems-1998.

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing-2002.

.4 Recommendations and suggested practices contained in the TAB Standard: mandatory.

.5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

.6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.

.7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

.8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.

.1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.

.2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

1.2 PURPOSE OF TAB

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads

.2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.3 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

1.4 CO-ORDINATION

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.5 PRE-TAB REVIEW

.1 Review contract documents before project construction is started and confirm in writing to Departmental Representative adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to Departmental Representative in writing proposed procedures which vary from standard.

.3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.6 START-UP

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Division 23.

1.7 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required by Departmental Representative for verification of TAB reports.

1.8 START OF TAB

.1 Notify Departmental Representative 7 days prior to start of TAB.

.2 Start TAB when building is essentially completed, including:

.3 Installation of ceilings, doors, windows, other construction affecting TAB.

.4 Application of weatherstripping, sealing, and caulking.

.5 Pressure, leakage, other tests specified elsewhere Division 23.

.6 Provisions for TAB installed and operational.

.7 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:

.1 Proper thermal overload protection in place for electrical equipment.

.2 Air systems:

.1 Filters in place, clean.

.2 Duct systems clean.

.3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances. Duct leakage tests complete.

.4 Correct fan rotation.

.5 Fire, smoke, volume control dampers installed and open.

.6 Coil fins combed, clean.

.7 Access doors, installed, closed.

.8 Outlets installed, volume control dampers open.

.3 Liquid systems:

.1 Flushed, filled, vented.

.2 Correct pump rotation.

.3 Strainers in place, baskets clean.

.4 Isolating and balancing valves installed, open.

.5 Calibrated balancing valves installed, at factory settings.

.6 Chemical treatment systems complete, operational.

1.9 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:

.1 Shop HVAC systems: plus 10 %, minus 0 %.

.2 Other HVAC systems: plus 5 %, minus +/- 10%

.3 Hydronic systems: plus or minus 10 %.

1.10 ACCURACY TOLERANCES

.1 Measured values accurate to within plus or minus 2 % of actual values.

1.11 INSTRUMENTS

.1 Prior to TAB, submit to Departmental Representative list of instruments used together with serial numbers.

.2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

.3 Calibrate within 3 months of TAB. Provide certificate of calibration to Departmental Representative.

1.12 SUBMITTALS

.1 Submit, prior to commencement of TAB:

.2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.13 PRELIMINARY TAB REPORT

.1 Submit for checking and approval of Departmental Representative, prior to submission of formal TAB report, sample of rough TAB sheets. Include:

.1 Details of instruments used.

.2 Details of TAB procedures employed.

.3 Calculations procedures.

.4 Summaries.

1.14 TAB REPORT

.1 Format in accordance with referenced standard.

.2 TAB report to show results in SI units and to include:

.1 Project record drawings.

.2 System schematics.

.3 Submit 6 copies of TAB Report to Departmental Representative for verification and approval, in English and/or French, both official languages in D-ring binders, complete with index tabs.

1.15 VERIFICATION

.1 Reported results subject to verification by Departmental Representative.

.2 Provide personnel and instrumentation to verify up to 30 % of reported results.

.3 Number and location of verified results as directed Departmental Representative.

.4 Pay costs to repeat TAB as required to satisfaction of Departmental Representative.

1.16 SETTINGS

.1 After TAB is completed to satisfaction of Departmental Representative, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.

.2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

1.17 COMPLETION OF TAB

.1 TAB considered complete when final TAB Report received and approved by Departmental Representative.

1.18 AIR SYSTEMS

.1 Standard: TAB to most stringent of this section or TAB standards of AABC, NEBB, SMACNA and ASHRAE.

.2 Qualifications: personnel performing TAB current member in good standing of AABC or NEBB qualified to standards of AABC or NEBB.

.3 Quality assurance: perform TAB under direction of supervisor qualified by to standards of AABC or NEBB.

.4 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dew point), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.

.5 Locations of equipment measurements: to include as appropriate:

- .1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment causing changes in conditions.
- .2 At controllers, controlled device.

.6 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

.7 Air Moving Systems:

- .1 General: measurements as required by referenced standards, including, but not limited to, the following:
  - .1 Measurements:
    - .1 Air velocity.
    - .2 Static pressure.
    - .3 Velocity pressure.
    - .4 Temperature:
      - .1 Wet bulb.
      - .2 Dry bulb.
    - .5 Cross sectional area.
    - .6 RPM.
    - .7 Electrical power:
      - .1 Voltage.
      - .2 Current draw.
  - .2 Location of equipment measurements:
    - .1 Inlet and outlet of each:
      - .1 Fan.
      - .2 Coil.
      - .3 Filter.
      - .4 Damper.
      - .5 Other auxiliary equipment.
  - .3 Location of system measurements at:
    - .1 Main ducts.
    - .2 Main branch ducts.
    - .3 Sub-branch ducts.
    - .4 Each supply, exhaust and return air inlet and outlet.

.5 Other auxiliary equipment.

.6 All areas served by system.

.4 All locations for systems measurements shall be identified as per paragraph 1.5 of this Section and be readily accessible for future testing agencies.

1.20 COMMISSIONING OF HVAC SYSTEMS

.1 TAB shall be present and assist the Departmental Representative during the commissioning of the HVAC Systems.

.2 Responsibilities of TAB during commissioning of major mechanical systems is outlined in Section 01 91 13. In addition, TAB shall provide information on entering and leaving air temperatures for all the reheat coils and reheat boxes with the control valve fully open.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE):

.1 ASHRAE Standard 90.1-01, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).

.2 American Society for Testing and Materials International (ASTM):

.1 ASTM B209M-04, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate Metric.

.2 ASTM C335-04, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.3 ASTM C411-04, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C449/C449M-00, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C533-2004, Calcium Silicate Block and Pipe Thermal Insulation.

.6 ASTM C547-2003, Mineral Fiber Pipe Insulation.

.7 ASTM C795-03, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.8 ASTM C921-03a, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.3 Canadian General Standards Board (CGSB):

.1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.2 CAN/CGSB-51.53-95, Poly (Vinyl Chloride) Jacketting Sheet, for Insulated Pipes, Vessels and Round Ducts

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS):

.1 Material Safety Data Sheets (MSDS).

.5 Manufacturer's Trade Associations:

.1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (Revised 2004).

.6 Underwriters' Laboratories of Canada (ULC):

.1 CAN/ULC-S102-03, Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S701-01, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.3 CAN/ULC-S702-1997, Thermal Insulation, Mineral Fibre, for Buildings

.4 CAN/ULC-S702.2-03, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.2 DEFINITIONS

.1 For purposes of this section:

.1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.

.2 "EXPOSED" - will mean "not concealed" as specified.

.2 TIAC ss:

.1 CRF: Code Rectangular Finish.

.2 CPF: Code Piping Finish.

1.3 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.1 Submit 12 copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.

.3 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.4 Samples:

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board. Affix label beneath sample indicating service.

.5 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

.1 Departmental Representative will make available five (5) copies of systems supplier's installation instructions.

1.4 QUALITY ASSURANCE

.1 Qualifications:

.2 Installer: specialist in performing work of this Section, and have at least 5 years successful experience in this size and type of project, qualified to standards of TIAC.

.3 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.3 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Storage and Protection:

.1 Protect from weather, construction traffic.

.2 Protect against damage.

.3 Store at temperatures and conditions required by manufacturer.

.3 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Place excess or unused insulation and insulation accessory materials in designated containers.

.3 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

.4 Dispose of unused adhesive material at official hazardous material collections site approved by Departmental Representative.

Part 2 Products

2.2 P-1 FORMED MINERAL FIBER TO 200°C

.1 Application: for piping valves and fittings on:
.1 Hot water heating.
.2 Domestic hot water.
.3 Domestic hot water recirculation.
.4 Glycol heating system.
.5 All other hot piping including drainage piping.

.2 Material:
.1 CGSB-51-GP-9M, rigid mineral fibre sleeving for piping and CGSB-51-GP-52M, vapour jacket and facing material.

.2 Acceptable Material: Fiberglas 850 pipe insulation with ASJ jacket, Knauf pipe insulation with ASJ jacket, Johns-Manville, Manson Alley “K”.

.3 Thickness: 1" (25mm)

2.3 P-2 FORMED MINERAL FIBER WITH VAPOUR BARRIER TO 85°C

.1 Application: for piping, valves and fittings on:
- .1 Domestic cold water, cistern water piping.
- .2 Chilled water piping.
- .3 Rainwater Piping.
- .4 All other cold piping system such as trap primer piping above floors, drains from plenums. Treated water piping (RO water) does not require insulation.

.2 Material:
- .1 CGSB 51-GP-9M, rigid mineral fibre sleeving for piping and CGSB 51-GP-52M, vapour barrier jacket and facing material.
- .2 Acceptable Material: Fiberglas 850 pipe insulation with ASJ jacket, Knauf pipe insulation with ASJ jacket, Johns-Manville, Mason Alley “K”.

.3 Thickness:
- .1 All piping provided with heat tracing: 50mm.
- .2 All other services: per table in 3.9.

2.4 FASTENINGS

.1 For Insulation Systems P-1 and P-2:
- .1 Tape: self adhesive.
- .2 Lap seal adhesive: quick-setting for joints and lap sealing of vapour barriers with 100% coverage.
- .3 Lagging adhesive: fire retardant coating.

.2 For vapour barriers:
- .1 Quick-setting adhesive for joints and lap sealing of vapour barriers. Flame spread 10, smoke development 0.

.3 All adhesives shall be U.L. listed and suitable for application as per insulation manufacturers' recommendations.

Part 3 Execution

3.1 APPLICATION

.1 Apply insulation after required tests have been completed and approved by Departmental Representative. Insulation and surfaces shall be clean and dry when installed and during

application of any finish. Apply insulation materials, accessories and finishes in accordance with manufacturer's recommendations and as specified herein.

.2 On piping with insulation and vapour barrier, install high density insulation under hanger shield. Maintain integrity of vapour barrier over full length of pipe without interruption at sleeves, fittings and supports.

.3 Apply insulation materials, accessories and finished in accordance with manufacturers' recommendations.

3.2 INSTALLATION

.1 Preformed: Sectional up to 300mm, sectional or curved segmented above 300mm.

.2 Seal and finish exposed ends and other terminations with insulating cement.

3.3 FASTENINGS

.1 Secure pipe insulation by tape at each end and centre of each section, but not greater than 450 mm on centres.

3.4 SIZING

.1 Coat canvas covering exposed in finished spaces with diluted coat of lagging adhesive. Provide a total of two coats of lagging adhesive. Provide a total of two coats of lagging adhesive. Dilution of lagging adhesive as per manufacturer's recommendations for priming.

3.5 HANGERS

.1 Hot Piping:
- .1 For pipes up to 50mm, provide proper covering shields sized to suit the insulated pipe, between the pipe insulation and the pipe hanger or support.
- .2 Where roller hangers and supports are used for hot piping 50mm diameter and larger, steel protection saddles shall be supplied and installed as part of the piping work. Pack the saddle voids with fiberglass insulation.

.2 Cold Piping:
- .1 Use calcium silicate insulation at all hanger locations on cold piping systems, except domestic water piping. Calcium silicate insulation length to be 450mm. Thickness of insulation to be the same as specified on adjacent insulation. The use of the Buckaroo System in lieu of the calcium silicate insulation at the hangers on cold piping will be acceptable.

3.6 DEMOUNTABLE INSULATION

.1 Insulation on valves, flanges and orifice plates for steam flow measurements and other fittings requiring access for servicing shall be demountable.

3.7 INSULATION THICKNESSES

Application	Temp Deg. C	TIAC Code	Pipe Sizes (NPS) and Insulation Thickness (mm)					
			Run Out	To 1	1 ¼ to 2	2 ½ to 4	5 to 6	8 & Over
Hot Water Heating	60 – 94	[A-1]	25	38	38	38	38	38
Hot Water Heating	Up to 59	[A-1]	25	25	25	25	38	38
Glycol Heating	60 – 94	[A-1]	25	38	38	38	38	38
Glycol Heating	Up to 59	[A-1]	25	25	25	25	38	38
Domestic HWS		[A-1]	25	25	25	38	38	38
Chilled Water	4 - 13	[A-3]	25	25	25	25	25	25
Chilled Water or Glycol	Below 4	[A-3]	25	25	38	38	38	38
Chilled Water Pump Casing		[A-3]	25	25	25	25	25	25
Condenser Water	4-13	[A-3]	25	25	25	25	25	25
Indoors Refrigerated Drinking Water		[A-3]	25	25	25	25	25	25
Domestic CWS with Vapour Retarder		[C-2]	25	25	25	25	25	25
RWL		[C-2]	25	25	25	25	25	25
Cooling Coil Cond. Drain		[C-2]	25	25	25	25	25	25
Diesel Generator Exhaust System		[A-2]	38	65	65	75	90	90

3.8 FINISHES

.1 Finishes:

.1 Concealed, indoors: canvas on valves, fittings. No further finish.

.2 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.

.3 Outdoors: water-proof SS jacket.

.4 Finish attachments: SS bands, at 150 mm on centre. Seals: closed.

.5 Installation: to appropriate TIAC code CRF/1 through CPF/5.

3.9 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Air Conditioning and Refrigeration Institute.
ARI 880 Performance Rating of Air Terminals

.2 American Society of Heating, Refrigeration, and Air Conditioning Engineers / American National Standards Institute.
ASHRAE/ANSI Standard 130, Methods for Testing Air Terminal Units

.3 American National Standards Institute / American Society of Heating, Refrigeration, and Air Conditioning Engineers

.4 Abbreviations and Acronyms:
- .1 ATC – Advanced Temperature Control
- .2 BMS – Building Management System
- .3 LACS – Laboratory Airflow Control System
- .4 UBC – Usage Based Controls
- .5 VAV – Variable Air Volume

1.2 ADMINISTRATION REQUIREMENTS

.1 Coordination:

.1 The LACS representative shall coordinate all details of the installation with the successful mechanical contractor. This effort shall include complete coordination of the sheet metal layout drawings to assure that the ductwork layout and sizing is based on the actual sizes of the airflow control valves for this project.

.2 Pre-installation Meetings:

.1 The LACS representative shall review the proper installation of the system with the contractor and the building management system (BMS) contractor.

.2 Project Installation Phase – The LACS representative shall make periodic visits to the project jobsite to assure that the system is being installed properly to assure optimal performance and that the location and orientation of the control valves is consistent for proper operation and future maintenance. Any discrepancies shall first be brought to the attention of the appropriate subcontractor. If no action is taken by said contractor, the representative shall bring these issues to the Departmental Representative for resolution.

1.3 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit manufacturer's detailed composite wiring diagrams for control systems showing factory installed wiring and equipment on packaged equipment or required for controlling devices or ancillaries, accessories and controllers.

.3 The laboratory airflow control system supplier shall provide a detailed proposal describing all elements of the laboratory control system. A schematic laboratory layout shall be provided, showing relations of these elements and a description of how they interact.

.4 Technical specification data sheets shall be provided for all proposed system components and devices.

.5 All proposed airflow control devices shall include discharge, exhaust, and radiated sound power level performance obtained from testing in accordance with ARI Standard 880.

.6 LACS submittals shall contain, at a minimum, the following information:
- .1 Product Data Sheets
- .2 Equipment Schedule Sheets containing Room#, Tag#, Min/Max flows, Catalog# and other configuration data as required to provide a fully engineered LACS.
- .3 Installation Instructions
- .4 Project-specific Wiring Diagrams
- .5 Points Lists

1.4 MAINTENANCE DATA

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

.2 Operation and maintenance manuals, including as-built wiring diagrams and component lists, shall be provided as closeout submittals.

1.5 QUALITY ASSURANCE

.1 Certifications: The laboratory airflow system provider shall be an entity that designs, develops, manufactures and sells products and services to control the environment and airflow of critical spaces using a Quality Management System registered to ISO 9001:2008.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Storage and Handling Requirements:

.1 Prior to installation, the LACS shall be stored in dry conditions within an environment complying with LACS product specifications as shown on product data sheets within the submittals.

.2 The LACS products shall be handled and transported in a manner consistent trade practices for control systems and instruments.

1.7 SITE CONDITIONS

.1 The ambient environmental conditions during installation and operation shall comply with LACS product specifications as shown on the product data sheets within the submittals.

1.8 WARRANTY

.1 The Warranty shall commence upon the date of shipment and extend for a period of 60 months for all airflow control devices and 36 months for all other control system components.

Part 2 Products

2.1 LABORATORY AIRFLOW CONTROL SYSTEMS

.1 The LACS shall be furnished and installed to control the airflow into and out of laboratory room 523. The exhaust flow rate of the laboratory fume hoods shall be controlled precisely to maintain a constant average face velocity into the fume hood at either a standard/in-use or standby level based on an operator's presence in front of the fume hood. The laboratory control system shall vary the amount of make-up/supply air into the room to operate the laboratories at the lowest possible airflow rates necessary to maintain temperature control, achieve minimum ventilation rates and maintain laboratory pressurization in relation to adjacent spaces (positive or negative). As part of this project, the existing base upgradable, two position fume hoods and associated tracking valves shall be upgraded with up-to-date valve cards to result in a fully variable air volume LACS for this Lab 523.

2.2 COMPONENTS

.1 Usage Based Control Equipment:

.1 For variable air volume (VAV) systems, a sash sensor shall be provided to measure the height of all 3 vertically moving fume hood sashes. A sash sensor shall also be provided to measure the opening of horizontal overlapping sashes if used.

.2 Note that the two existing combination sash fume hoods (Manufacturer: Mott, Model: 7423000) require option "S2 for 7423000 fume hood" to be provided and installed in order to upgrade these hoods to VAV from CAV.

.3 A presence and motion sensor shall be provided on the new hood, and reused on any existing hood, to determine an operator's presence in front of a hood by detecting the presence and/or motion of an operator, and to command the LACS from an in-use operating face velocity (e.g., 100 fpm) to a standby face velocity (e.g., 60 fpm) and vice versa.

.1 The sensor shall define an adjustable detection zone that extends approximately 20 inches (50 cm) from the front of the fume hood. If the sensor does not detect presence and/or motion in its detection zone within 30 to 3,000 seconds, it shall command the system to the user-adjustable standby face velocity. When the sensor detects the presence and/or motion of an operator within the detection zone, it shall command the system to the in use face velocity within 1.0 second.

.2 The sensor shall sense an inanimate object when placed in the detection zone and remain in the standard mode of operation for 30 to 3,000 seconds, after which it will return to a standby mode. Operators shall enter and leave the zone with the unit adjusting automatically between in-use and standby modes. If the inanimate object is moved or taken out of the zone, the unit shall adapt to the change automatically.

.3 The sensor shall have an adjustable detection zone capable of covering a fume hood up to eight feet wide and be mounted from six to 12 feet above the floor surface.

.4 The sensor shall be configurable for varying levels of lighting intensity and motion sensitivity.

.5 The sensor shall have the ability to operate on either AC or DC power sources.

.3 The airflow at the fume hood shall vary in a linear manner between two adjustable minimum and maximum flow set points to maintain a constant face velocity throughout this range. A minimum volume flow shall be set to assure flow through the fume hood even with the sash fully closed.

.2 Airflow Control Device - General

.1 The airflow control device shall be a venturi valve.

.2 The valve assembly manufacturer's Quality Management System shall be registered to ISO 9001:2008.

.3 Airflow control device shall be OSHPD tested and certified per 2013 CBC, 2012, IBC, ASCE 7-10, and ICC-ES-AC-156.

.4 The airflow control device shall be pressure independent over its specified differential static pressure operating range. An integral pressure independent assembly shall respond and maintain specific airflow within one second of a change in duct static pressure irrespective of the magnitude of pressure and/or flow change or quantity of airflow controllers on a manifolded system.

.5 The airflow control device shall maintain accuracy within ±5% of signal over an airflow turndown range of no less than:

a. 12.5 to 1 (medium pressure all valve sizes)
b. 16 to 1 (medium pressure w/o 14" valve)
c. 7 to 1 (low pressure all valve sizes)
d. 11 to 1 (low pressure w/o 14" valve)
e. 8 to 1 (medium pressure shut-off all valve sizes)
f. 14 to 1 (medium pressure shut-off w/o 14" valve)
g. 5 to 1 (low pressure shut-off all valve sizes)
h. 9 to 1 (low pressure shut-off w/o 14" valve)

.6 No minimum entrance or exit duct diameters shall be required to ensure accuracy and/or pressure independence.

.7 No rotational/axial orientation requirements shall be required to ensure accuracy and/or pressure independence.

.8 The airflow control device shall maintain pressure independence regardless of loss of power.

.9 The airflow control devices shall be constructed of one of the following four types:

Class A—The airflow control device for non-corrosive airstreams, such as supply and general exhaust, shall be constructed of 16-gauge aluminum. The device's shaft and internal “S” link shall be made of 316 stainless steel. The shaft support brackets shall be made of galvaneal (non shutoff valves) or 316 stainless steel (shutoff valves). The pivot arm shall be made of aluminum (for non shutoff valves) and 303/304 stainless (for shut off valves). The pressure independent springs shall be a spring-grade stainless steel. All shaft bearing surfaces shall be made of a PP (polypropylene) or PPS (polyphenylene sulfide) composite. Sound attenuating devices used in conjunction with general exhaust or supply airflow control devices shall be constructed using 24 gauge galvanized steel or other suitable material used in standard duct construction. No sound absorptive materials of any kind shall be used.

PVDF— The airflow control device for extremely corrosive airstreams, such as acid digestion fume hoods, shall have a PVDF (polyvinylidene fluoride fluoropolymer) coating. The device's shaft shall be made of 316 stainless steel with a Teflon coating. The shaft support brackets shall be made of 316 stainless steel with PVDF coating. The pivot arm and internal mounting link shall be made of 316 or 303 stainless steel with PVDF coating. The pressure independent springs shall be a spring-grade stainless steel with PVDF coating. The internal nuts, bolts and rivets shall be stainless steel with PVDF coating. All shaft bearing surfaces shall be made of Teflon or PPS (polyphenylene sulfide) composite. Only devices clearly defined as “extremely corrosion resistant” on project drawings will require this construction.

.10 Actuation: For pneumatically-actuated VAV operation, a pneumatic actuator shall be factory mounted to the valve. Loss of pneumatic main air or control power shall cause normally open valves to fail to maximum position and normally closed valves to fail to minimum position.

.11 The controller for the airflow control devices shall be microprocessor based and operate using peer-to-peer control architecture. The room-level airflow control devices shall function as a standalone network.

.12 There shall be no reliance on external or building-level control devices to perform room-level control functions. Each laboratory control system shall have the capability of performing fume hood control, pressurization control, temperature control, humidity control, and implement occupancy and emergency mode control schemes.

.13 NVLAP Accreditation (Lab Code 200992-0)

.1 Each new airflow control device shall be factory characterized on air stations NVLAP Accredited (a program administered by NIST) to ISO/IEC 17025:2005 standards.

.2 Each new airflow control device shall be factory characterized to the job specific airflows as detailed on the plans and specifications using NVLAP Accredited air stations and

instrumentation having a combined accuracy of no more than ±1% of signal (5,000 to 250cfm), ±2% of signal (249 to 100cfm) and ±3% of signal (199 to 35cfm). Electronic airflow control devices shall be further characterized and their accuracy verified to ±5% of signal at a minimum of 48 different airflows across the full operating range of the device.

.3 Each new airflow control device shall be marked with device-specific factory characterization data. At a minimum, it should include the room number, tag number, serial number, model number, eight-point characterization information (for electronic devices), date of manufacture and quality control inspection numbers. All information shall be stored by the manufacturer for use with as-built documentation. Characterization data shall be stored indefinitely by the manufacturer and backed up off site for catastrophic event recovery.

.3 Exhaust and Supply Airflow Device Controller

.1 The airflow control device shall be a microprocessor-based design and shall use closed loop control to linearly regulate airflow based on a digital control signal. The device shall generate a digital feedback signal that represents its airflow.

.2 The airflow control device shall store its control algorithms in non-volatile, re-writeable memory. The device shall be able to stand-alone or to be networked with other room-level digital airflow control devices using an industry standard protocol.

.3 Room-level control functions shall be embedded in and carried out by the airflow device controller using distributed control architecture. Critical control functions shall be implemented locally; no room-level controller shall be required.

.4 The airflow control device shall use industry standard 24 VAC power.

.5 The airflow control device shall have provisions to connect a notebook PC commissioning tool and every node on the network shall be accessible from any point in the system.

.6 The airflow control device shall have built-in integral input/output connections that address fume hood control, temperature control, humidity control occupancy control, emergency control, and non-network sensors switches and control devices. At a minimum, the airflow controller shall have:

.1 Three universal inputs capable of accepting 0 to 10 VAC, 4 to 20 mA, 0 to 65 K ohms, or Type 2 or Type 3 10 K ohm @ 25 degree C thermistor temperature sensors.
.2 One digital input capable of accepting a dry contact or logic level signal input.
.3 Two analog outputs capable of developing either a 0 to 10 VAC or 4 to 20 mA linear control signal.
.4 One Form C (SPDT) relay output capable of driving up to 1 A @ 24 VAC/VAC.

.7 The airflow control device shall meet FCC Part 15 Subpart J Class A, CE, and CSA Listed per file #228219.

.4 Fume Hood Monitor

A fume hood monitor shall be provided to receive the sash sensor output, and presence and/or motion signal. This same monitor shall generate an exhaust airflow control signal for the appropriate airflow control device in order to provide a constant average face velocity. Audible and separate visual alarms shall be provided for flow alarm and emergency exhaust conditions. The fume hood monitor shall incorporate the following capabilities:

.1 (Optional) LED display with the ability to display one of the following measurements:
   i. Cubic feet per minute (CFM)
   ii. Meters cubed per hour (m3/h)
   iii. Liters per second (l/s)
   iv. Feet per minute (fpm)
   v. Meters per second (m/s)

.2 Alarm Muting option, which silences the audible alarm for an adjustable time period when the mute button is pushed. If another alarm is generated during the mute period, the new alarm will override the mute delay and the alarm will sound again.

.3 Auto Alarm Muting option, which sets the alarm to mute automatically after 20 seconds.

.4 Emergency Exhaust button with LED, which activates an emergency exhaust mode. In this mode, the exhaust air is at its maximum flow. When activated, the alarm will sound and the LED will flash. To activate emergency exhaust mode, push the button. Push the button again to cancel emergency exhaust mode.

.5 Flow Alarm LED, which illuminates to indicate an unsafe airflow condition. The audible alarm will also activate and may be muted.

.6 Broken retracting cable alarm, an audible alarm with a flashing LED that indicates whether a vertical sash sensor cable is detached, thereby ensuring the fume hood users' safety.

.7 (Optional) Diversity Alarm LED that can be activated locally or from the BMS system. No audible alarm will be generated at the fume hood monitor.

.8 (Optional) Energy waste alarm option, which generates a local visual and audible alarm to notify when the fume hood sash is open beyond its minimum flow position and the lights in the room are off. When activated, the LED display will show "ENRG" and the audible alarm will sound until the sash is closed. The light levels at which the alarm is both initiated and cancelled shall be configurable.

.9 (Optional) Fume hood decommissioning option, which commands the exhaust flow through the fume hood to the minimum allowed by the exhaust valve when the sash is fully closed and no chemicals are present in the hood. The mode shall be initiated by either a pushbutton sequence on the fume hood monitor, external momentary switch input to the fume hood monitor, or a network command. When activated, the LED display will show "OFF," and the exhaust valve will move to its minimum position or shutoff position. Safety shall be built into the decommission option, whereby opening the fume hood sash will automatically return the fume hood exhaust to an in-use operating volume as determined by the sash sensor. Fume hood decommissioning shall be a point that can be integrated to the BMS system.

2.3 ACCEPTABLE MATERIALS

.1 The only acceptable materials are systems and equipment manufactured by Phoenix Controls Corporation.

Part 3 Execution

3.1 INSTALLATION

.1 Contractor shall install the sash sensors, interface boxes, presence and motion sensor, and fume hood monitor on the fume hood under supervision of the LACS supplier. Reel-type sash sensors and their stainless steel cables shall be hidden from view. Bar-type sash sensors shall be affixed to the individual sash panels. Sash interface boxes with interface cards shall be mounted in an accessible location.

.2 Contractor shall install an appropriately sized and fused 24 VAC transformer suitable for NEC Class II wiring.

.3 Contractor shall install 20 psi clean, dry pneumatic supply air to all airflow control devices, where required.

.4 All cable shall be furnished and installed by contractor. The contractor shall terminate and connect all cables as required; and shall utilize cables specifically recommended by the laboratory airflow controls supplier.

.5 The contractor shall install all airflow control devices in the ductwork and shall connect all airflow control valve linkages.

.6 The contractor shall provide and install all reheat coils and transitions.

.7 The contractor shall provide and install insulation as required.

.8 Each pressurization zone shall have either a dedicated, single-phase primary circuit or a secondary circuit disconnect.

3.2 SYSTEM START-UP

.1 System start-up shall be provided by a factory-authorized representative of the LACS manufacturer. Start-up shall include calibrating the fume hood monitor and any combination sash sensing equipment, as required. Start-up shall also provide electronic verification of airflow (fume hood exhaust, supply, make-up, general exhaust or return), system programming and integration to BMS (when applicable).

.2 The balancing contractor shall be responsible for final verification and reporting of all airflows.

3.3 CLOSEOUT ACTIVITIES

.1 Training: Operation and maintenance manuals, including as-built wiring diagrams and component lists, shall be provided.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Related Sections:

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 29.06 - Health and Safety Requirements.

.3 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.4 Section 07 84 00 - Firestopping.

.5 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

1.2 REFERENCES

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

.2 American Society for Testing and Materials International, (ASTM).

.1 ASTM A480/A480M-03c, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

.2 ASTM A635/A635M-02, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.

.3 ASTM A653/A653M-03, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.3 Department of Justice Canada (Jus).

.1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.5 National Fire Protection Association (NFPA).

.1 NFPA 90A-02, Standard for the Installation of Air-Conditioning and Ventilating Systems.

.2 NFPA 90B-02, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

.3 NFPA 96-01, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.6 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

.1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2nd Edition 1995 and Addendum No. 1, 1997.

.2 SMACNA HVAC Air Duct Leakage Test Manual, 1985, 1st Edition.

.3 IAQ Guideline for Occupied Buildings Under Construction 1995, 1st Edition.

.7 Transport Canada (TC).

.1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.3 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 47 15 - Sustainable Requirements: Construction and Section 02 62 00.01 - Hazardous Materials for the following:

.1 Sealants.

.2 Tape.

.3 Proprietary Joints.

.3 Co-ordinate submittal requirements and provide submittals required by Section 01 47 15 - Sustainable Requirements: Construction.

.4 Submit Indoor Air Quality (IAQ) Management Plan in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

1.4 QUALITY ASSURANCE

.1 Certification of Ratings:

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.3 Indoor Air Quality (IAQ) Management Plan.

.1 During construction meet or exceed the requirements of SMACNA IAQ Guideline for Occupied Buildings under Construction.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Protect on site stored or installed absorptive material from moisture damage.

.2 Store and manage hazardous materials in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

.3 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Separate for reuse and recycling and place in designated containers Steel Metal Plastic waste in accordance with Waste Management Plan.

.5 Place materials defined as hazardous or toxic in designated containers.

.6 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

.7 Fold up metal and plastic banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 SEAL CLASSIFICATION

.1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
750	C
250	C
125	C
125	Unsealed

.2 Seal classification:

.1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.

.2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant.

.3 Class C: transverse joints and connections made air tight with gaskets sealant. Longitudinal seams unsealed.

.4 Unsealed seams and joints.

2.2 SEALANT

.1 Sealant: oil resistant, water based, polymer type flame resistant duct sealant. Temperature range of minus 30 degrees C to plus 93 degrees C.

2.3 TAPE

.1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

2.4 DUCT LEAKAGE

.1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.5 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows.

.1 Rectangular: standard radius short radius with single thickness turning vanes Centreline radius: 1.5 times width of duct.

.2 Round: smooth radius five piece. Centreline radius: 1.5 times diameter.

.3 Mitred elbows, rectangular:

.1 To 400 mm: with single thickness turning vanes.

.2 Over 400 mm: with double thickness turning vanes.

.4 Branches:

.1 Rectangular main and branch: with radius on branch 1.5 times width of duct 45 degrees entry on branch.

.2 Round main and branch: enter main duct at 45 degrees with conical connection.

.3 Provide volume control damper in branch duct near connection to main duct.

.4 Main duct branches: with splitter damper.

.5 Transitions:

.1 Diverging: 20 degrees maximum included angle.

.2 Converging: 30 degrees maximum included angle.

.6 Offsets:

.1 Full radiused elbows as indicated.

.7 Obstruction deflectors: maintain full cross-sectional area.

.1 Maximum included angles: as for transitions.

2.6 FIRE STOPPING

.1 Retaining angles around duct, on both sides of fire separation in accordance with Section 07 84 00 - Firestopping.

.2 Fire stopping material and installation must not distort duct.

2.7 GALVANIZED STEEL

.1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.

.2 Thickness, fabrication and reinforcement: to SMACNA.

.3 Joints: to SMACNA proprietary manufactured duct joint. Proprietary manufactured flanged duct joint to be considered to be a class A seal.

2.8 STAINLESS STEEL

.1 To ASTM A480/A480M, Type 304 for fume hood exhaust.

.2 Finish: No. 4.

.3 Thickness, fabrication and reinforcement: to SMACNA as indicated.

.4 Joints: to ASHRAE and SMACNA be continuous inert gas welded.

2.9 ALUMINUM

.1 To ASHRAE and SMACNA. Aluminum type: 3003-H-14 for dishwasher exhaust.

.2 Thickness, fabrication and reinforcement: to SMACNA.

.3 Joints: to SMACNA be continuous weld.

2.10 BLACK STEEL

.1 To ASTM A635/A635M for kitchen hood exhaust.

.2 Thickness: 1.2 mm or as indicated.

.3 Fabrication: ducts and fittings to SMACNA.

.4 Reinforcement: as indicated.

.5 Joints: continuous weld.

2.11 HANGERS AND SUPPORTS

.1 Hangers and Supports: in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.

.1 Maximum size duct supported by strap hanger: 500.

.2 Hanger configuration: to ASHRAE and SMACNA.

.3 Hangers: galvanized steel angle with galvanized steel rods to ASHRAE and SMACNA following table:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

.4 Upper hanger attachments:

.1 For concrete: manufactured concrete inserts.

.2 For steel joist: manufactured joist clamp.

.3 For steel beams: manufactured beam clamps.

Part 3 Execution

3.1 GENERAL

.1 Do work in accordance with NFPA 90A, NFPA 90B, ASHRAE, & SMACNA.

.2 Do not break continuity of insulation vapour barrier with hangers or rods.

.1 Insulate strap hangers 100 mm beyond insulated duct Ensure diffuser is fully seated.

.3 Support risers in accordance with SMACNA as indicated.

.4 Install breakaway joints in ductwork on sides of fire separation.

.5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

.6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining where required.

.7 Ground across flex connector with No. 2 braided copper 8 trap.

.8 Seal and protect duct work during construction. Cover open ends.

3.2 HANGERS

.1 Strap hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: in accordance with SMACNA as follows:

Duct Size	Spacing
(mm)	(mm)
To 1500	3000
1501 and over	2500

3.3 SEALING AND TAPING

.1 Apply sealant to outside of joint to manufacturer's recommendations.

.2 Bed tape in sealant and recoat with minimum of one coat of sealant to manufacturer’s recommendations.

3.4 LEAKAGE TESTS

.1 In accordance with SMACNA HVAC Duct Leakage Test Manual.

.2 Do leakage tests in sections.

.3 Make trial leakage tests to demonstrate workmanship.

.4 Do not install additional ductwork until trial test has been passed.

.5 Test section minimum of 30 m long with not less than three branch takeoffs and two 90 degrees elbows.

.6 Complete test before performance insulation or concealment Work.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Related Sections:

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 29.06 - Health and Safety Requirements.

.3 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.4 Section 07 84 00 - Firestopping.

.5 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

1.2 REFERENCES

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

.2 Department of Justice Canada (Jus).

.1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.4 National Fire Protection Association (NFPA).

.1 NFPA 90A-02, Standard for the Installation of Air-Conditioning and Ventilating Systems.

.2 NFPA 90B-02, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

.3 NFPA 96-01, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

.1 SMACNA Standards of COnstruction for PVC Duct Systems.

.2 SMACNA HVAC Air Duct Leakage Test Manual, 1985, 1st Edition.

.3 IAQ Guideline for Occupied Buildings Under Construction 1995, 1st Edition.

.6 Transport Canada (TC).

.1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.3 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

1.4 QUALITY ASSURANCE

.1 Materials shall be as specified in SMACNA PVC Duct Construction Standard, PVC Class 12454-B and B per ASTM D-1784, (formerly known as Type I, Grade 1) and PVC Class 1433-D, ASTM D-1784. Composition shall include inhibitor for UV radiation. A

material sample coupon shall be submitted to the Departmental Representative for review with the bid package. Viron International PVC Duct meets or exceeds all of the above specifications.

.2 Ductwork shall be fabricated, reinforced, installed, sealed and tested in accordance with requirements and recommendations of SMACNA Thermoplastic Duct (PVC) Construction Manual.

.3 Certification of Ratings:

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.4 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.5 Indoor Air Quality (IAQ) Management Plan.

.1 During construction meet or exceed the requirements of SMACNA IAQ Guideline for Occupied Buildings under Construction.

1.5 DELIVERY, STORAGE AND HANDLING

.1 All PVC duct and fittings not installed immediately should be stored indoors in a safe, dry location and protected against damage or loss. If storage indoors is not practical outdoor storage is acceptable provided duct and fittings are protected from direct exposure to sunlight and properly supported to prevent sagging or buckling. At no time should the surface temperature of stored parts be allowed to exceed 100º F or fall below 50º F. Extreme care should be taken when handling or installing ductwork below 50º F. PVC duct and fittings should always be stored separately from metal pipe and fittings. Practices, such as dragging the duct on rough ground or over obstacles should be avoided. Shock impacts, such as dropping, should be avoided, particularly in cold weather. If the PVC duct becomes damaged, the damaged portion should be cut out prior to installation.

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Separate for reuse and recycling and place in designated containers Steel Metal Plastic waste in accordance with Waste Management Plan.

.5 Place materials defined as hazardous or toxic in designated containers.

.6 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

.7 Fold up metal and plastic banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 POLYVINYL CHLORIDE (PVC)

.1 PVC: to ASTM D1784

.2 Fabricate from unplasticized rigid PVC sheets to ASTM D1927 and to following thickness:

Largest dimension (Round or Rectangular)	Wall Thickness (mm)
Up to 450 mm	3.2mm
451mm to 750 mm	5.0mm

.3 Construction Standard:

.1 Construction to be to SMACNA "Standards of Construction of Construction for PVC Duct Systems".

.2 Maximum operating static pressure: 500 Pa.

.4 Welding: hot gas, filler rod welding only throughout.

.5 Straight ductwork heat formed with butt-welded longitudinal seams.

.6 Rectangular ductwork: corners to be heat-formed.

.7 Round ductwork: moulded to form perfect round shape within tolerances specified in standard.

.8 Important notice: no metals to penetrate duct system.

2.2 DUCT LEAKAGE

.1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.3 FITTINGS

.1 Fabrication: to SMACNA.

.2 Longitudinal Seams:

.1 For thermally formed round duct sections, longitudinal seams shall be butt welded.

.2 Alignment of longitudinal seams in adjacent butt welded sections of duct shall be avoided, and seams shall be staggered.

.3 For straight rectangular duct, the corners shall be formed. Welded corner seams are not acceptable.

.4 Longitudinal seams shall be butt welded and located at a distance of not less than 1/8 of the span width from corner of duct.

.3 Elbows - Round Duct:

.1 Unless otherwise specified, centerline radius for standard elbows shall be 1.5 times diameter.

.2 Segmented elbows shall be joined by butt welding and number of gores or segments shall be in accordance with table included herein.

.3 Elbows may also be constructed by press forming in halves from a sheet. The halves shall then be joined by butt-welding.

SEGMENTED ELBOWS

Duct Diameter or Width	Minimum Number of Segments	
	45 Degrees	90 Degrees
Up through 200mm	3	5
225mm to 1200mm	3	5
1225 mm and above	3	7

.4 Elbows - Rectangular Duct:

.1 Rectangular elbows shall be fabricated from flat stock with welded corner construction.

.2 Unless otherwise specified, centerline radius for standard rectangular elbows shall be 1.5 times duct width.

.3 Square throat elbows shall be provided with turning vanes.

.5 Offsets:

.1 Unless otherwise specified, centerline radii for standard offsets shall be same as for elbows.

.2 Where space limitations will not allow standard centerline radius offset, vane blades shall be installed to decrease turbulence.

.6 Transitions and Reducers:

.1 Transition pieces in mains and sub-mains shall be tapered.

.2 Unless otherwise specified, angular limitations for transitions illustrated in thermoplastic duct construction manual shall be held where field conditions permit.

.7 Branches Entering Main:

.1 Branch ducts shall enter main duct near large end of a transition, at an angle not exceeding 45 degree wherever possible.

.2 Branches shall not be positioned directly opposite one another on a main or a sub-main.

.3 Intersection of branches with mains and sub-mains shall be continuously welded.

.8 Transverse Joints

.1 Transverse joints shall be made by either flanged method, bell and spigot method or sleeve joint method. Welded butt joints shall not be used.

.9 Flanged Joints:

.1 Minimum dimensions of flanges for round and rectangular duct shall be in accordance with thermoplastic duct construction manual.

.2 Where flange joints are used as reinforcement, their rigidity shall also be that specified by thermoplastic duct construction manual.

.3 Spacing between flanges and/or equivalent reinforcement shall be as specified in thermoplastic duct construction manual.

.4 Flanges shall be welded to duct on inside and outside of flange face, as shown in thermoplastic duct construction manual.

.5 Weld on flange face shall be ground flush with face of flange.

.6 Flanges shall be welded to duct in accordance with thermoplastic duct construction manual.

.7 Face of flange shall have no projections or depressions greater than 1/32” and shall be perpendicular to centerline of duct within 1/20”.

.8 Unless otherwise specified, bolt size and spacing of bolt holes shall be in accordance with thermoplastic duct construction manual. For rectangular duct, first bolt shall be located a maximum of 1 ½” from outside corner of reinforcement as illustrated in thermoplastic duct construction manual. Flat washers shall be used under both the nut and bolt head.

.9 In corrosive atmosphere, hardware for joining flanges shall be an appropriate type stainless steel or PVC.

.10 Care shall be exercised in tightening of flange bolts so as not to overstress PVC flange or its attachment to duct.

.11 Flanged joints shall be provided with a gasket of suitable material which is compatible with chemical environment and materials from which duct is made. After joint assembly, gasket material shall not protrude more than 1/8 inch beyond inside surface of duct, nor shall a cavity of more than 1/8 inch be formed below internal duct

surface. Flange gaskets shall be of sufficient thickness to properly seal a joint, and shall be a minimum of 3/32 inch thick for duct dimensions up through 24 inches diameter, and 3/16 inch thick for duct diameters greater than 24 inches. Gaskets shall be of the full face type having an unbroken perimeter.

2.4 FIRE STOPPING

.1 Retaining angles around duct, on both sides of fire separation in accordance with Section 07 84 00 - Firestopping.

.2 Fire stopping material and installation must not distort duct.

2.5 HANGERS AND SUPPORTS

.1 Hangers and Supports: in accordance with ASHRAE and SMACNA.

.2 Hangars: complete with locking nuts and washers.

.3 Support spacing:

.1 Horizontal ducts: to SMACNA.

.2 Supports:

1. Support independently from fume hood.

2. Support heavy accessories independently from adjacent ductwork.

.3 Drainage:

.1 Slope all exhaust ducts back to fume hood.

Part 3 Execution

3.1 GENERAL

.1 Do work in accordance with NFPA 90A, NFPA 90B, ASHRAE, & SMACNA.

.2 Do not break continuity of insulation vapour barrier with hangers or rods.

.1 Insulate strap hangers 100 mm beyond insulated duct Ensure diffuser is fully seated.

.3 Support risers in accordance with SMACNA as indicated.

.4 Install breakaway joints in ductwork on sides of fire separation.

.5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

.6 Seal and protect duct work during construction. Cover open ends.

3.2 HANGERS

.1 Strap hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: in accordance with SMACNA.

END OF SECTION

Part 1 General

1.1 SCOPE AND CLASSIFICATION

.1 This specification covers the requirements for the purchase of ONE bench-mounted PVC-lined acid digestion laboratory fume hood which is to be installed into a functioning laboratory designed for and using a remote exhaust blower system. It is written to cover the by-pass design configuration, vapor-proof electrical configuration, service fixture configuration, and custom sink requirements for this hood. The specification sets the requirements for quality, performance and appearance.

1.2 MANDATORY REQUIREMENTS

.1 Laboratory hood shall be of double wall construction with epoxy-coated, cold-rolled steel exterior and PVC internal liner and baffle. Hood shall be equipped with a washdown system behind the baffle and a feed system for duct washdown. The vertical rising sash assemblies shall feature a 6.4mm Polycarbonate sash on acid digestion hoods with single counterbalance sash weight. Sashes shall have a fully open height of 711.2mm from the work surface and provide a viewing height of 952.5mm. Hoods shall be provided with an air foil across the bottom of the sash area that shall be constructed to maintain airflow should the operator inadvertently block the airflow. Access for maintenance shall be from both the front and exterior sides of the hood. The specified hood-mounted service fixtures shall be pre-plumbed. All electrical services shall be pre-wired to a single point junction box on the top of the hood. Hood shall be of one piece construction and shall pass through a 1028.7mm opening without disassembly.

1.3 REFERENCES

.1 The laboratory hoods shall conform to the following regulations and standards:

SEFA - #1-2014 (Laboratory Fume Hoods)
NFPA - #45 section 6-1 through 6-14
ASTM-E-84 - Surface Burning Characteristics of Building Materials
ASHRAE - 110-95 (Method of Testing Performance of Laboratory Fume Hoods)
ANSI -Z 9.5 (Laboratory Ventilation)
UL -3101 (Electrical Wiring)
UL-1805 (Hood Construction)
CAN/CSA Standard C22.2 No. 1010.1

1.4 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

1.5 DELIVERY AND STORAGE

.1 Laboratory hoods and supporting surfaces shall be delivered adequately protected from damage during shipment.

1.6 WARRANTY

.1 Manufacturer's warranty against defects in material or workmanship on its fume hoods shall be for 1 year from date of installation or 2 years from date of purchase, whichever is sooner, shall include replacement of parts (except lamps) and labor.

Part 2 Products

2.1 MATERIALS

.1 Hood exterior construction shall be 20 gauge (or heavier) cold rolled sheet steel or galvanized steel supports. All exterior painted surfaces shall be epoxy-coated. Base metal material shall be properly prepared for epoxy coating.

.2 Hood interior liner, baffle and integral work surface with drainage trough shall be unplasticized PVC.

.3 Corner posts shall be 16 gauge cold-rolled steel with epoxy-coated finish.

.4 Exhaust connection shall be PVC pipe.

.5 Hose connectors shall be chemically-resistant, glass-filled polypropylene.

.6 Gooseneck faucet shall be gray PVC.

.7 Sash on hood shall be 6.4mm thick Polycarbonate surrounded by an epoxy-coated aluminum and PVC frame suitable for frequent use of hydrofluoric acid.

.8 Hood service fixtures shall feature 6.4mm copper tubing with extruded brass valves and rotating seats, TFE coated silicone bronze stem and TFE packing. Gas valves shall feature brass service lines.

.9 Sash foil shall be 18 gauge epoxy-coated cold-rolled steel constructed in such a way that airflow is maintained should the operator inadvertently block the airflow.

.10 The supporting surface, located underneath the integral PVC work surface, shall be black enamel-coated lamiboard or equivalent.

2.2 SPECIFIC FABRICATION REQUIREMENTS

.1 Since this specialty fume hood is being installed into an existing and working laboratory, the fume hood's overall exterior dimensional information is as follows: 1828.8mm w x 1498.6mm h x 957.6mm d. For procedural and operator safety requirements, the interior working depth must not be less than 736.6mm deep. For clarification, this 736.6mm distance is measured from the inside surface of the sash and across the work surface to the innermost rear baffle. This distance is critical to allow the operator to safely work unencumbered by hazardous chemicals and pre-existing laboratory equipment that is required for use.

.2 The bench-mounted laboratory hood with by-pass design shall minimize face velocity fluctuations as the sash is raised or lowered. With the sash positioned 152.4mm above the

air foil, the average inflow velocity shall not be less than twice the selected full open face velocity nor greater than three times that amount.

.3 Exhaust air volume requirements and static pressure losses shall be as described in the table.

.4 The exhaust connection shall be 250mm ID.

.5 Corner posts shall be pre-punched and plugged to accommodate up to 4 service fixtures and 2 electrical receptacle boxes on each side. Right-hand corner post shall have Council of Canadians with Disabilities (CCD) compliant light switch. Corner posts shall have front access panels (one on each side) to allow for maintenance to the service fixtures from the front of the hood.

.6 Interchangeable removable side panels, removable front panel and front access panels shall provide access to plumbing fixtures, electrical wiring, counterbalance sash weights, and lighting fixtures. All services shall be accessible from the front of the hood.

.7 The air foil shall be located directly across the bottom of the sash opening to allow the air to bypass underneath and through the foil's perforated openings and sweep across the work surface to prevent any back flow of fumes escaping from the front of the hood. The foil shall be at least 4" wide and extend back under the sash to prevent closure of the lower by-pass opening when the sash is in the fully closed position. The air foil shall have a large aerodynamic radius to sweep the air into the hood with minimal turbulence and perforated to pull inflow air from beneath so that clean air continually flows over the foil creating a constant protective barrier from contaminants. This airflow shall continue even if blocked by the presence of the operator.

.8 The air foil must contain slots to allows for the passage of electrical cords located on both the right and left side of the air foil to permit the sash to close completely when electrical cords from equipment inside the hood are plugged into the GFCI duplex receptacles located on the corner posts. This is also necessary to keep cords from getting in the way and hindering safe operation for the operator.

.9 The liner and baffle(s) shall be fabricated of type 1, unplasticized PVC. The liner shall be one piece welded construction with coved corners and without interior access panels. All joints shall be ground smooth and polished. The tamper-resistant, preset baffle shall be one piece without slots or need for adjustment. The baffle shall provide uniform draw throughout the fume cavity. Baffle(s) shall be removable for cleaning.

.10 The integral work surface shall have a 6.4mm deep dish seamlessly welded to the hood interior. The washwater drainage trough shall be located in the rear edge of the work surface to provide for the drainage of the effluent water.

.11 Trough shall feature 50.8mm diameter drain connection at the right end.

.12 Hood shall be equipped with an internal washdown system to wash behind the baffle serviced by an additional cold water valve and supply line. There shall be a connection point to the internal manifold for feed to the duct system wash rings. This connection shall be plugged upon delivery.

.13 Hood shall have a single vertical-rising sash counterbalanced by a single weight suspended by two vinyl-coated stainless steel cables that pass through ball bearing pulleys. The sash shall operate smoothly without tilting when raised or lowered from either end and shall remain at rest in any open position. All sashes shall be framed with extruded epoxy-coated aluminum and PVC. For this application, the sash handle itself must contain openings to bleed air into the hood chamber to direct any possible hazardous fume concentrations away from the user's breathing zone.

.14 The hood shall be equipped with two right side cold water (CW) service fixtures capable of providing cold tap water. Fixtures must be rated to a maximum pressure of 200 psi with a working pressure of 125 psi. Services must be pre-plumbed. Fixture handles shall be plastic, color coded, and labelled for cold water service. One PVC CW gooseneck faucet to be provided by the manufacturer will contain one vacuum breaker (9.5mm lines). The dimensions of the PVC faucet must conform to the following: 265.2mm high and 149.1mm across the width of the gooseneck's arc. The second cold water (CW) service fixture is intended to be used with a spray hose, custom built, and supplied by the end user.

.15 The hood shall be equipped with one compressed air connection with control on the exterior right side of the hood.

.16 The fume hood will be equipped with three (3) custom fabricated PVC sinks in the following sizes:

- One (1 ea) 279.4mm x 393.7mm x 203.2mm right side, front
- Two (2 ea) round, 152.4mm diameter and 127.0mm deep, PVC cup sink with cover, one left side front with the other directly behind.

The one 279.4mm x 393.7mm x 203.2mm deep rectangular sink is to be mounted 50.8mm in from the right hand wall and 25.4mm in from the from the front work surface. The 279.4mm dimension faces the front and 393.7mm dimension runs back into the hood and alongside the right side wall.

The left side placement of the two round sinks is to be as follows: in 203.2mm from the left wall with first sink in 127mm from the inner lip. The second sink is placed directly behind and parallel to the first with a 25.4mm spacing in between the two.

.17 The hood shall be equipped with two removable covers for the two round sinks mentioned above.

.18 Hoods shall be provided with high-efficiency, instant-start, T8 fluorescent lighting systems (bulbs included) located behind a laminated safety glass shield on top of the hood liner. The fluorescent light assemblies shall be serviceable from outside the fume hood cavity. Hoods shall be provided with a light switch, blower switch, and all internal wiring to a single point junction box. The hood shall be provided with the following lamps:

- Two (2 ea), 4-foot (1219.2mm) 32-watt fluorescent lamps

.19 Hoods shall feature two (2) 115 volt, exterior GFCI duplexes on left side and right side of hood.

.20 A lamiboard or equivalent surface shall be provided to support the integral PVC work surface.

.21 Face velocity alarms to monitor hood performance (not included with hood) are recommended and shall be available for factory or field installation.

.22 One (1) 1219.2mm acid storage corrosion resistant cabinet, compatible with and finish/colour-matched to above fume hood. Cabinet to have the following specifications:

- Durable epoxy-coated steel construction with corrosion-resistant polyethylene-lined interior.
- Two (2) manual-closing, non-locking doors, left hand hinge on left door, right hand hinge on right door.
- Include vacuum-formed PVC liner tray.
- Include four levelling feet and one 203.2mm filler panel to increase cabinet depth from 558.8mm to 762.0mm.
- Support loads up to 362.9 kg
- Adjustable minimum/maximum base heights of 901.7mm/933.45mm.

.23 One (1) 609.6mm acid storage corrosion resistant cabinet, compatible with and finish/colour-matched to above fume hood. Cabinet to have the following specifications:

- Durable epoxy-coated steel construction with corrosion-resistant polyethylene-lined interior.
- Single (1) manual-closing, non-locking door, Right hinge
- Include vacuum-formed PVC liner tray.
- Include four levelling feet and one 8" filler panel to increase cabinet depth from 558.8mm to 762.0mm.
- Adjustable minimum/maximum base heights of 901.7mm/933.5mm

.24 Fume hood must be VAV compatible.

Part 3 Execution

3.1 EXAMINATION

.1 Verify equipment rough-in before proceeding with work.

.2 Coordinate with other trades for the proper and correct installation of plumbing and electrical rough-in and for rough opening dimensions required for the installation of the hood.

3.2 INSTALLATION

.1 Install according to manufacturer's instructions.

.2 Installation, testing, balancing, and certification to be done according to MD15128-2013.

.3 Install equipment plumb, square and straight with no distortion and securely anchor as required.

.4 Sequence installations to ensure utility connections are achieved in an orderly and expeditious manner.

.5 Touch up minor damaged surfaces caused by installation. Replace damaged components as directed by departmental representative.

3.3 ADJUSTING

.1 Adjust operating equipment, with exception of air moving equipment, to efficient operation for its intended use, and as required by the manufacturer.

3.4 CLEANING

.1 Clean equipment, casework, countertops and all other surfaces as recommended by the manufacturer, rendering all work in a new and unused appearance.

.2 Clean adjacent construction and surfaces that may have been soiled in the course of installation of work in this section.

3.5 PROTECTION OF FINISHED WORK

.1 Provide all necessary protective measures to prevent exposure of equipment and surfaces from exposure to other construction activity.

.2 Advise contractor of procedures and precautions for protection of material and installed equipment and casework from damage by work of other trades.

3.6 DEMONSTRATION

.1 Provide systems demonstration and demonstrate all equipment operations and functions.

Part 1 General

1.1 SECTION INCLUDES

.1 This Section covers items common to Sections of Division 26.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM International) latest edition of the following:

.1 ASTM E814, Standard Test Method for Fire Tests of Penetration Firestop Systems.

.2 Canadian Standards Association (CSA International) latest edition of the following:

.1 CSA C22.1, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.

.2 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.3 Institute of Electrical and Electronics (IEEE) latest edition of the following:

.1 IEEE SP1122, The Authoritative Dictionary of IEEE Standards Terms.

.4 National Research Council of Canada (NRCC) latest edition of the follow:

.1 NBC, National Building Code.

1.3 DEFINITIONS

.1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.4 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates and labels for control items in English.

1.5 QUALITY ASSURANCE

.1 Quality Assurance in accordance with Section 01 45 00 – Quality Control.

.2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Electrical Contractor license or apprentices in accordance with authorities having

jurisdiction as per the conditions of Provincial Act respecting manpower vocational training and qualification.

.1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.

.2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.

.3 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29 – Health & Safety Requirements.

1.6 ELECTRICAL DRAWINGS

.1 Drawings are diagrammatic.

.2 Obtain accurate dimensions from architectural and equipment layout drawings.

1.7 PERMITS, FEES AND INSPECTION

.1 Obtain an electrical work permit and pay associated fees.

.2 Notify Departmental Representative of changes required by the Inspection Department prior to making changes.

.3 Furnish Certificates of Acceptance from Electrical Inspection Department on completion of work to Departmental Representative.

Part 2 Products

2.1 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Section 01 61 00 – Common Product Requirements.

.2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from authority having jurisdiction, inspection authorities before delivery to site.

2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

.2 Division 26 responsibility is as follows:

.1 Supply and installation of breakers and/or switches.

.2 Supply and installation of power feeder (conduit and wire) from panel to starter, from starter to disconnect switch and from disconnect switch to motor.

.3 Supply and installation of starters complete with motor protection unless noted otherwise.

.4 Supply and installation of disconnect switches at motors unless noted otherwise on mechanical drawings.

.5 Installation and wiring of line voltage thermostats and PE switches where directly control 120V fractional horsepower motors.

.6 Supply and installation of 120V power feeders to mechanical equipment such as time clocks and control panels.

.3 Control wiring and conduit is by Division 25 unless noted otherwise on electrical drawings.

2.3 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction, inspection authorities and Departmental Representative.

.2 Decal signs, minimum size 7" x 10".

2.4 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.5 IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:

.1 Nameplates: Lamicoid 1/8" thick plastic engraving sheet, black matte finish face with white core for normal power, and white matte finish face with red core for emergency power and life safety system including fire alarm, lettering accurately aligned and engraved into core, mechanically attached with self tapping screws.

.1 Sizes as follows: 10mm x 50mm, I line with 6mm high letters.

.2 Wording on nameplates to be approved by Departmental Representative prior to manufacture.

.3 Allow for ten (10) letters per nameplate.

2.6 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

WIRING COLOUR CODING	
Phase A	Red
Phase B	Black
Phase C	Blue

Neutral	White/Grey
Ground	Green
Bond	Green
Isolated Ground	Green with Yellow Stripe

.4 Use colour coded wires in communication cables, matched throughout system.

2.7 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 20 foot intervals.

.3 Colours: to match facility's existing colour coding system; see Legend located in Main Electrical Room.

.4 Coverplates for boxes containing branch circuits are to have each branch circuit number neatly identified on the coverplate with felt marker pen.

Part 3 Execution

3.1 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 and NBC.

3.2 FIREPROOFING

.1 Seal any penetrations for conduits and/or cables that pass through floors and fire rated walls with CSA approved material. Fire ratings of walls/floors are to be maintained utilizing a proper firestop system. Firestop systems are to be tested to ASTM E814 criteria.

.2 Caulking shall not be used as a firestopping method for PVC conduits.

.3 Submit firestopping material shop drawings for review by Departmental Representative.

3.3 AS-BUILT RECORDS

.1 General: To be read in conjunction with Section 01 78 00 – Closeout Submittals.

.2 Site Records:

.1 Obtain sets of white prints and mark thereon all changes as work progresses and as changes occur. Incorporate all information issued in Addenda, Site Instructions, Change Orders and all changes in actual installation as a result of site conditions and coordination.

.3 As-Built Drawings:

.1 Prior to start of testing, balancing and adjusting, finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 1/2" high as follows: AS-BUILT DRAWINGS (This drawing has been revised to show electrical systems as installed) (Signature of Contractor) (Date).

.3 Submit to the Project Manager for approval and make all corrections as directed.

.4 At the 95% project completion stage, based on Progress Claim, Provide one (1) set of up-to-date prints of "As-Built" drawings, to the Departmental Representative for review. Progress claim will not be released until this step has been completed.

3.4 CLEANING

.1 Cleaning: in accordance with Section 01 74 11 – Cleaning.

.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

.3 At time of final cleaning, clean lighting reflectors, lenses, and other lighting surfaces that have been exposed to construction dust and dirt.

.4 Remove construction materials from wiring devices, coverplates, outlets, cabinets, enclosures, tubs, etc…

3.5 COOPERATION

.1 Co-operate and investigate with other trades to make maximum use of spaces. Avoid conflict with pipes, ducts, etc. Prepare shop drawings indicating the route of main conduits, ducts and trays for submission to the Construction Manager for approval.

.2 Co-operate with other trades on the site and carry out the work, in such a way, as not to hinder or hold up the work of other trades.

.3 Consult with other trades where their respective installations conflict and re-route conduits, ducts, outlets, equipment, etc, as required, subject to the approval of the Construction Manager.

.4 Obtain from the mechanical and other trades complete detailed wiring diagrams of equipment requiring connections and be responsible for pointing out any discrepancies or the reason why they cannot be adhered to.

END OF SECTION

Owner Supplied Fume Hood Selection, Brochure, User's Manual, & Wiring Diagram

6' Protector PVC Acid Digestion Laboratory Hood, 2 Fixtures,1 Receptacle, 115V

http://www.labconco.com/product/6-protector-pvc-acid-digestion-laboratory-hood-2-fixtures1-receptacle-11/5256

Catalog Number: 141610002

Protector PVC Acid Digestion Laboratory Hoods feature washdown systems, integral work surfaces and drainage troughs so that they may be thoroughly rinsed after each use. Their liners of Type 1 unplasticized polyvinyl chloride are designed to withstand reaction from strong acid. These hoods feature Lexan* polycarbonate sashes, which are recommended for applications involving the use of acids including hydrofluoric acid but not perchloric acid. The Lexan material does not fog or etch when exposed to hydrofluoric fumes.

Weight: 570.0 lbs
Weight metric: 258.5 kg
Dimensions: 72.0" w x 37.7" d x 59.0" h
Dimensions metric: 182.9 x 95.8 x 149.9 cm
Electrical: 115 volts, 50/60 Hz
Product Subcategory: Acid Digestion
Nominal Width: 6'
Blower Requirements: Remote blower required
CFM/Static Pressure at 100 fpm: With sash open 28" high, exhausts 1180 CFM at 0.38" static pressure
Conformance: ANSI Z9.5, ASHRAE 110, ASTM E84, CAN/CSA C22.2, CFR 29, NFPA 45, SEFA 1, SEFA 8 (Cabinet Surface Finish), UL
Electrical Duplexes: 1
Electrical Standard: 100-115 volts, 50/60 Hz, 10 amps
Enclosure Height: 59.0"
Lighting: T8 fluorescent
Service Fixtures: 2
Style: Benchtop

Compliance

- SEFA 1-2002 (Laboratory Fume Hoods)
- NFPA 45-2000 (Fire Protection for Laboratories Using Chemicals) section 6-1 through 6-14
- ASTM E84-01 Surface Burning Characteristics of Building Materials
- ASHRAE 110-95 (Method of Testing Performance of Laboratory Fume Hoods)
- ANSI Z9.5-1993 (Laboratory Ventilation)
- UL 3101-1/61010-1
- CAN/CSA C22.2 No. 1010.1
- UL 1805

Features

- By-pass airflow design
- Curved air foil allows air to sweep the work surface while Clean-Sweep™ openings pull inflow air from under the air foil.
- Glacier white, dry powder epoxy-coated steel exterior
- Heat-welded unplasticized PVC liner (30.0" interior depth) with integral work surface and drainage trough
- Black enamel-coated hardboard surface to support the integral work surface
- 3/16" thick tempered safety glass vertical-rising sash with frame of epoxy-coated aluminum and PVC (Protector PVC Perchloric Acid Laboratory Hoods)
- 1/4" thick Lexan* polycarbonate vertical-rising sash with frame of epoxy-coated aluminum and PVC (Protector PVC Acid Digestion Laboratory Hoods)
- Removable front and side panels and front access panels for access to plumbing and electrical wiring
- Pre-wired T8 fluorescent lighting, light switch and blower switch for 115 volt, 60 Hz operation to single point internal junction box
- Built-in washdown system with internal piping and spray nozzles behind the baffle and remote control fixture on the left side
- Washdown port for connection to external wash rings (not included)
- Two pre-plumbed service fixtures with forged brass valves, lower right side with brass tubing and plastic serrated hose connector for gas and lower left side with copper tubing and gray PVC rigid gooseneck faucet for cold water.
- One pre-wired 115 volt electrical duplex receptacle on lower right side
- Factory prepared for up to seven service fixtures including two gooseneck faucets

Continue reading online at http://www.labconco.com/

Protecting your laboratory environment
LABCONCO

Labconco Corporation
8811 Prospect Avenue
Kansas City, MO 64132-2696
Phone: 816-333-8811
Toll Free: 800-821-5525

Scan for more info:

Protector® Special Application Laboratory Fume Hoods

- *Protector® Stainless Steel Radioisotope Laboratory Hoods*
- *Protector® Stainless Steel Perchloric Acid Laboratory Hoods*
- *Protector® PVC Perchloric Acid & Acid Digestion Laboratory Hoods*

Protecting your laboratory environment

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Protector® Stainless Steel Radioisotope Laboratory Hoods

Features & Benefits

Protector Stainless Steel Radioisotope Laboratory Hoods provide protection from applications requiring the use of certain radiochemicals. Available in 4', 5', 6' and 8' widths and two depths, these benchtop hoods feature a corrosion-resistant Type 304 stainless steel interior. The one-piece liner features radiused corners and is free of joints, cracks or crevices to prevent build-up of residue and simplify decontamination procedures.

Front and side panels may be easily removed for lamp replacement and access to electrical and plumbing connections.

Large unobstructed sightline provides visibility of 37.5" high from the work surface to the header panel, allowing taller users comfortable viewing while standing.

Durable and attractive exterior is glacier white powder-coated steel.

Fluorescent lighting illuminates the interior. The high-efficiency, instant start, T8 fluorescent lights are located outside the hood interior for corrosion-resistance and easy replacement.

By-pass airflow design ensures stable face velocities. The by-pass block partially obstructs the by-pass opening above the sash to control and reduce the minimum air volume demanded.

Vertical-rising tempered safety glass sash with cable pulley is anti-racking for smooth operation.

Service access panels allow accessibility to plumbing from the front of the hood.

Pre-wired electrical components. Fluorescent lights and switches are factory-wired to the hood's single point junction box. On some models, one electrical duplex receptacle is factory-wired on the right side; on some 8' models, one duplex receptacle is mounted on each side. Each hood is factory-prepared for up to four electrical duplexes and an airflow monitor.

Corrosion-resistant, Type 304 stainless steel baffle and liner with integral work surface provides a seamless work area.

Optional color-coded service fixtures for gas, air, water, vacuum and other services have remote controls for use regardless of the sash position. On some models, two service fixtures are pre-plumbed. Each corner post is factory-prepared for up to 4 service fixtures (8 fixtures total per hood). **Additional service fixtures require holes drilled in the liner at the factory or on site.**

Hardboard surface to support integral work surface is included.

Eco-Foil™ air foil with Clean-Sweep™ openings reduces energy consumption by 7-10% compared to flat air foils while its aerodynamic curve allows air to sweep the work surface for maximum containment. Air foil is powder-coated stainless steel for durability.

Clean-Sweep™ sash handle and tracks. The powder-coated aluminum sash handle includes Clean-Sweep openings to bleed air into the hood chamber and away from the operator's breathing zone. Clean-Sweep slots on the powder-coated stainless steel sash tracks of the corner posts enhance airflow.

Cord-Keeper™ slots on the left and right side of the air foil allow the sash to close completely when electrical cords from equipment inside the hood are plugged into receptacles located on the corner posts. Cords are kept out of the way of the operator.

Performance tested to ASHRAE 110-1995.

ETL-listed. Hoods carry the ETL mark signifying that they are certified to UL 61010-1, UL 1805 and CAN/CSA C22.2 No.61010.1.

CE Mark. Hoods for 230 volt operation conform to the CE (European Community) requirements for electrical safety and electromagnetic compatibility.

Exclusive Feature

Protector® Stainless Steel Radioisotope Laboratory Hoods

6' x 31.7" deep Protector Stainless Steel Radioisotope Laboratory Hood 120600002 is shown with two 3' Protector Acid Storage Cabinets 9901100. ***Blower, ductwork and base must be ordered separately.***

All models feature:

- By-pass airflow design and by-pass block.
- Glacier white powder-coated steel exterior.
- Powder-coated stainless steel Eco-Foil™ air foil with Clean-Sweep™ airflow openings.*
- Cord-Keeper™ slots on left and right side of air foil.
- Type 304 stainless steel liner with radiused corners, integral work surface and pre-set baffle(s).
- Black enamel-coated hardboard supporting surface.
- Powder-coated aluminum sash handle with Clean-Sweep™ openings and Clean-Sweep™ slots on the powder-coated stainless steel sash tracks.*
- Tempered safety glass vertical-rising sash with cable pulley.
- Removable front and side panels and front access panels for access to plumbing and electrical wiring.
- Pre-wired T8 fluorescent lighting with vapor-proof design and ADA-compliant light and blower switches.
- 11.00" OD Type 304 stainless steel exhaust connection(s).

** U.S. Patent No. 6,461,233*

Exclusive Feature

Heights of switches, electrical receptacle and service fixtures meet requirements of Americans with Disabilities Act (ADA).

All models conform to the following standards:

- CFR 29, Part 1910 • SEFA 1-2010 • CE (230 volt models)
- SEFA 8-2010, Cabinet Surface Finish Tests • NFPA 45-2011
- ASTM E84-09C • ASHRAE 110-95 • ANSI Z9.5-2012
- CAN/CSA C22.2 No. 61010.1 • UL 61010-1 • UL 1805

Fixtured models may feature:

- Two pre-plumbed service fixtures with forged brass valves, lower right side with brass tubing for gas and lower left side with copper tubing for air. Components for converting either or both fixtures to cold water and vacuum are provided. **Inlet tubing is not provided.**
- One pre-wired GFCI electrical duplex receptacle on lower right side and, on 8' models, one additional pre-wired GFCI electrical duplex receptacle on the lower left side.

Required accessories not included:

- ***Dedicated Remote Blower***
- ***Ductwork.*** Type 304 stainless steel duct is recommended. Contact Labconco for source recommendations.
- ***Base Cabinet or Stand***

Optional accessories for on-site installation include:

- ***Service Fixture Kits*** • ***Electrical Duplex Kits***
- ***Guardian Airflow Monitor Kits*** • ***Sash Stop Kits***
- ***Ceiling Enclosure and Rear Finish Panel Kits***

Total Exhaust CFM and Static Pressure @ 28" Sash Opening (100% Open)

Face Velocity (fpm)	Airflow Volumetric Rate (CFM) @ Static Pressure (inches of water)							
Sash @ Full Open (28")	4' Hood		5' Hood		6' Hood		8' Hood	
	CFM	s.p.	CFM	s.p.	CFM	s.p.	CFM	s.p.
125	905	0.39	1195	0.52	1475	0.78	2050	0.44
100	725	0.25	955	0.33	1180	0.50	1640	0.28

Total Exhaust CFM and Static Pressure @ 18" Sash Opening (62.5% Open)

Face Velocity (fpm)	Airflow Volumetric Rate (CFM) @ Static Pressure (inches of water)							
Sash @ 62.5% Open (18")	4' Hood		5' Hood		6' Hood		8' Hood	
	CFM	s.p.	CFM	s.p.	CFM	s.p.	CFM	s.p.
125	565	0.15	745	0.20	920	0.31	1280	0.17
100	455	0.10	595	0.13	740	0.20	1025	0.11

Contact Labconco at ***800-821-5525*** *or* ***816-333-8811*** *for ordering information on accessories and options such as flush air foils and for blower sizing assistance.*

Ordering Information & Dimensional Data

Protector® Radioisotope Laboratory Hoods

Use this key to configure the **nine digit catalog number** to order your Protector Radioisotope Laboratory Hood. For example, a **120500002** is a 5' Protector Radioisotope Laboratory Hood, with 31.7" exterior depth, 100-115 volt, 50/60 Hz electrical requirements, two service fixtures and one GFCI electrical duplex receptacle.

1 2 0 0 0

STEP 1. Select the **width** of your fume hood. This number is the fourth digit of your catalog number. Shipping weight is also noted for 31.7" Models. Add 65 lbs. (29 kg) for 37.7" Models. Add 10 lbs. (5 kg) for Fixtured Models.

4 = 4' (122 cm)/720 lbs. (327 kg)
5 = 5' (152 cm)/775 lbs. (351 kg)
6 = 6' (183 cm)/835 lbs. (379 kg)
8 = 8' (244 cm)/955 lbs. (433 kg)

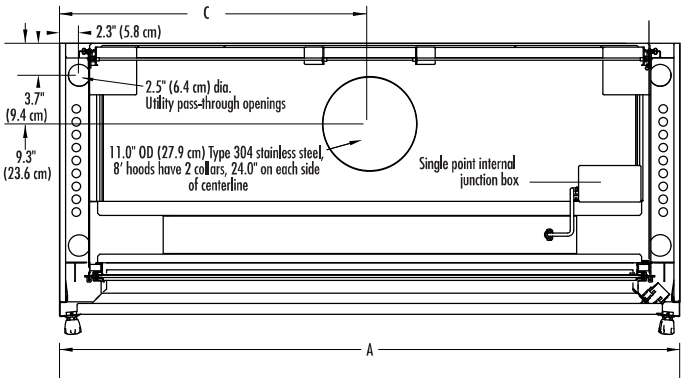
STEP 2. Select the **depth** of your fume hood. This number is the fifth digit of your catalog number.

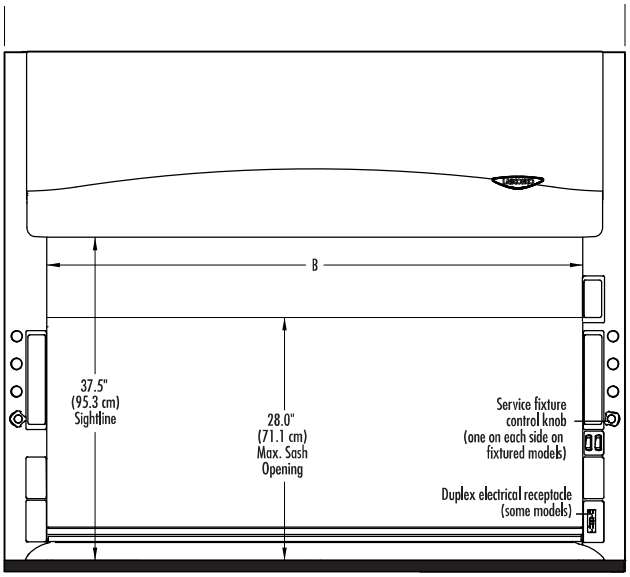
0 = 31.7" (80.5 cm)
1 = 37.7" (95.8 cm)

STEP 3. Select the **Electrical Requirements, Service Fixtures** and **GFCI Electrical Duplex Receptacle** combination you desire. These two numbers comprise the eighth and ninth digits of your catalog number.

Electrical Requirements	No Service Fixtures	Two Service Fixtures	Two Service Fixtures & GFCI Duplex*
100-115 volts, 50/60 Hz, 10 amps	00	01	02
208-230 volts, 50/60 Hz, 5 amps	20	21	—

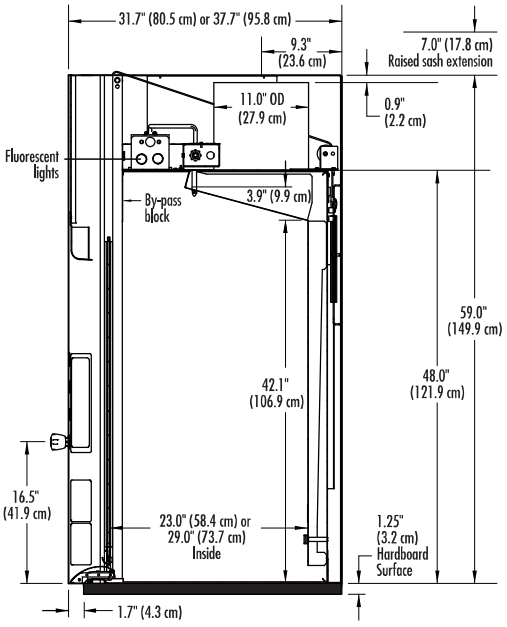
**Hoods with GFCI electrical duplex are rated at 20 amps. 8' hoods have two GFCI electrical duplex receptacles, one mounted on each side, rated at 20 amps each.*





	A	B	C
4' Hood	48.0" (121.9 cm)	38.25" (97.2 cm)	24.0" (61.0 cm)
5' Hood	60.0" (150.0 cm)	50.25" (97.2 cm)	30.0" (61.0 cm)
6' Hood	72.0" (182.9 cm)	62.25" (158.1 cm)	36.0" (91.4 cm)
8' Hood	96.0" (243.8 cm)	86.25" (219.1 cm)	24.0"* (61.0 cm)

**8' model has two exhaust collars, 24.0" on each side of centerline*



*Contact Labconco at **800-821-5525** or **816-333-8811** or visit **www.labconco.com** for detailed AutoCAD drawings.*

Requires Ductwork and Blower

Protector Stainless Steel Perchloric Acid Laboratory Hood 130600002 is shown with Protector Acid Storage Cabinets 9901100.

Protector® Stainless Steel Perchloric Acid Laboratory Hoods

Features & Benefits

Protector Stainless Steel Perchloric Acid Laboratory Hoods are designed specifically for procedures involving the use of perchloric acid. They feature an internal washdown system, integral work surface and drainage trough so that they may be thoroughly rinsed after each use to prevent the accumulation of potentially reactive perchloric salts. Available in 4', 5', 6' and 8' widths and two depths, these benchtop hoods feature a corrosion-resistant Type 316 stainless steel interior to withstand reaction from perchloric acid.

Front and side panels may be easily removed for lamp replacement and access to electrical and plumbing connections.

Large unobstructed sightline provides visibility of 37.5" high from the work surface to the header panel, allowing taller users comfortable viewing while standing.

By-pass airflow design ensures stable face velocities. The by-pass block partially obstructs the by-pass opening above the sash to control and reduce the minimum air volume demanded.

Fluorescent lighting illuminates the interior. The high-efficiency, instant start, T8 fluorescent lights are located outside the hood interior for corrosion-resistance and easy replacement.

Durable and attractive exterior is glacier white powder-coated steel.

Vertical-rising tempered safety glass sash with cable pulley is anti-racking for smooth operation.

Service access panels allow accessibility to plumbing from the front of the hood.

Pre-wired electrical components. Fluorescent lights and switches are factory-wired to the hood's single point junction box. On some models, one electrical duplex receptacle is factory-wired on the right side; on some 8' models, one duplex receptacle is mounted on each side. Each hood is factory-prepared for up to four electrical duplexes and an airflow monitor.

Corrosion-resistant, Type 316 stainless steel baffle and liner with integral work surface and drainage trough provides a seamless work area.

Hardboard surface to support integral work surface is included.

Performance tested to ASHRAE 110-1995.

Built-in washdown system facilitates the removal of hazardous perchlorates from behind the baffle. The system consists of pre-plumbed internal piping, spray nozzles and upper left side-mounted remote control knob.

Optional color-coded service fixtures for gas, air, water, vacuum and other services have remote controls for use regardless of the sash position. On some models, two service fixtures are pre-plumbed. Each corner post is factory-prepared for up to 4 service fixtures (8 fixtures total per hood). **Additional service fixtures require holes drilled in the liner at the factory or on site.**

Eco-Foil™ air foil with Clean-Sweep™ openings reduces energy consumption by 7-10% compared to flat air foils while its aerodynamic curve allows air to sweep the work surface for maximum containment. Air foil is powder-coated stainless steel for durability.

Clean-Sweep™ sash handle and tracks. The powder-coated aluminum sash handle includes Clean-Sweep openings to bleed air into the hood chamber and away from the operator's breathing zone. Clean-Sweep slots on the powder-coated stainless steel sash tracks of the corner posts enhance airflow.

Cord-Keeper™ slots on the left and right side of the air foil allow the sash to close completely when electrical cords from equipment inside the hood are plugged into receptacles located on the corner posts. Cords are kept out of the way of the operator.

ETL-listed. Hoods carry the ETL mark signifying that they are certified to UL 61010-1, UL 1805 and CAN/CSA C22.2 No.61010.1.

CE Mark. Hoods for 230 volt operation conform to the CE (European Community) requirements for electrical safety and electromagnetic compatibility.

Exclusive Feature

Protector® Stainless Steel Perchloric Acid Laboratory Hoods

6' x 31.7" deep Protector Stainless Steel Perchloric Acid Laboratory Hood 130600002 is shown with two 3' Protector Acid Storage Cabinets 9901100. ***Blower, ductwork and base must be ordered separately.***

All models feature:

- By-pass airflow design and by-pass block.
- Glacier white powder-coated steel exterior.
- Powder-coated stainless steel Eco-Foil™ air foil with Clean-Sweep™ airflow openings.*
- Cord-Keeper™ slots on left and right side of air foil.
- Type 316 stainless steel liner with radiused corners, integral work surface, drainage trough and pre-set baffle(s).
- Black enamel-coated hardboard supporting surface.
- Powder-coated aluminum sash handle with Clean-Sweep™ openings and Clean-Sweep™ slots on the powder-coated stainless steel sash tracks.*
- Tempered safety glass vertical-rising sash with cable pulley.
- Removable front and side panels and front access panels for access to plumbing and electrical wiring.
- Pre-wired T8 fluorescent lighting with vapor-proof design and ADA-compliant light and blower switches.
- Built-in washdown system with internal piping and spray nozzles with maximum flow rate from 0.5 -1.0 GPM. Include upper left side-mounted remote control fixture with forged brass valve with maximum flow rate of 3 GPM and maximum working pressure ranging from 10 to 40 psi depending on number of hood's spray nozzles. Valve is capable of supplying water to hood's spray nozzles and, except for 8' models, one wash ring (wash rings not included).
- Washdown fitting located on top of hood to facilitate connection to external wash rings (wash rings not included).
- 11.00" OD Type 304 stainless steel exhaust connection(s).

Exclusive Feature ** U.S. Patent No. 6,461,233*

Heights of switches, electrical receptacle and service fixtures meet requirements of ADA.

All models conform to the following standards:

- CFR 29, Part 1910 • SEFA 1-2010 • CE (230 volt models)
- SEFA 8-2010, Cabinet Surface Finish Tests • NFPA 45-2011
- ASTM E84-09C • ASHRAE 110-95 • ANSI Z9.5-2012
- CAN/CSA C22.2 No. 61010.1 • UL 61010-1 • UL 1805

Fixtured models may feature:

- Two pre-plumbed service fixtures with forged brass valves, lower right side with brass tubing for gas and lower left side with copper tubing for air. Components for converting either or both fixtures to cold water and vacuum are provided. **Inlet tubing is not provided.**
- One pre-wired GFCI electrical duplex receptacle on lower right side and, on 8' models, one additional pre-wired GFCI electrical duplex receptacle on the lower left side.

Required accessories not included:

- ***Dedicated remote PVC blower***
- ***Wash rings and other ductwork*** • ***Base cabinet or stand***

Optional accessories for on-site installation include:

- ***Service Fixture Kits*** • ***Washdown Valve Kit***
- ***Electrical Duplex Kits*** • ***Guardian Airflow Monitor Kits***
- ***Sash Stop Kits*** • ***Ceiling Enclosure and Rear Finish Panel Kits***

Total Exhaust CFM and Static Pressure @ 28" Sash Opening (100% Open)

Face Velocity (fpm)	Airflow Volumetric Rate (CFM) @ Static Pressure (inches of water)							
Sash @ Full Open (28")	4' Hood		5' Hood		6' Hood		8' Hood	
	CFM	s.p.	CFM	s.p.	CFM	s.p.	CFM	s.p.
125	905	0.39	1195	0.52	1475	0.78	2050	0.44
100	725	0.25	955	0.33	1180	0.50	1640	0.28

Total Exhaust CFM and Static Pressure @ 18" Sash Opening (62.5% Open)

Face Velocity (fpm)	Airflow Volumetric Rate (CFM) @ Static Pressure (inches of water)							
Sash @ 62.5% Open (18")	4' Hood		5' Hood		6' Hood		8' Hood	
	CFM	s.p.	CFM	s.p.	CFM	s.p.	CFM	s.p.
125	565	0.15	745	0.20	920	0.31	1280	0.17
100	455	0.10	595	0.13	740	0.20	1025	0.11

Contact Labconco at ***800-821-5525*** *or* ***816-333-8811*** *for ordering information on accessories and options such as flush air foils and for blower sizing assistance.*

Ordering Information & Dimensional Data

Protector® Stainless Steel Perchloric Acid Laboratory Hoods

Use this key to configure the **nine digit catalog number** to order your Protector Stainless Steel Perchloric Laboratory Hood. For example, a **130600002** is a 6' Protector Stainless Steel Laboratory Hood, with 31.7" exterior depth, 100-115 volt, 50/60 Hz electrical requirements, two service fixtures and one GFCI electrical duplex receptacle.

1 3 0 0 0

STEP 1. Select the **width** of your fume hood. This number is the fourth digit of your catalog number. Shipping weight is also noted for 31.7" Models. Add 65 lbs. (29 kg) for 37.7" Models. Add 10 lbs. (5 kg) for Fixtured Models.

4 = 4' (122 cm)/770 lbs. (349 kg)
5 = 5' (152 cm)/825 lbs. (374 kg)
6 = 6' (183 cm)/885 lbs. (401 kg)
8 = 8' (244 cm)/1000 lbs. (454 kg)

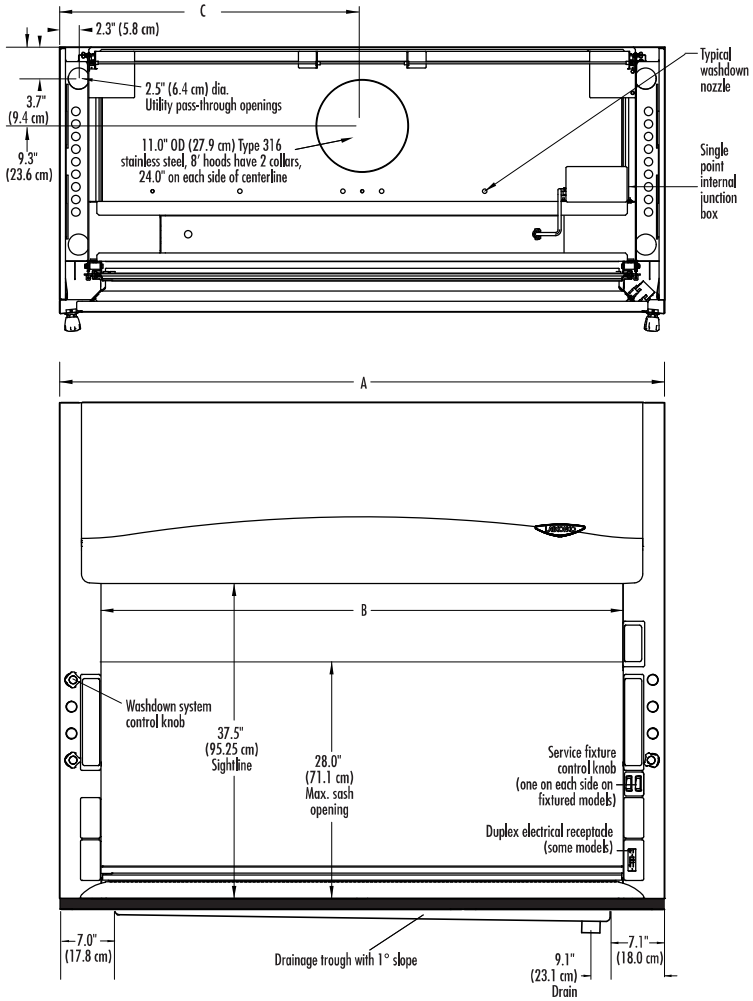
STEP 2. Select the **depth** of your fume hood. This number is the fifth digit of your catalog number.

0 = 31.7" (80.5 cm)
1 = 37.7" (95.8 cm)

STEP 3. Select the **Electrical Requirements, Service Fixtures** and **GFCI Electrical Duplex Receptacle** combination you desire. These two numbers comprise the eighth and ninth digits of your catalog number.

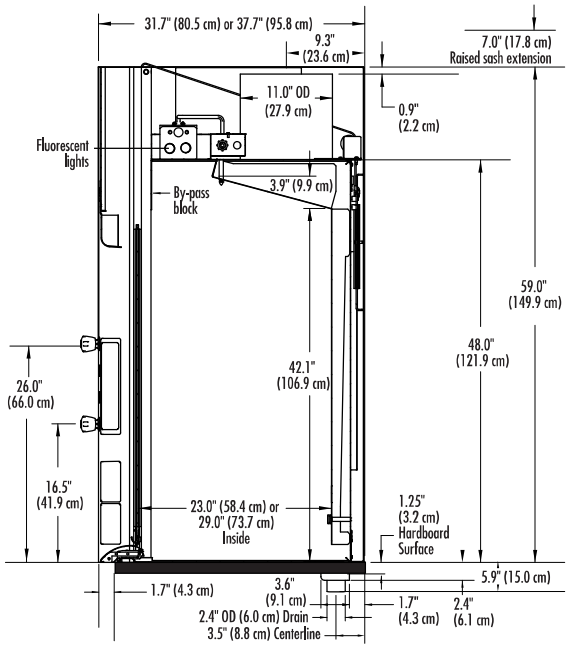
Electrical Requirements	No Service Fixtures	Two Service Fixtures	Two Service Fixtures & GFCI Duplex*
100-115 volts, 50/60 Hz, 10 amps	00	01	02
208-230 volts, 50/60 Hz, 5 amps	20	21	—

**Hoods with GFCI electrical duplex are rated at 20 amps. 8' hoods have two GFCI electrical duplex receptacles, one mounted on each side, rated at 20 amps each.*



	A	B	C
4' Hood	48.0" (121.9 cm)	38.25" (97.2 cm)	24.0" (61.0 cm)
5' Hood	60.0" (150.0 cm)	50.25" (97.2 cm)	30.0" (61.0 cm)
6' Hood	72.0" (182.9 cm)	62.25" (158.1 cm)	36.0" (91.4 cm)
8' Hood	96.0" (243.8 cm)	86.25" (219.1 cm)	24.0"* (61.0 cm)

**8' model has two exhaust collars, 24.0" on each side of centerline*



*Contact Labconco at **800-821-5525** or **816-333-8811** or visit **www.labconco.com** for detailed AutoCAD drawings.*

Requires Ductwork and Blower

Protector PVC Perchloric Acid Laboratory Hood 140610002 is shown with Protector Standard Storage Cabinet 9901000 and Protector Acid Storage Cabinet 9901100.

Protector® PVC Perchloric Acid & Acid Digestion Laboratory Hoods

Features & Benefits

Protector PVC Perchloric Acid Laboratory Hoods feature an internal washdown system, integral work surface and drainage trough so that they may be thoroughly rinsed after each use to prevent the accumulation of potentially reactive perchloric salts. The liner of Type 1 unplasticized polyvinyl chloride is designed to withstand reaction from perchloric acid and other highly corrosive inorganic chemicals that do not involve high temperatures. Protector PVC Acid Digestion Laboratory Hoods feature a Lexan* sash, which is recommended for applications involving the use of acids including hydrofluoric acid but not perchloric acid.

Front and side panels may be easily removed for lamp replacement and access to electrical and plumbing connections.

Large unobstructed sightline provides visibility of 37.5" high from the work surface to the header panel, allowing taller users comfortable viewing while standing.

By-pass airflow design ensures stable face velocities. The by-pass block partially obstructs the by-pass opening above the sash to control and reduce the minimum air volume demanded.

Fluorescent lighting illuminates the interior. The high-efficiency, instant start, T8 fluorescent lights are located outside the hood interior for corrosion-resistance and easy replacement.

Durable and attractive exterior is glacier white powder-coated steel.

Vertical-rising tempered safety glass sash with cable pulley is anti- racking for smooth operation. Protector PVC Acid Digestion Hoods feature a Lexan* polycarbonate sash that resists fogging or etching when exposed to hydrofluoric acid fumes.

Service access panels allow accessibility to plumbing from the front of the hood.

Pre-wired electrical components. Fluorescent lights and switches are factory-wired to the hood's single point junction box. On some models, one electrical duplex receptacle is factory-wired on the right side; on some 8' models, one duplex receptacle is mounted on each side. Each hood is factory-prepared for up to four electrical duplexes and an airflow monitor.

Corrosion-resistant baffle and liner of Type 1 unplasticized PVC with integral work surface provides a crevice-free work area and withstands heat up to 140° F (60° C).

Hardboard surface to support integral work surface is included.

Performance tested to ASHRAE 110-1995.

ETL-listed. Hoods carry the ETL mark signifying that they are certified to UL 61010-1, UL 1805 and CAN/CSA C22.2 No.61010.1.

Clean-Sweep™ sash handle and tracks. The powder-coated aluminum sash handle includes Clean-Sweep openings to bleed air into the hood chamber and away from the operator's breathing zone. Clean-Sweep slots on the powder-coated stainless steel sash tracks of the corner posts enhance airflow.

Optional color-coded service fixtures for gas, air, water, vacuum and other services have remote controls for use regardless of the sash position. On some models, two service fixtures are pre-plumbed, the left one a rigid gooseneck faucet, the right a serrated hose connector. Each corner post is factory-prepared for up to 4 service fixtures (8 fixtures total per hood). **Additional service fixtures require holes drilled in the liner at the factory or on site.**

Eco-Foil™ air foil with Clean-Sweep™ openings reduces energy consumption by 7-10% compared to flat air foils while its aerodynamic curve allows air to sweep the work surface for maximum containment. Air foil is powder-coated stainless steel for durability.

Built-in washdown system facilitates the removal of hazardous perchlorates from behind the baffle. The system consists of pre-plumbed internal piping, spray nozzles and upper left side-mounted remote control knob.

CE Mark. Hoods for 230 volt operation conform to the CE (European Community) requirements for electrical safety and electromagnetic compatibility.

Cord-Keeper™ slots on the left and right side of the air foil allow the sash to close completely when electrical cords from equipment inside the hood are plugged into receptacles located on the corner posts. Cords are kept out of the way of the operator.

**Lexan is a registered trademark of SABIC Innovative Plastics*

Exclusive Feature

Protector® PVC Perchloric Acid & Acid Digestion Laboratory Hoods

6' x 37.7" deep Protector PVC Perchloric Acid Laboratory Hood 140610002 is shown with 3' Protector Standard Storage Cabinet 9900100 and 3' Protector Acid Storage Cabinet 9901100. ***Blower, ductwork and base must be ordered separately.***

All models feature:

- By-pass airflow design and by-pass block.
- Glacier white powder-coated steel exterior.
- Powder-coated stainless steel Eco-Foil™ air foil with Clean-Sweep™ airflow openings.*
- Cord-Keeper™ slots on left and right side of air foil.
- Heat-welded Type 1 unplasticized PVC liner with integral work sur face, drainage trough and pre-set baffle(s). PVC withstands maximum continuous operating temperature of 140° F (60° C) and has a flame spread less than 25 per ASTM E-84.
- Black enamel-coated hardboard supporting surface.
- Powder-coated aluminum sash handle with Clean-Sweep™ openings and Clean-Sweep™ slots on the powder-coated stainless steel sash tracks.*
- Removable front and side panels and front access panels for access to plumbing and electrical wiring.
- Pre-wired T8 fluorescent lighting with vapor-proof design and ADA-compliant light and blower switches.
- Built-in washdown system with internal piping and spray nozzles with maximum flow rate from 0.5 -1.0 GPM. Include upper left side-mounted remote control fixture with forged brass valve with maximum flow rate of 3 GPM and maximum working pressure ranging from 10 to 40 psi depending on number of hood's spray nozzles. Valve is capable of supplying water to hood's spray nozzles and, except for 8' models, one wash ring (wash rings not included).
- Washdown fitting located on top of hood to facilitate connection to external wash rings (wash rings not included).
- 12.75" OD PVC exhaust connection(s).

Exclusive Feature ** U.S. Patent No. 6,461,233*

All models conform to the following standards:

- CFR 29, Part 1910 • SEFA 1-2010 • CE (230 volt models)
- SEFA 8-2010, Cabinet Surface Finish Tests • NFPA 45-2011
- ASTM E84-09C • ASHRAE 110-95 • ANSI Z9.5-2012
- CAN/CSA C22.2 No. 61010.1 • UL 61010-1 • UL 1805

Protector PVC Perchloric Acid Hoods feature:

- 3/16" thick tempered safety glass vertical-rising sash with cable pulley. Glass is suitable for perchloric acid use.

Protector PVC Acid Digestion Hoods feature:

- 1/4" thick Lexan polycarbonate vertical-rising sash with cable pulley. Lexan resists etching by hydrofluoric acid fumes.

Fixtured models may feature:

- Two pre-plumbed service fixtures with forged brass valves, lower right side with brass tubing and plastic serrated hose connector for gas and lower left side with copper tubing and gray PVC rigid gooseneck faucet for cold water. Components for converting the lower right fixture to air or vacuum are provided. **Inlet tubing is not provided.**
- One pre-wired GFCI electrical duplex receptacle on lower right side and, on 8' models, one additional pre-wired GFCI electrical duplex receptacle on the lower left side.

Required accessories not included:

- ***Dedicated remote PVC blower***
- ***Wash rings and other ductwork*** • ***Base cabinet or stand***

Optional accessories for on-site installation include:

- ***Service Fixture Kits*** • ***Electrical Duplex Kits***
- ***Guardian Airflow Monitor Kits*** • ***Sash Stop Kits***
- ***Ceiling Enclosure and Rear Finish Panel Kits***

Total Exhaust CFM and Static Pressure @ 28" Sash Opening (100% Open)

Face Velocity (fpm)	Airflow Volumetric Rate (CFM) @ Static Pressure (inches of water)							
Sash @ Full Open (28")	4' Hood		5' Hood		6' Hood		8' Hood	
	CFM	s.p.	CFM	s.p.	CFM	s.p.	CFM	s.p.
125	905	0.27	1195	0.44	1475	0.59	2050	0.35
100	725	0.17	955	0.28	1180	0.38	1640	0.22

Total Exhaust CFM and Static Pressure @ 18" Sash Opening (62.5% Open)

Face Velocity (fpm)	Airflow Volumetric Rate (CFM) @ Static Pressure (inches of water)							
Sash @ 62.5% Open (18")	4' Hood		5' Hood		6' Hood		8' Hood	
	CFM	s.p.	CFM	s.p.	CFM	s.p.	CFM	s.p.
125	565	0.11	745	0.17	920	0.23	1280	0.13
100	455	0.07	595	0.11	740	0.15	1025	0.09

Contact Labconco at ***800-821-5525*** *or* ***816-333-8811*** *for ordering information on accessories and options such as flush air foils and for blower sizing assistance.*

Ordering Information & Dimensional Data

Protector® PVC Perchloric Acid & Acid Digestion Laboratory Hoods

Use this key to configure the **nine digit catalog number** to order your Protector PVC Laboratory Hood. For example, a **140410002** is a 4' Protector PVC Perchloric Acid Laboratory Hood, 100-115 volt, 50/60 Hz electrical requirements, two service fixtures and one GFCI electrical duplex receptacle.

1 4 1 0 0

STEP 1. Select the **application type** of your fume hood. This number is the third digit of your catalog number.

0 = Perchloric Acid (with safety glass sash)
1 = Acid Digestion (with Lexan sash)

STEP 2. Select the **width** of your fume hood. This number is the fourth digit of your catalog number. Add 10 lbs. (5 kg) for Fixtured Models.

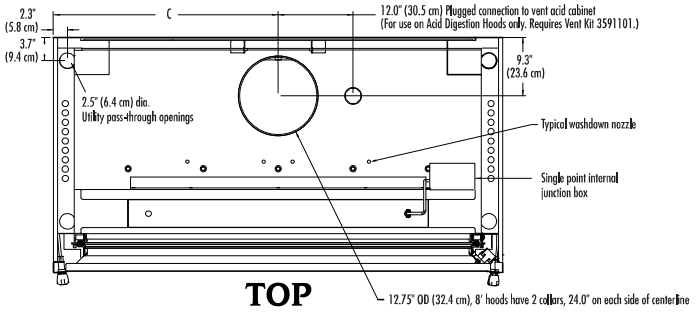
4 = 4' (122 cm)/735 lbs. (333 kg)
5 = 5' (152 cm)/790 lbs. (358 kg)
6 = 6' (183 cm)/850 lbs. (386 kg)
8 = 8' (244 cm)/970 lbs. (440 kg)

STEP 3. Select the **Electrical Requirements, Service Fixtures** and **GFCI Electrical Duplex Receptacle** combination you desire. These two numbers comprise the eighth and ninth digits of your catalog number.

Electrical Requirements	No Service Fixtures	Two Service Fixtures*	Two Service Fixtures* & GFCI Duplex**
100-115 volts, 50/60 Hz, 10 amps	00	01	02
208-230 volts, 50/60 Hz, 5 amps	20	21	—

**Left side service fixture is a Rigid Gooseneck Faucet. Right side service fixture is serrated hose connector.*

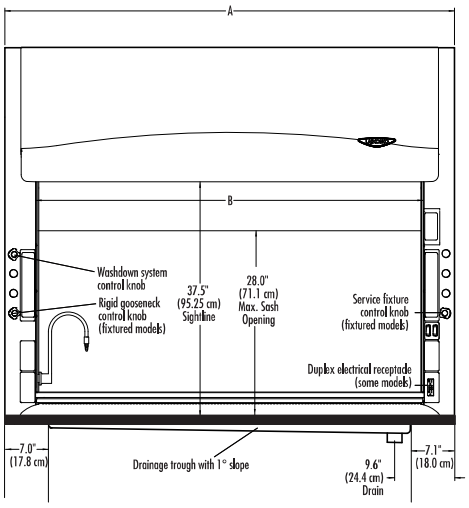
***Hoods with GFCI electrical duplex are rated at 20 amps. 8' hoods have two GFCI electrical duplex receptacles, one mounted on each side, rated at 20 amps each.*



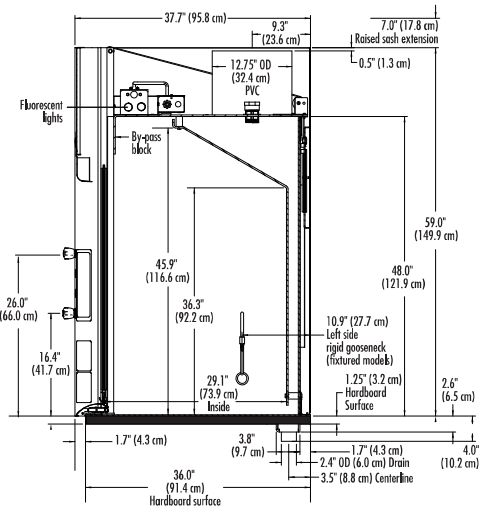
TOP

	A	B	C
4' Hood	48.0" (121.9 cm)	38.25" (97.2 cm)	24.0" (61.0 cm)
5' Hood	60.0" (150.0 cm)	50.25" (97.2 cm)	30.0" (61.0 cm)
6' Hood	72.0" (182.9 cm)	62.25" (158.1 cm)	36.0" (91.4 cm)
8' Hood	96.0" (243.8 cm)	86.25" (219.1 cm)	24.0"* (61.0 cm)

**8' model has two exhaust collars, 24.0" on each side of centerline*



FRONT



SIDE

Protecting your laboratory environment
LABCONCO

Labconco Corporation
8811 Prospect Avenue
Kansas City, MO 64132-2696
800-821-5525 or 816-333-8811
FAX 816-363-0130, www.labconco.com

*Contact Labconco at **800-821-5525** or **816-333-8811** or visit **www.labconco.com** for detailed AutoCAD drawings.*

User's Manual

Protector® PVC Laboratory Fume Hoods

Perchloric Acid Models

14041 Series
14051 Series
14061 Series
14081 Series

Acid Digestion Models

14141 Series
14151 Series
14161 Series
14181 Series

To receive important product updates, complete your product registration card online at **register.labconco.com**

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LABCONCO®

Labconco Corporation
8811 Prospect Avenue
Kansas City, MO 64132-2696
800-821-5525, 816-333-8811
FAX 816-363-0130
E-MAIL labconco@labconco.com
HOME PAGE www.labconco.com

Please read the User's Manual before operating the equipment.

Warranty

Labconco provides a warranty on all parts and factory workmanship. The warranty includes areas of defective material and workmanship, provided such defect results from normal and proper use of the equipment. Glassware is not warranted from breakage when dropped or mishandled.

The warranty for Protector® PVC Laboratory Fume Hoods will expire one year from date of installation or two years from date of shipment from Labconco, whichever is sooner.

This limited warranty covers parts and labor, but not transportation and insurance charges. In the event of a warranty claim, contact Labconco Corporation or the dealer who sold you the product. If the cause is determined to be a manufacturing fault, the dealer or Labconco Corporation will repair or replace all defective parts to restore the unit to operation. Under no circumstances shall Labconco Corporation be liable for indirect, consequential, or special damages of any kind. This statement may be altered by a specific published amendment. No individual has authorization to alter the provisions of this warranty policy or its amendments. Lamps and filters are not covered by this warranty. Damage due to corrosion or accidental breakage is not covered.

Returned or Damaged Goods

Do not return goods without the prior authorization from Labconco. Unauthorized returns will not be accepted. If your shipment was damaged in transit, you must file a claim directly with the freight carrier. Labconco Corporation and its dealers are not responsible for shipping damages.

The United States Interstate Commerce Commission rules require that claims be filed with the delivery carrier within fifteen (15) days of delivery.

Limitation of Liability

The disposal and/or emission of substances used in connection with this equipment may be governed by various federal, state, or local regulations. All users of this equipment are required to become familiar with any regulations that apply in the user's area concerning the dumping of waste materials in or upon water, land, or air and to comply with such regulations. Labconco Corporation is held harmless with respect to user's compliance with such regulations.

Contacting Labconco Corporation

If you have questions that are not addressed in this manual, or if you need technical assistance, contact Labconco's Customer Service Department or Labconco's Product Service Department at 1-800-821-5525 or 1-816-333-8811, between the hours of 7:00 a.m. and 6:00 p.m., Central Standard Time.

Part #9410800, Rev. A
ECO J202

TABLE OF CONTENTS

CHAPTER 1
INTRODUCTION

Congratulations on your purchase of a Labconco Protector® PVC Perchloric Acid Laboratory Fume Hood or Protector® PVC Acid Digestion Laboratory Hood. The difference between the two hoods is that the Protector PVC Perchloric Acid Hood uses a glass sash and the Protector PVC Acid Digestion Hood uses a Lexan™ sash to combat the fogging of glass caused by hydrofluoric acid (HF). Note that Perchloric acid will react with the Lexan sash and is not to be used in an Acid Digestion Hood. The Protector PVC Perchloric Laboratory Hood is designed to efficiently ventilate procedures using Perchloric acid. The Protector PVC Acid Digestion Laboratory Hood is designed to efficiently ventilate all other heavy acid operations including hydrofluoric acid. It is the result of Labconco's more than 50 years experience in manufacturing fume hoods, and users like you suggested many of its features to us.

The Protector PVC Perchloric Acid Fume Hood has been engineered to provide maximum safety in a laboratory while using Perchloric acid. **Usage of materials other than Perchloric acid is not recommended. Perchloric acid is a strong oxidizing agent, and should not be used in combination with any organic material as the possibility of a hazardous chemical reaction or explosion could develop**. The Protector PVC Acid Digestion Fume Hood has been designed to handle all other types of acids including hydrofluoric acid (HF), but not Perchloric acid. The Protector PVC Hoods offer many unique features to enhance safety, performance, and visibility.

To take full advantage of them, please acquaint yourself with this manual and keep it handy for future reference. If you are unfamiliar with how fume hoods operate, please review *Chapter 4: Performance Features and Safety Precautions* before you begin working in the fume hood. Even if you are an experienced fume hood user, please review *Chapter 5: Using The Protector PVC,* which describes the Protector PVC Perchloric Acid Hood features so that you can use the hood efficiently.

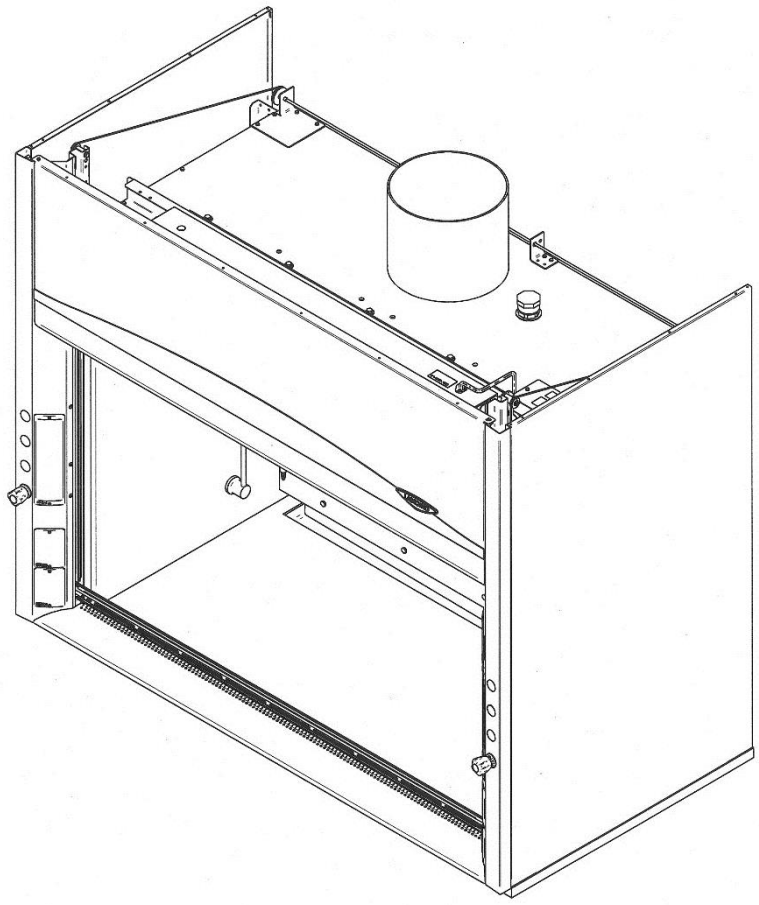


Figure 1-1

About This Manual

This manual is designed to help you learn how to install, use, and maintain your laboratory fume hood. Instructions for installing optional equipment on your hood are also included.

Chapter 1: Introduction provides a brief overview of the laboratory fume hood, explains the organization of the manual, and defines the typographical conventions used in the manual.

Chapter 2: Prerequisites explains what you need to do to prepare your site before you install your laboratory fume hood. Electrical and service requirements are discussed.

Chapter 3: Getting Started contains the information you need to properly unpack, inspect, install, and certify your laboratory fume hood.

Chapter 4: Performance Features and Safety Precautions explains how the Protector operates and the appropriate precautions you should take when using the fume hood.

Chapter 5: Using The Protector PVC discusses the basic operation of your fume hood. Information on how to prepare, use and shut down your Protector Hood are included.

Chapter 6: Maintaining The Protector PVC explains how to perform routine maintenance on your fume hood.

Chapter 7: Modifying The Protector PVC explains how to modify the fume hood or add accessories.

Chapter 8: Troubleshooting contains a table of problems you may encounter while using your laboratory fume hood including the probable causes of the problems and suggested corrective actions.

Appendix A: Protector PVC Components contains labeled diagrams of all of the components of the fume hoods.

Appendix B: Protector PVC Dimensions contains comprehensive diagrams showing all of the dimensions for the laboratory fume hoods.

Appendix C: Protector PVC Specifications contains the electrical requirements for laboratory fume hood. Wiring diagrams are also included.

Appendix D: Serial Number Tag Description provides current rating code used on serial number tag.

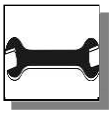
Appendix E: References lists the various resources available that deal with laboratory fume hoods.

Typographical Conventions

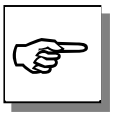
Recognizing the following typographical conventions will help you understand and use this manual:

- Book, chapter, and section titles are shown in italic type (e.g., *Chapter 3: Getting Started*).
- Steps required to perform a task are presented in a numbered format.
- Comments located in the margins provide suggestions, reminders, and references.
- Critical information is presented in boldface type in paragraphs that are preceded by the exclamation icon. Failure to comply with the information following an exclamation icon may result in injury to the user or permanent damage to fume hood.

- Les informations critiques sont présentées en gras dans les paragraphes qui sont précédés par l'icône d'exclamation. Ne pas se conformer aux informations qui suivent une icône d'exclamation peut résulter à la blessure de l'utilisateur ou à des dommages irréversibles de la hotte aspirante.



- Critical information is presented in boldface type in paragraphs that are preceded by the wrench icon. These operations should only be performed by a trained certifier or contractor. Failure to comply with the information following a wrench icon may result in injury to the user or permanent damage to your hood.
- Les informations critiques sont présentées en gras dans les paragraphes qui sont précédés par l'icône de clé plate. Ces opérations devraient être seulement exécutées par un professionnel agrée. L'échec pour se conformer aux informations qui suivent une icône de clé plate peut résulter à la blessure de l'utilisateur ou à des dommages irréversibles de la hotte.



- Important information is presented in capitalized type in paragraphs that are preceded by the pointer icon. It is imperative that the information contained in these paragraphs be thoroughly read and understood by the user.

- The S icon indicates the text is specific to the standard model.

- The A icon indicates the text is specific to the A-Style Combination Sash Model.

- CAUTION – See Manual. When this symbol is on a fume hood it indicates a caution that is detailed in this manual.
- PRUDENCE – Consulter le Manuel. Quand ce symbole est sur une hotte aspirante, il indique une prudence qui est détaillée dans ce manuel.

- CAUTION – Hot Surface.
- AVERTIR – Surface Chaude

- CAUTION – See Manual. This symbol on the fume hood indicates the possibility of a pinch hazard.
- PRUDENCE – Consulter le Manuel. Ce symbole sur la hotte indique la possibilité d'un risque de pincement.

Your Next Step

If your Fume Hood needs to be installed, proceed to *Chapter 2: Prerequisites* to ensure your installation site meets all of the requirements. Then, go to *Chapter 3: Getting Started* for instructions on how to install your laboratory fume hood and make all of the necessary connections.

If you would like to review how laboratory fume hoods operate, go to *Chapter 4: Performance Features and Safety Precautions*.

For information on the operational characteristics of your laboratory fume hood, go to *Chapter 5: Using The Protector PVC*.

If your laboratory fume hood is installed and you need to perform routine maintenance on the cabinet, proceed to *Chapter 6: Maintaining Your Protector PVC*.

For information on making modifications to the configuration of your fume hood, go to *Chapter 7: Modifying The Protector PVC*.

Refer to *Chapter 8: Troubleshooting* if you are experiencing problems with your fume hood.

CHAPTER 2
PREREQUISITES

Before you install your laboratory fume hood, you need to prepare your site for installation. Carefully examine the location where you intend to install your hood. You must be certain that the area is level and of solid construction. In addition, a dedicated source of electrical power must be located near the installation site.

Carefully read this chapter to learn the requirements for your installation site:

- The location requirements.
- The support requirements.
- The exhaust requirements.
- The exhaust washdown requirements.
- The electrical power requirements.
- The service line requirements.
- The space requirements.

Refer to *Appendix B: Protector PVC Dimensions* for complete fume hood dimensions.

Refer to *Appendix C: Protector PVC Specifications* for complete laboratory fume hood electrical and environmental conditions, specifications and requirements.

Location Requirements

The fume hood should be located away from traffic patterns, doors, windows, fans, ventilation registers, and any other air-handling device that could disrupt its airflow patterns. All windows in the room should be closed.

La hotte aspirante devrait être localisé loin des voies de circulation, des portes, des fenêtres, des ventilateurs, des bouches de ventilation, et de tout appareil qui pourrait interrompre ses voies de flux d'air. Toutes les fenêtres dans la pièce devraient être fermées.

Support Requirements

DO NOT install the fume hood on a cart, dolly, or mobile bench. ALL Protector Hood installations must be permanent and stationary. The supporting structure usually consists of a base cabinet and chemically resistant work surface.

NE PAS installer la hotte aspirante sur un chariot ou un banc mobile. TOUTES les installations de la Hotte Protecteur doivent être permanentes et fixes. La structure de soutien consiste habituellement en un meuble doté d'une surface de travail chimiquement résistante.

Exhaust Requirements

The exhaust duct connection has been designed for 12" nominal duct (12.75" OD) to allow for minimum static pressure loss while operating at 100 fpm face velocities. The 12" diameter exhaust duct also allows for proper transport velocities away from the hood in the 1000 fpm to 2500 fpm range. The proper exhaust volume and static pressure loss are listed next for each hood model:

Airflows and Static Pressure

Hood Type	Face Velocity (fpm)		Eco Energy Saving Air Foil Airflow Volumetric Rate (CFM) @ Static Pressure (inches of water)			
	Sash at Full open at 28"	Sash at 62.5% open at 18"	4' Hood	5' Hood	6' Hood	8' Hood
PVC Hoods Perchloric and Acid Digestion	125	200	905, 0.27"	1195, 0.44"	1475, 0.59"	2050, 0.35"
	100	160	725, 0.17"	955, 0.28"	1180, 0.38"	1640, 0.22"
	N/A	125	565, 0.11"	745, 0.17"	920, 0.23"	1280, 0.13"
	N/A	100	455, 0.07"	595, 0.11"	740, 0.15"	1025, 0.09"

12.75" OD Exhaust

Recommendations highlighted

Proper PVC blower selection can be determined from these exhaust requirements and the total system static pressure loss. Contact Labconco Customer Service for assistance in sizing a blower system.

Exhaust Washdown Requirements

The entire exhaust duct system must feature an adequate washdown system. This includes the exhaust ductwork, blower, hood structure itself, and any ductwork located outside the blower. Wash rings are required to be placed in the exhaust duct system every 8 to 10 feet and after any change in direction to provide adequate washdown. Contact Labconco for washdown ring ordering information. Order part number 4746000 for a 10" wash ring and 4746100 for a 12" wash ring. Depending on the length of duct run and number of wash rings and elevation differences, Labconco recommends one additional washdown valve for every three wash rings. The washdown nozzles are designed at a normal pressure of 40 psi with a flowrate of 1 gallon per minute and a minimum pressure of 10 psi with a flow rate of 0.5 gallons per minute. The washdown nozzle at a maximum pressure of 100 psi has a flowrate of 1.5 gallons per minute. Each washdown valve can only produce up to 3.5 gallons per minute at 40 psi and additional washdown valves are ordered frequently and installed on the fume hood front corner post. Order 9808310 Washdown Valve Kit (3/8 lines) per sizing chart that follows.

Additional Washdown Valve Sizing Chart

Duct Run	4' PVC 30'	4' PVC 60'	5' PVC 30'	5' PVC 60'	6' PVC 30'	6' PVC 60'	8' PVC 30'	8' PVC 60'	
Nozzles Mounted on Fume Hood	3	3	4	4	4	4	6	6	
Additional Wash Rings	3	6	3	6	3	6	3	6	
Additional Washdown Valve Kits Required (9808310)	1	2	1	2	1	2	1 or 2	2 or 3	Minimum 10 psi pressure Normal 40 psi pressure

A washdown and drain should be provided in your exhaust blower. This washdown water and effluent material can be drained from the exhaust blower back into the exhaust duct for disposal. Contact Labconco for PVC blowers. The Protector PVC Hood washdown drain outlet is sized for 2" nominal (2.375" OD) PVC pipe.

Electrical Requirements

The Protector Hood models feature internal wiring for the fluorescent light assembly and light switch. All internal wiring is terminated at the single point wiring junction box for hook-up by a qualified electrician. The blower switch, and light switch wires are also terminated at the single point wiring junction box for hook-up by a qualified electrician. Refer to *Chapter 3: Getting Started* and *Appendix* C*: Protector PVC Specifications* for the wiring diagram for proper electrical installation.

Les modèles Protège-capot disposent câblage interne de l'assemblage de lumière fluorescente et interrupteur de lumière. Tout le câblage interne est terminé à la boîte de jonction point de câblage unique pour le raccordement par un électricien qualifié. Le bouton du ventilateur, et fils de l'interrupteur de lumière sont également mis fin à la boîte de jonction point de câblage unique pour le raccordement par un électricien qualifié. Reportez-vous au Chapitre 3: Mise en route et à l'Annexe C: Spécifications PVC Protector pour le schéma de câblage pour l'installation électrique correcte.

Service Line Requirements

All service lines to the laboratory fume hood should be ¼ inch outside diameter, copper (brass for natural gas), and equipped with an easily accessible shut-off valve, should disconnection be required. If the service line pressure exceeds 40 PSI, it must be equipped with a pressure regulator to reduce the line pressure. Please check with local codes for other requirements.

Space Requirements

The dimensions for the different models are shown in *Appendix B: Protector PVC Dimensions*.

CHAPTER 3
GETTING STARTED

Now that the site for your laboratory fume hood is properly prepared, you are ready to unpack, inspect, install, and certify your unit. Read this chapter to learn how to:

- Unpack and move your Protector PVC Hood.
- Set up the fume hood with the supporting structure and hardboard work top.
- Connect to an exhaust system suitable for Perchloric Acid and acids.
- Connect the exhaust washdown to the exhaust system.
- Connect to the washdown drain.
- Connect the electrical supply source.
- Connect the service lines.
- Arrange certification of your Protector PVC Hood.

Depending upon which model you are installing, you may need common plumbing and electrical installation tools in addition to 5/16", 3/8", 7/16", and 1/2" wrenches, ratchets, sockets, a nut driver set, a flat-blade screwdriver, a Phillips screwdriver, and a carpenter level to complete the instructions in the chapter.

The Protector PVC Hood models weigh between 400 to 800 lbs. (182-363 kg). The shipping skid allows for lifting with a mechanical lift truck or floor jack. If you must lift the fume hood manually, follow safe-lifting guidelines. Normally, the fume hood can be slid off a hydraulic lift table and be placed into position on top of the work surface. Do not lift by the front air foil.

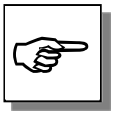
Les PVC modèles de la Hotte Protecteur pèsent entre 400 à 800 livres. (182-363 Kg). La palette bois d'envoi permet le soulèvement par un camion muni d'un élévateur mécanique ou par un cric rouleur. Si vous devez soulever manuellement la hotte aspirante, respectez les règles de sécurité du soulèvement.

Normalement, la hotte aspirante peut être glissée d'une table munie d'un élévateur hydraulique et être placée en position sur la surface de travail. Ne pas soulever par l'écoulement d'air du devant.

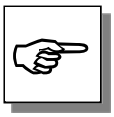
Unpacking Your Fume Hood

Carefully remove the shrink-wrap or carton on your fume hood and inspect it for damage that may have occurred in transit. If your unit is damaged, notify the delivery carrier immediately and retain the entire shipment intact for inspection by the carrier.

The United States Interstate Commerce Commission rules require that claims be filed with the delivery carrier within fifteen (15) days of delivery.



DO NOT RETURN GOODS WITHOUT THE PRIOR AUTHORIZATION OF LABCONCO. UNAUTHORIZED RETURNS WILL NOT BE ACCEPTED.



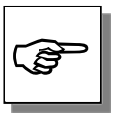
IF YOUR HOOD WAS DAMAGED IN TRANSIT, YOU MUST FILE A CLAIM DIRECTLY WITH THE FREIGHT CARRIER. LABCONCO CORPORATION AND ITS DEALERS ARE NOT RESPONSIBLE FOR SHIPPING DAMAGES.

Do not discard the shipping skid or packing material for your fume hood until you have checked all of the components and installed and tested the unit. **The PVC fume hood baffle is installed as shown in Figure 1-1.** Do not remove the fume hood from its shipping skid until it is ready to be placed into its final location. Move the unit by placing a flat, low dolly under the shipping skid, or by using a floor jack.

Do not move the hood by tilting it onto a hand truck.

Ne pas déplacer la hotte en le penchant sur un diable.

Removing the Shipping Skid



LEAVE THE FUME HOOD ATTACHED TO ITS SHIPPING SKID UNTIL IT IS AS CLOSE TO ITS FINAL LOCATION AS POSSIBLE. MOVE THE HOOD BY USING A SUITABLE FLOOR JACK, OR BY PLACING A FURNITURE DOLLY UNDERNEATH THE SKID. DO NOT MOVE THE HOOD BY TILTING IT ONTO A HAND TRUCK.

After you verify the fume hood components, move your hood to the location where you want to install it. Follow the steps listed next to remove the shipping skid from your unit.

1. Remove the side panels by unscrewing the Phillips screws.

2. Find the hardware (bolts, washers, nuts) that attach the fume hood to the skid and remove the hardware. Some hardware is on the sides and some is on the back.

Sash Weight Release

To protect the fume hood from damage in shipment, the sash weight has been secured to the back of the fume hood with screws. Simply remove the screws and make sure the sash cables or chains are on the pulleys or sprockets before operation of the sash.

NOTE: THE SASH WEIGHT ITSELF WAS INDIVIDUALLY MATCHED FOR THIS SPECIFIC HOOD AND SHOULD NOT BE EXCHANGED ON ANY OTHER UNIT.

Installing the Hood on a Supporting Structure and Hardboard Work Top

The Protector Hood is heavy! Use caution when lifting or moving the unit.

La Hotte Protecteur est lourd ! Prudence en soulevant ou en déplaçant l'objet.

When installing the Protector PVC Hood onto the lower hardboard work top, ensure that the structure can safely support the combined weight of the fume hood and any related equipment. **The hardboard work top is aligned flush with the back of the fume hood for good airflow: this will provide the correct spacing under the air foil for proper bypass airflow. The lower base cabinets are placed flush with the front of the hardboard work top as shown in Figure 3-2. The hardboard work top supports the PVC Hood and has a cutout to clear the drain trough.**

WARNING: It is important to support the rear of the work surface and fume hood. The cross support provides support for the bottom of the work surface. Install the cross support after the base cabinets and work surface are leveled and before installing the hood.

AVERTISSEMENT : Il est important de soutenir l'arrière de la surface de travail et la hotte aspirante. Le support tranversal soutient le bas de la surface de travail. Installer le support transversal après que les meubles et la surface de travail soient nivelés et avant d'installer la hotte.

The following are instructions for mounting a cross support:

1. Level the base cabinets and the hardboard work top. Work top should be placed flush with the back of the fume hood as shown in Figure 3-1.
2. Scribe a line on the wall or back of the base cabinet to locate the support under the work surface.
3. Mount the support by attaching it to the wall or base cabinet.
4. Anchor cabinet(s) with seismic restraints if required by the local code in your area.

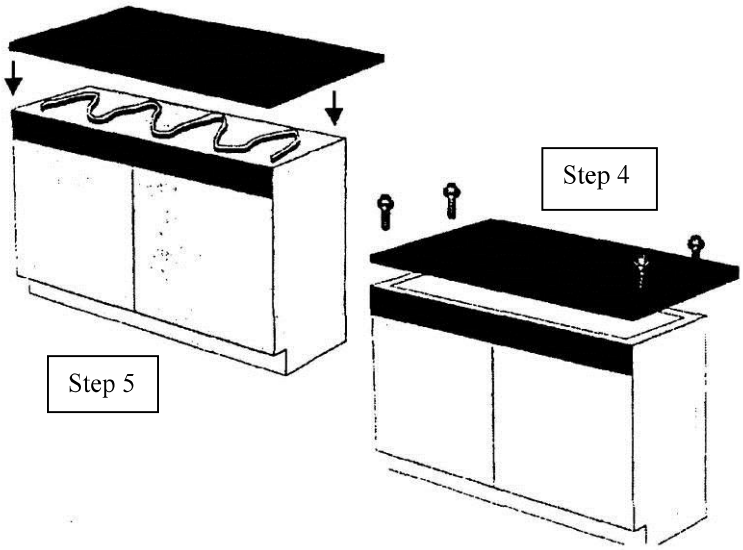


Figure 3-1

5. Secure the hardboard surface to the top of the base cabinet(s) using adhesives with the Acid Storage Cabinet(s). Be sure the PVC Hood drain trough is accounted for in the relief area of the hardboard top. See figure 3-2.
6. After completing step 5, apply a sufficient quantity of adhesive to the top surface of the hardboard.
7. Place the hood on top of the work surface and cross support.
8. Place heavy weights on the inside of the fume hood for approximately 24 hours. This provides a proper bond of the adhesive. Protect the hood's integral work surface from possible damage by wrapping any weighted material first.
9. Place the hood on top of the work top and cross support.

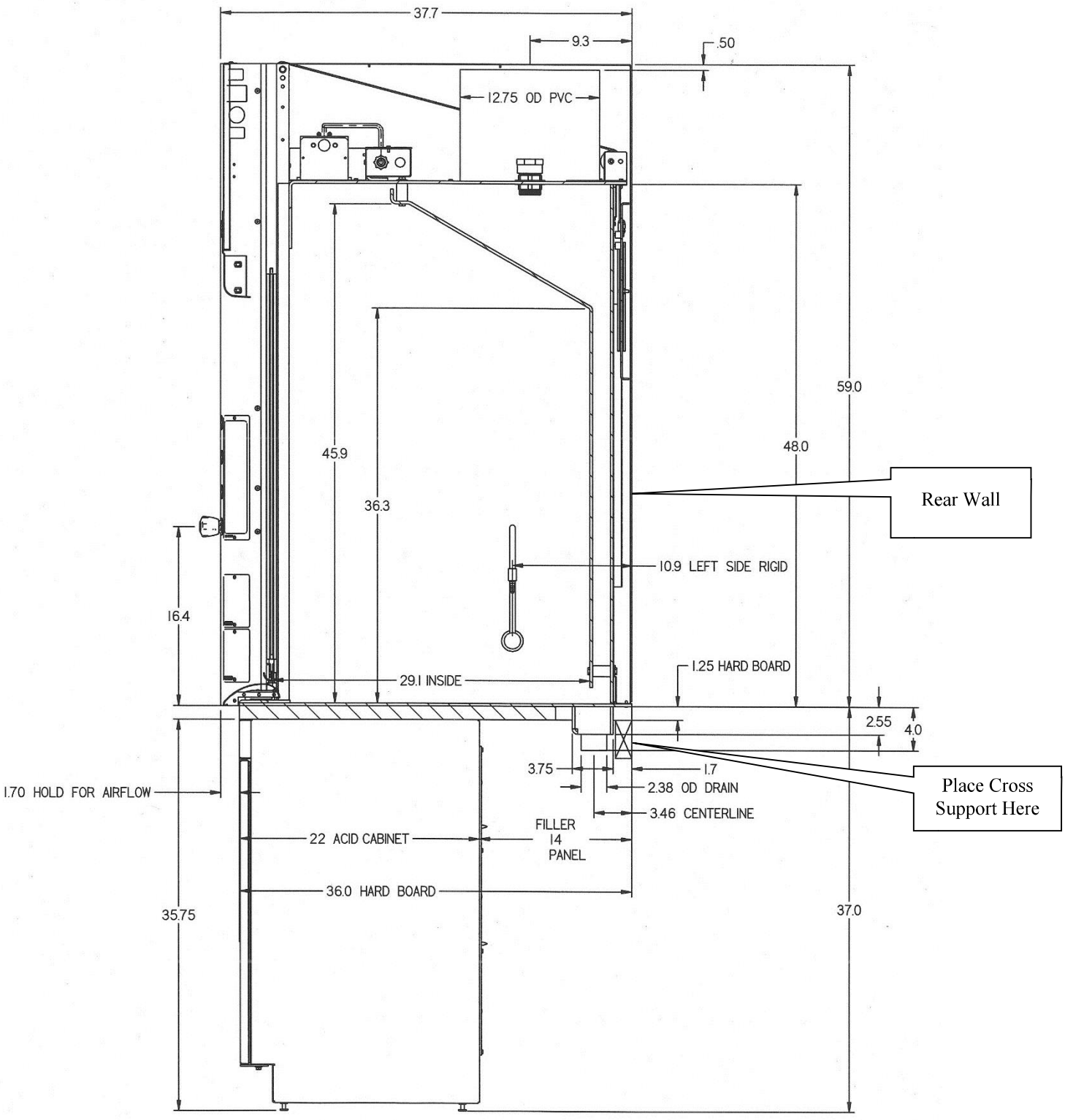
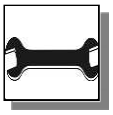

37.7
9.3
.50
12.75 OD PVC
59.0
48.0
45.9
36.3
Rear Wall
10.9 LEFT SIDE RIGID
16.4
29.1 INSIDE
1.25 HARD BOARD
2.55
4.0
3.75
1.7
2.38 OD DRAIN
3.46 CENTERLINE
Place Cross Support Here
1.70 HOLD FOR AIRFLOW
22 ACID CABINET
FILLER 14 PANEL
36.0 HARD BOARD
35.75
37.0

Figure 3-2

Connecting to the Hood Exhaust System

WARNING: The weight of the exhaust ductwork system must be supported independently of the hood superstructure. Do not allow this weight to be supported by the hood structure as damage to the hood may occur.

AVERTISSEMENT : Le poids du système d'aspiration de ductwork doit être soutenu d'une manière indépendante de la superstructure de la hotte. Au cas où ce poids est supporté par la structure de la hotte, des dommages à la hotte peuvent arriver.



The exhaust connection should be installed by a qualified HVAC contractor. The exhaust connection on your hood is manufactured with 12" PVC nominal pipe (12.75" OD) to allow for minimum static pressure loss with proper transport velocities away from the hood. Consult Labconco Customer Service should you require help sizing your blower for the exhaust volume and total system static pressure loss.

La connexion d'échappement devrait être installée par un professionnel de CVC agrée. La connexion d'aspiration sur votre hotte a été conçue pour un tuyau nominal de 12 pouces (12,75 pouces de diamètre externe) afin d'avoir une perte minimale de pression statique avec les correctes flux de transport loin de la hotte. Consulter le Service Clientèle de Labconco si la calibration de votre soufflerie pour le volume d'aspiration et la perte de pression statique du système le requiert.

The selected exhaust duct material must be fabricated out of type 1 unplasticized polyvinyl chloride or type 316 stainless steel material. The duct should be fully welded in the case of the stainless steel material or solvent bonded in the case of polyvinyl chloride so that it does not have any cracks or holes where Perchloric acid salts or acids can collect.

Le matériau conduit d'évacuation sélectionné doit être fabriquée sur une polychlorure de vinyle non plastifié de type 316 ou un matériau en acier inoxydable de type. Le conduit doit être entièrement soudé dans le cas de l'acier inoxydable ou du solvant collé dans le cas du polychlorure de vinyle pour qu'il ne possède pas de fissures ou de trous, où les sels de l'acide perchlorique ou des acides peuvent s'accumuler.

The exhaust duct system for a PVC Fume Hood should be run in a vertical position and feature horizontal runs only where it cannot be avoided. Should a horizontal run be a part of your exhaust system, it should be sloped downward toward the hood to prevent the pooling of the washdown water and perchloric acid salts or acids in the duct.

Le système de conduits d'échappement pour un PVC Hotte doit être exécuté dans une position verticale et horizontale fonctionnalité fonctionne uniquement lorsque cela ne peut être évité. Si une course horizontale être une partie de votre système d'échappement, il devrait être en pente descendante vers le capot pour empêcher la mise en commun de l'eau de lavage à grande eau et les sels de l'acide perchlorique ou acides dans le conduit.

CAUTION: PVC Fume Hoods must never be manifolded into a common exhaust system. They require a dedicated exhaust system.

ATTENTION: PVC hottes ne doivent jamais être un tuyau collecteur dans un système d'échappement commun. Ils exigent un système d'échappement spécifique.

Connecting to the Exhaust Washdown

The entire exhaust duct system must have an adequate washdown system. This includes the exhaust ductwork located between the exhaust blower and the hood structure, the exhaust blower, and any ductwork located on the outlet side of the blower. Wash rings are recommended to be placed in the exhaust duct system approximately every 8 to 10 feet and after every change in direction to provide an adequate washdown. A drain should be provided in your exhaust blower and this washdown water and effluent material can be drained from the exhaust blower back directly into the exhaust duct for disposal. The PVC Hood was designed with an auxiliary port plugged at the factory, and it is to be connected to the washdown valve system to provide water to the wash rings. The plug is located on top of the hood near the first washdown nozzle. Plumb from the plugged connector with a 3/8" rigid polyethylene, copper, or stainless steel line.

Connecting to the Washdown Drain

The Protector PVC Hood has been supplied with a 2" nominal (2.375" OD) PVC pipe drain. Connect the 2" pipe to your floor drain. Be sure the connection is either fully solvent bonded or leak tight. See Figure 3-2.

Connecting the Electrical Supply Source to the Protector Fume Hood

Prior to connecting any electrical wiring to the fume hood structure, refer to the hood identification plate for the proper electrical requirements of your specific model.

WARNING: **The building electrical supply system for Protector Hoods is required to include overload protection. A switch or circuit breaker shall be in close proximity to the equipment and within easy reach of the operator. The switch or circuit breaker is to be marked as the disconnecting device for the equipment.**

AVERTISSEMENT : Le système d'alimentation électrique de la Hotte Protecteur doit inclure la protection contre la surcharge. Un commutateur ou disjoncteur doit être tout près de l'équipement et à portée facile de l'opérateur. Le commutateur ou le disjoncteur doit être marqué comme l'appareil débranchant pour l'équipement.

The identification plate, model number, serial number, and electrical connection boxes are accessible from the front of the fume hood by removing the front panel.

The Protector PVC Hood is normally wired for 115 Volt, 50/60 Hz, 20 Amp or 230Volt, 50/60 Hz, 10 Amp electrical service. Check the I.D. plate behind the front panel for voltage verification. The number of circuits varies depending on the model. All of the electrical connections are terminated at the field wiring terminal box for hook-up by a qualified electrician. We recommend each circuit be a dedicated branch circuit. However, if wired together the maximum load allowed is the sum of individual outlets plus the rating of the unit (i.e. 2 Amps remote, 8 Amps integral blower) not to exceed the 10A or 20A electrical service. The single point internal junction box is used for the connection of the lights, blower, and duplex outlets. Refer to the wiring diagram for your Protector PVC in *Appendix C: Protector PVC Specifications.*

The fume hood is required to be grounded to the MAINS protective earthing ground for safe operation. Using a ring terminal sized for a 10-24 machine screw, connect the MAINS ground conductor to the grounding lug marked with the protective earthing symbol, ⏚ . Only MAINS ground conductors should be connected to the protective earthing ground lug, no other conductors should be connected to this grounding lug. Using wire nuts connect the MAINS supply conductors to the fume hood supply wires. Insure that the wires are connected as per the appropriate wire color codes for the input voltage. For 115V Phase (Hot) is black and Neutral is white, for 230V Phase1 is brown and Phase2 is blue. Refer to the wiring diagram for your Protector PVC in *Appendix C: Protector PVC Specifications.*

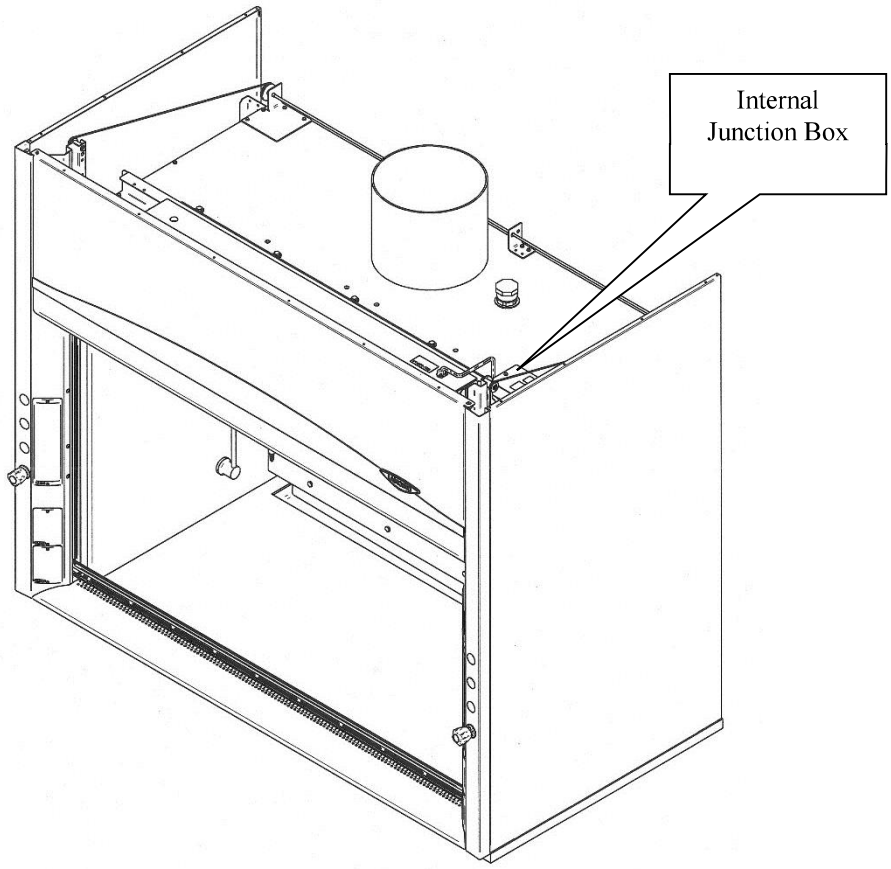


Figure 3-3

All wiring for the fume hood SHOULD be performed by a licensed electrician and conform to all local codes. In most cases, the hood will require the use of shielded conduit to protect the wiring into the hood. The grounding connection shall not be made to the terminal box cover.

Tout le câblage électrique pour la hotte aspirante devrait être exécuté par un électricien agrée et être conforme à tous les règles en vigueur. Dans la plupart des cas, la hotte exigera l'usage de conduit blindé pour protéger le câblage électrique dans la hotte. La prise de terre ne sera pas faite à la couverture de la boîte du terminal.

The fluorescent light has been mounted outside the top liner panel and is sealed from vapors inside the hood structure. To change the fluorescent light bulbs in your hood, you must first remove the front panel from the hood. Next remove the knock out plugs holding the light fixture in place. Lift fixture up and replace any deflective bulbs. Reverse order to reassemble.

Connecting the Service Lines to the Protector Fume Hood

The hoods with service fixtures have been plumbed from the valve to the hose connector or gooseneck for your installation convenience. Supply tubing shall be provided by the qualified installer. Tubing can enter the hood from above, through the back, or through the work surface to make these connections to the service fixtures.

NOTE: Inspect all fittings for leakage. Tighten the fittings slightly if needed.

NOTE : Inspecter toutes les installations à la recherche de fuite. Resserrer les installations légèrement si nécessaires.

CAUTION: Do not use oxygen with any standard service fixture. Contact Labconco Customer Service for oxygen fixture information.

PRUDENCE : Ne pas utiliser de l'oxygène avec l'accessoire de service standard. Contacter le Service Clientèle de Labconco pour les informations d'accessoire d'oxygène.

Should access to the hood plumbing fixture bodies be required, remove the service access plate on the hood front corner posts by loosening their individual screws (see item 11, Figure A-1 in *Appendix A*). The valve body will now be fully exposed for any service work that may be necessary. The service fixtures supplied on your laboratory hood are designed for use with the following services:

- Air
- Cold Water
- Hot Water
- Natural Gas – See caution below
- Vacuum

WARNING: Contact Labconco Customer Service directly before using any service other than those listed above in these valves to assure full compatibility.

AVERTISSEMENT : Contacter le Service Clientèle de Labconco directement avant d'utiliser n'importe quel service autre que ceux énumérés au-dessus dans ces soupapes pour assurer une pleine compatibilité.

CAUTION: Natural gas should be used only in the service fixture that has been pre-plumbed with brass tubing. Sulfur content of the gas could cause deterioration of standard copper supply lines.

PRUDENCE : Le gaz naturel devrait être seulement utilisé dans l'accessoire de service qui a été pré soudé avec des tuyaux de cuivre. Le contenu soufré du gaz pourrait causer la détérioration des lignes d'alimentation en cuivre standard.

Sealing the Protector Hood to the Work Surface

When the hood has been set in place, ducted, wired, and plumbed, it should be sealed to the hardboard work top. Materials such as silicone sealants are recommended to seal the hood structure.

Certifying the Protector PVC Fume Hood

The combination of your laboratory hood, exhaust ductwork, and exhaust blower gives you the flexibility to change the airflow at the sash opening of your hood. To determine the actual face velocity at the sash opening, airflow velocity readings will need to be taken. This should be done across the sash opening of the hood in accordance with the *Industrial Ventilation Manual* section on laboratory hoods (see *Appendix E: References*). Labconco recommends an average face velocity at the sash opening of 100 feet per minute. Consult Chapter 2 for proper airflow volumes for your particular model.

Your Protector Fume Hood has been tested at the factory per ASHRAE 110-1995. All hoods achieve an "as manufactured rating" of less than 0.05 part per million (ppm) at 4 liters per minute (lpm); AM<0.05 (consult Labconco for individual fume hood ratings). For "field use" ASHRAE testing contact Labconco Sales Engineering Team or Customer Service for a certified on-site contractor.

NOTE: Face velocity profiles and smoke testing should be done periodically to ensure safe performance.

NOTE : Les profils de flux frontal et les tests de fumée devraient être régulièrement faits pour garantir une utilisation en toute securité.

CHAPTER 4
PERFORMANCE FEATURES AND SAFETY PRECAUTIONS

Performance Features

Your Protector PVC Perchloric Acid Fume Hood has been engineered to efficiently ventilate and remove Perchloric acid fumes. The Protector PVC Acid Digestion Fume Hood has been engineered to efficiently ventilate and remove acid fumes of all kinds (excluding Perchloric acid) including hydrofluoric acid (HF). The Protector PVC Acid Digestion Hood must not be used with Perchloric acid as it can react with the Lexan sash. The Protector PVC Fume Hoods are designed to provide a flow of air sufficient to extract the acid fumes from within the work area and keep them away from the operator to avoid ingestion, inhalation, or skin contact.

The hood interior is constructed of seamless PVC with coved interior corners. The hood also features an integral washdown system, which helps prevent the accumulation of perchlorates or acids. The smooth interior finish compliments the washdown system as there are no screws or hollow fasteners present that could harbor undesirable residue.

The Protector PVC Fume Hood has been engineered to allow you, the customer, the maximum work area and personnel safety. The by-pass air configuration on the Protector PVC Fume Hoods is totally dependent on air being supplied to the hood from its surrounding environment for proper operation.

As stated previously, the Protector PVC Perchloric Acid Hood is designed to handle Perchloric acid operations of all types, while the PVC Acid Digestion Hood is designed to handle acids of all kinds (excluding Perchloric acid) including hydrofluoric acid (HF). Usage of materials other than the specific acids mentioned above is not recommended. Perchloric acid is a strong oxidizing agent, and should not be used in combination with any organic material as the possibility of a hazardous chemical reaction or explosion could develop.

The integral washdown system in either PVC Fume Hood allows the operator the ability to wash behind the baffle and ensure that a build-up of Perchloric salts or other acids does not develop in that location. All of the washdown water from the internal spray nozzles is contained behind the baffle and does not interfere with normal operations being performed inside the hood. The washdown water is collected in the hood drain trough.

The hood liner must be washed down manually by the operator. The internal washdown system can be connected to the wash rings used in your hood exhaust system. The water used in the spray wash rings is collected in the hood drain trough once it has been allowed to flow down and cleanse the duct thoroughly.

WARNING: It is recommended that the PVC Hood be washed down thoroughly after every usage for 10 minutes, at least once a day.

AVERTISSEMENT: Il est recommandé que le capot PVC être lavé soigneusement après chaque usage pendant 10 minutes, au moins une fois par jour.

1. **Unique sash provides maximum visibility of 37.5" high while conserving energy by limiting sash travel to 28"**. Vertical-rising sash may be raised from a closed to 28" operating height. Exhaust volume and blower sizing are based on the 28" height. Optional sash stops are available to limit sash height and reduce energy usage. The PVC Perchloric Acid Hood has a glass sash specifically used for Perchloric Acid. The PVC Acid Digestion Hood has a Lexan sash specifically used for all acids (excluding Perchloric acid) including hydrofluoric acid (HF). **NOTE:** Hydrofluoric acid will etch or fog standard plate glass, but not Lexan plastic.
2. **By-pass airflow design** ensures relatively stable face velocities.
3. **Large usable interior work depth and interior height of 48"** provides ample working space.
4. **Baffle** directs airflow to the rear of the interior to provide efficient airflow. The baffle may be removed for cleaning purposes only.
5. **Exterior access cover plates** are removable for easy access to plumbing valves when access through the sides is not available.
6. **Lift-Away™ front panel** provides easy access to electrical wiring, sash weights, and lighting fixtures.
7. **Energy efficient fluorescent lighting** is located behind a laminated safety glass shield mounted to the top of the hood. The factory-wired lighting is serviceable from outside the hood cavity.
8. **Low-mounted, factory-wired light and blower switches** are ADA compliant.

9. **Clean-Sweep™** air foil allows air to sweep the work surface for maximum containment.
10. **Streamlined corner posts** provide maximum visibility and the flexibility to add services; services are most easily added at the factory, because of the PVC liner.
11. **All hoods are factory-prepared for up to 7 service fixtures**. Additional fixtures are available only as a factory special. Liner hole drilling is required to add another fixture in the field.
12. **One duplex electrical receptacle** is mounted on the right corner post. Receptacles are factory-wired to hood single point junction box. Additional electrical receptacles are available as factory or field installed.
13. **PVC interior liner** is seamless PVC with coved interior corners and integral work surface.
14. **Accessory Guardian™ Digital Airflow Monitor** or **Guardian Jr. Monitor** continuously monitors face velocity. An audio/visual alarm alerts the user to low airflow conditions. The right corner post is factory prepared to accommodate the Guardian Monitor (sold separately).
15. **Optional Energy-Reducing A-Style Combination Sash Models.** These combination sashes allow the operator to use the hood with sashes either half open vertically or horizontally to conserve energy. Optional sash stops prevent raising the vertical sash above the half-open and fully closed positions unless manually defeated by the operator.
16. **Outside frame of epoxy-coated steel and galvanized steel** is durable and corrosion resistant.
17. **Exhaust connection**. The hood features 12" (12.75" OD pipe) PVC exhaust connections sized to allow for a minimum static pressure loss through the hood structure while providing a good transport velocity through the exhaust system.
18. **Solid hardboard support** provided to support the integral PVC bottom.
19. **Optional Ceiling Enclosure Kits** are available for a decorative facade between the hood and the ceiling.
20. **Optional Sash Stops** provide a means of controlling the operating height of the sash.
21. **Washdown control fixture.** Located on the left hand side of the hood superstructure, this valve controls the water flow to the integral washdown spray nozzles. The nozzles are located behind the hood baffle and washdown areas in the hood, which are inaccessible without removing the baffle. The control fixture can also be set up to control the washdown system used in your exhaust ductwork. To do this, connect the water line from your external washdown system to the plugged connection provided on the top of the internal washdown assembly. For additional washdown valves and sizing, See Chapters 2 & 7.

22. **Acid Cabinet Vent Connection.** As a convenience, the PVC Hood has a 2" plugged connection on top of the hood to vent the acid cabinet below the fume hood. The acid vent kit is listed in Chapter 7 and ordered separately as part number 3591101.
23. **Built-in Upper Bypass.** The PVC Hood includes an upper bypass block which proves to be useful when working with heat in digestions.

See Diagram on Page 20.

24.  **CAUTION –** Current rating of receptacle is specified in *Appendix D*.

    AVERTIR – Classification des prises de courant est spécifié dans l'Annexe D.

25.  **CAUTION –** See Appendix C and D for complete current rating.

    AVERTIR – Voir Annexe C et D pour la classification complete du courant.

26.  **CAUTION –** Flammable Gas.

    AVERTIR – Gaz Inflammable.

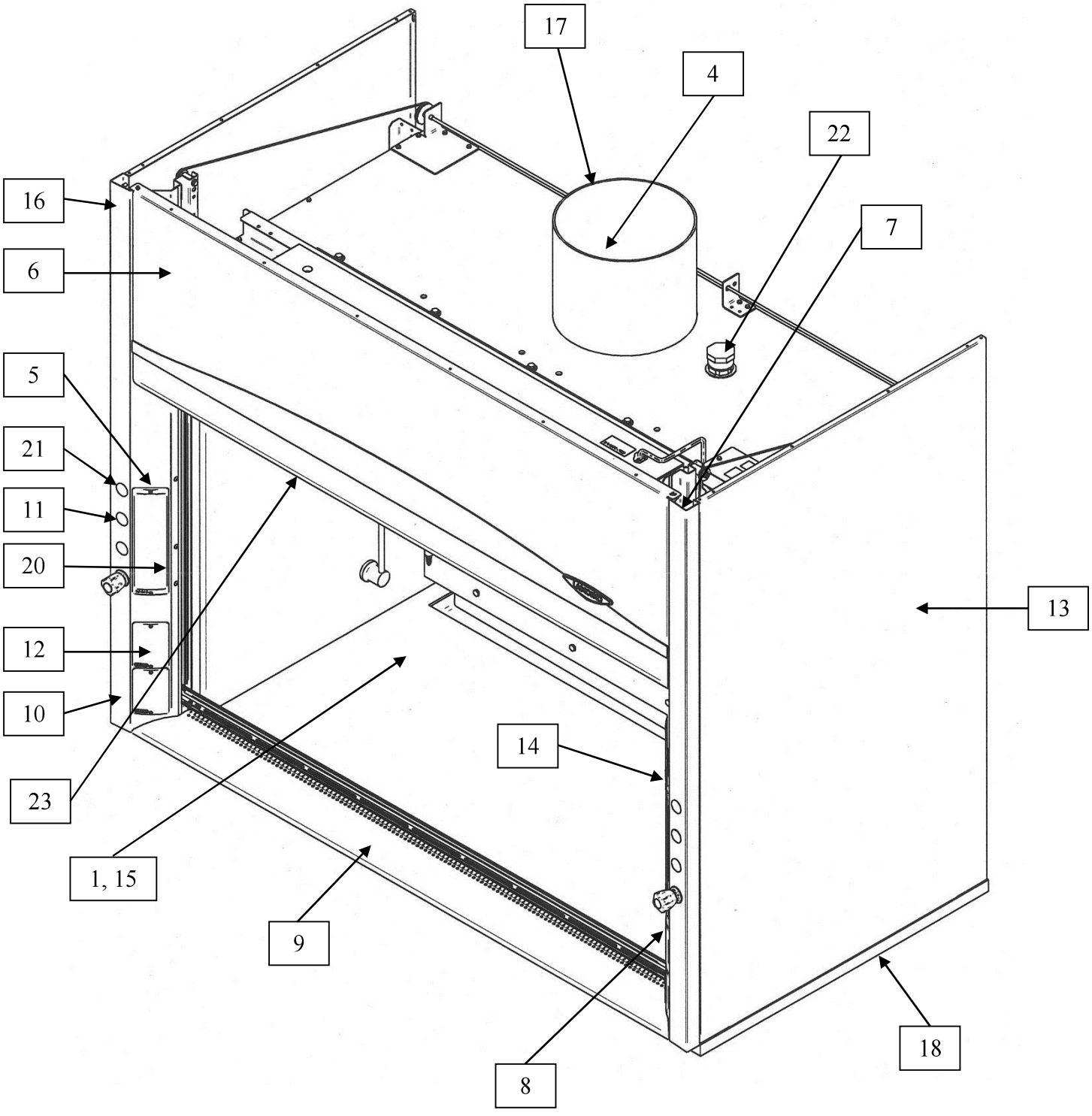


Figure 4-1

Safety Precautions

Although the laboratory hood has been engineered to maintain optimum operator safety, caution should always be used while working in the hood. Prior to using the hood, check to make sure that the exhaust blower is operating and that air is entering the hood at its specified face velocity.

Bien que la hotte de laboratoire ait été réglée pour maintenir la sécurité optimale de l'opérateur, la prudence devrait toujours être utilisée en travaillant sous la hotte. Avant utiliser la hotte, le contrôle pour s'assurer que la soufflerie d'aspiration fonctionne et que cet air entre dans la hotte au flux spécifié.

Do not place any hot items directly on the PVC Hood integral work surface.

Ne placez pas d'aliments chauds directement sur la surface de travail intégrante PVC Hood.

Always keep the ventilation system in operation when using any heat generating source inside the PVC Hood. Severe damage to the PVC Hood liner and PVC baffle can occur if the ventilation system is turned off before the heat load inside has been reduced to a safe level.

Toujours garder le système de ventilation en marche lorsque vous utilisez une source de production à l'intérieur du capot PVC chaleur. De graves dommages au capot liner PVC et PVC chicane peut se produire si le système de ventilation est coupée avant que l'intérieur de la charge thermique a été réduite à un niveau sûr.

USE GOOD HOUSEKEEPING IN THE HOOD AT ALL TIMES. CLEAN UP SPILLS IMMEDIATELY WITH A MILD DETERGENT. PERIODICALLY CLEAN HOOD INTERIOR, INCLUDING FLUORESCENT LIGHT GLASS PANEL. REPLACE BURNED OUT LIGHT BULBS TO MAINTAIN MAXIMUM ILLUMINATION.

DO NOT OVERLOAD THE WORK SURFACE WITH APPARATUS OR WORK MATERIAL. THE SAFE OPERATION OF THE LABORATORY HOOD IS BASED UPON HAVING PROPER AIRFLOW THROUGH THE STRUCTURE. DO NOT PLACE LARGE, BULKY OBJECTS SUCH AS BLOCK HEATERS, DIRECTLY ON THE HOOD

WORK SURFACE. INSTEAD, ELEVATE THE OBJECT 2" TO 3" ON BLOCKS TO ALLOW A FLOW OF AIR UNDER THE OBJECT AND INTO THE LOWER REAR BAFFLE EXHAUST SLOT. ENSURE BLOCKS ARE LEVEL AND SECURED IN PLACE.

Blocking the bottom of the baffle at the rear of hood will change the airflow pattern in the hood causing turbulence and possible leakage at the face of the hood. (Don't store containers or supplies against baffles, as this will affect airflow through the hood).

Avoid placing your head inside hood. Keep hands out of hood as much as possible.

Bloquer le fond du déflecteur à l'arrière de la hotte changera le modèle du flux d'air dans la hotte causant de la turbulence et une fuite possible devant la hotte. (Ne pas emmagasiner des récipients ou des provisions contre les déflecteurs, car ceci affectera le flux d'air à travers la hotte).

Eviter de placer votre tête à l'intérieur de la hotte. Garder les mains à l'extérieur de la hotte le plus possible.

Always work as far back in hood as possible. It is best to keep all chemicals and apparatus 6" inside the front of the hood.

Toujours travailler aussi loin que possible de la hotte. Il est recommandé de garder tous les produits chimiques et appareils à 6 pouces à l'intérieur de l'avant de la hotte.

Perchloric acid use in PVC Perchloric Acid Hoods is recommended. Perchloric acid is not allowed in PVC Acid Digestion Hoods.

L'utilisation de l'acide perchlorique en PVC perchlorique Hoods acide est recommandée. L'acide perchlorique n'est pas autorisé en PVC acide hottes de digestion.

Wash the hood down thoroughly after each usage or at least once a day for a period of 10 minutes.

Laver le capot vers le bas après chaque utilisation ou au moins une fois par jour pendant une période de 10 minutes.

Safety requires regular washdown of fume hood interior, ductwork, and the movement of air preferably after each experiment. The baffle on this hood may be removed for access to all surfaces as a follow-up to washdown procedures. All deposits should be flushed away. Utilize lowest quantities of Perchloric acid or acids to fit procedural requirements.

La sécurité exige lavage à grande eau régulière de sorbonne intérieur, conduits, et le mouvement de l'air de préférence après chaque expérience. Le déflecteur sur ce capot peut être retiré pour accéder à toutes les surfaces comme un suivi des procédures de lavage. Tous les dépôts doivent être rincées loin. Utiliser plus faibles quantités d'acide perchlorique ou acides pour s'adapter aux exigences procédurales.

The use of Perchloric acid creates extreme inherent hazard because of its certain characteristics. Since there is a constant danger of explosion when using Perchloric acid, it is recommended that laboratories employing its use in any quantity become well informed of its characteristics. Only personnel fully cognizant with the properties of Perchloric acid and the hazards associated with it should perform Perchloric acid procedures.

L'utilisation d'acide perchlorique crée un aléa inhérent extrême en raison de ses certaines caractéristiques. Comme il ya un danger constant d'explosion lors de l'utilisation d'acide perchlorique, il est recommandé que les laboratoires qui emploient son utilisation dans n'importe quelle quantité deviennent bien informés de ses caractéristiques. Seul un personnel parfaitement au courant avec les propriétés de l'acide perchlorique et les risques qui y sont associés doivent effectuer les procédures d'acide perchlorique.

The PVC Perchloric Acid Hood is specially designed for use with Perchloric acid. It should not be used as a general-purpose laboratory fume hood. Do not work with organic materials in the PVC Perchloric Acid Fume Hood. Perchloric acid when used with organic material can cause a hazardous chemical reaction or explosion. Because of extreme hazards, miscellaneous work should not be performed in this hood. Do not store chemicals in a fume hood.

Le PVC Acide perchlorique capot est spécialement conçu pour être utilisé avec de l'acide perchlorique. Il ne devrait pas être utilisé comme une hotte de laboratoire à usage général. Ne pas travailler avec des matières organiques dans le PVC Acide perchlorique Hotte. L'acide perchlorique lorsqu'il est utilisé avec des matières organiques peut provoquer une réaction chimique dangereuse ou une explosion. En raison de risques extrêmes, travaux divers ne doit pas être effectuée dans cette hotte. Ne pas entreposer de produits chimiques dans une hotte.

All apparatus used within the hood interior should have inorganic coatings and lubricants.

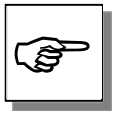
Tous les appareils utilisés à l'intérieur de la hotte doit avoir des revêtements et des lubrifiants minéraux.

Although, the Protector PVC Perchloric Acid Fume Hoods conform to all generally accepted standards of design for this type of equipment, we accept no responsibility or liability for accidents that may possibly occur in the use of Perchloric acid in our hoods.

Bien que, le Protecteur du PVC acide perchlorique hottes sont conformes aux normes généralement admises de la conception de ce type de matériel, nous déclinons toute responsabilité pour les accidents qui pourraient éventuellement se produire dans l'utilisation de l'acide perchlorique dans nos hottes.

Radioisotope materials are not recommended for use in PVC Hoods.

Matériaux radio-isotopes ne sont pas recommandés pour une utilisation dans des hottes en PVC.



AVOID CROSS DRAFTS AND LIMIT TRAFFIC IN FRONT OF THE HOOD. AIR DISTURBANCES CREATED MAY DRAW FUMES OUT OF THE HOOD.

The use of heat-generating equipment in this hood without the exhaust system operating properly can cause damage to the hood.

L'usage d'équipement chaleur-produiant dans ce capuchon sans l'opération de système d'aspiration peut causer convenablement des dommages à la hotte.

The Protector PVC Laboratory Hoods should be certified by a qualified certification technician before initially used. The hood should be re-certified whenever it is relocated, serviced or at least annually thereafter.

Le protecteur en PVC Hoods laboratoire doivent être certifiés par un technicien de certification qualifié avant la première utilisation. La hotte doit être re-certifié à chaque fois qu'il est déplacé, l'entretien ou au moins annuellement par la suite.

Ensure that the hood is connected to electrical service in accordance with local and national electrical codes. Failure to do so may create a fire or electrical hazard. Do not remove or service any electrical components without first disconnecting the hood from electrical service. Proper operation of the fume hood depends largely upon the hood's location and the operator's work habits. Consult the *Reference Manual in Appendix D.*

Assurez-vous que le capot est connecté au service électrique conformément aux codes électriques locaux et nationaux. Ne pas le faire peut créer un risque d'incendie ou électrique. Ne pas enlever ou de réparer des composants électriques sans d'abord débrancher la hotte du service électrique. Le bon fonctionnement de la hotte dépend largement de l'emplacement de la hotte et les habitudes de travail de l'opérateur. Consultez le manuel de référence à l'Annexe D.

If the unit is not operated as specified in this manual it may impair the protection provided by the unit.

Si l'unité n'est pas utilisée comme spécifié dans ce manuel il peut diminuer la protection fournie par l'unité.

Do not position the fume hood so that it is difficult to operate the main disconnect device.

Ne pas positionner la hotte de sorte qu'il est difficile de faire fonctionner le dispositif principal de déconnexion.

CHAPTER 5
USING THE PROTECTOR PVC

Operating the Vertical-Rising Glass Sash

Because of the Protector PVC Perchloric Acid Hood's counterbalanced sash mechanism, it will take only a few pounds of force to move the sash up or down, and you can operate the sash smoothly with one or two hands positioned any where along the handle. The glass sash is suitable for use with Perchloric acid. The vertical-rising sash may be raised to a maximum 28" operating height. The airflow requirements should be sized for the 28" operating height; if using sash stops then the airflow requirements can be reduced by approximately 40% at 18" or approximately 50% at 15".

Operating the Vertical-Rising Lexan Sash

Because of the Protector PVC Acid Digestion Hood counterbalanced sash mechanism, it will take only a few pounds of force to move the sash up or down, and you can operate the sash smoothly with one or two hands positioned any where along the handle. The Lexan sash prevents fogging caused by hydrofluoric acid (HF). The Lexan sash is suitable for acids other than Perchloric acid, which can react with the Lexan plastic. The airflow requirements should be sized for the 28" operating height, if using sash stops then the airflow requirements can be reduced by approximately 40% at 18" or approximately 50% at 15".

Operating the Blower

Your Protector PVC Fume Hood utilizes a remote style blower, which can be activated by turning the blower switch to "ON." You can validate the hood performance by watching smoke drawn into the hood face opening.

Operating the Lights

Your Protector PVC Fume Hood utilizes a factory-wired fluorescent light to illuminate the hood interior. Simply turn the light switch to "ON" to operate.

S

Operating the Washdown Control Valve

Your Protector PVC Fume Hood has a washdown control valve located on the upper left-hand side that controls water to the washdown spray nozzles. The nozzles are located behind the hood baffle and will washdown areas in the hood, which are unaccessible without removing the baffle. The washdown control system can also be set up to control the washdown rings used in your exhaust ductwork. This is done by connecting the water line to the plugged connection on top of the washdown hood system or ordering additional washdown valves found in Chapter 2 and Chapter 7.

Working in Your Protector PVC Fume Hood

Planning

- Thoroughly understand procedures and equipment required before beginning work.
- Arrange for minimal disruptions, such as room traffic or entry into the room while the hood is in use.

Start-up

- Turn on fluorescent light and hood blower.
- Slowly raise the sash.
- Check the baffle air slots for obstructions.
- Allow the hood to operate unobstructed for 5 minutes.
- Wear a long sleeved lab coat and rubber gloves. Use protective eyewear. Wear a protective mask if appropriate.

Loading Materials and Equipment

- Only load the PVC Hood materials required for the procedure. Do not overload the hood. Only use Perchloric acid in the PVC Perchloric Acid Fume Hood.
- Radioisotope materials are not recommended for use in these PVC Hoods. Consult your Safety Officer should you have any questions.
- Do not obstruct the front air foil, or rear baffle slots.
- Large objects should not be placed close together and spaced above the liner bottom to permit airflow to sweep under the equipment.
- After loading the hood, wait one minute to purge airborne contaminants from the work area.

Work Techniques

- Keep all materials at least 6 inches inside of the sash, and perform all contaminated operations as far to the rear of the work area as possible. Segregate all clean and contaminated materials in the work area.
- Avoid using techniques or procedures that disrupt the airflow patterns of the hood.

Final Purging

- Upon completion of work, the hood should be allowed to operate for two to three minutes undisturbed, to purge airborne contaminants from the work area before shutting down blower.

Unloading Materials and Equipment

- Objects in contact with contaminated material should be surface decontaminated before removal from the hood.
- All open trays or containers should be covered before being removed from the hood.

Final Washdown Procedure

- Water washdown or flooding the surfaces with water is standard practice and results in reduction of contamination on the PVC liner material due to Perchloric acid salts or acids.
- Proper operation of your PVC Fume Hood requires that you wash the fume removal system down sufficiently to ensure that there is no build up of Perchloric acid salts or acids within the entire system.
- Normal washdown procedures suggest that you run the wash system in the exhaust duct with the fan on for approximately 1-2 minutes, and then with the fan off for approximately 10 minutes to thoroughly clean this portion of the exhaust system.
- In addition to this, the internal hood spray nozzles should be activated for approximately 10 minutes after the completion of your procedures to clean behind the baffle in the hood. Work areas in front of the baffle in the hood will need to be manually cleaned by the operator. Because the volume of Perchloric acid salts or acids can vary greatly due to specific procedures and workloads, you should consult your in-house Safety Officer for specific rules and frequency requirements for washing down your total system.

Shutdown

- Only turn off the fluorescent light and hood blower if final washdown is complete, and then close the sash.

CHAPTER 6
MAINTAINING THE PROTECTOR PVC

Now that you have an understanding of how to work in the fume hood, we will review the suggested maintenance schedule and the common service operations necessary to maintain your fume hood for peak performance.

Service Safety Precautions

- If performing any electrical maintenance, always disconnect the power at the main disconnect.
- If performing decontamination inside the fume hood, consult your safety officer for proper personal protective equipment and procedure.
- Since some service operations require a step ladder, always use proper safety and consult your safety officer
- If performing maintenance on any service lines, always shut off the supply first.
- Some removable components may be heavy, follow safe-lifting guidelines.
- Verify all components are installed correctly with performance verified before conducting normal operations.

Précautions de Sécurité pour l'Entretien

- Lors de l'entretien électrique, toujours débrancher le courant du secteur principal.
- Durant la décontamination sous la hotte d'aspiration, consulter votre responsable de sécurité pour le correct équipement de protection du personnel et la procédure.
- Puisque certaines opérations d'entretien exigent plusieurs étapes, toujours utiliser la correcte sécurité et consulter votre responsable de sécurité

- Lors de l'entretien sur n'importe quelles lignes de secteur, toujours éteindre premièrement l'alimentation.
- Quelques composants détachables peuvent être lourds, respecter les règles de sécurité du soulèvement.
- Vérifier tous les composants sont correctement installés avec un fonctionnement vérifié avant de faire des opérations normales.

- **Only trained and experienced certification technicians should perform some of the service operations after the fume hood has been properly decontaminated. DO NOT attempt to perform these operations if you are not properly trained. The wrench icon precedes the service operations that require qualified technicians.**
- **Seulement les techniciens de certification expérimentés et entraînés devraient exécuter certaines des opérations d'entretien après que la hotte d'aspiration ait été convenablement décontaminée. NE PAS tenter d'exécuter ces opérations si vous n'êtes pas convenablement entraîné. L'icône de clé plate précède les opérations d'entretien qui exigent des techniciens qualifiés.**

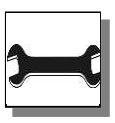
Routine Maintenance Schedule

Daily
Tous les jours

- Washdown PVC liner and PVC baffle surfaces (if used daily) from Perchloric acid salts or acids as outlined in Chapter 5 Final Washdown.
- Lavage à grande eau PVC doublure et surfaces de chicanes en PVC (si elle est utilisée tous les jours) à partir de sels de l'acide perchlorique ou acides à décrite dans le chapitre 5 lavage à grande finale.

Weekly

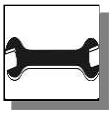
- Using ordinary dish soap to clean the surface inside of the fume hood, and the work surface.
- Using an appropriate glass cleaner, clean the sash and all glass surfaces.
- Operate the fume hood blower, noting the airflow velocity through the hood using a source of visible smoke.



Monthly (or more often as required)
Mensuellement (ou plus régulièrement si nécessaire)

- Determine the actual face velocity through the sash opening of the hood where the average reading should be at the specified velocity. (Use calibrated thermal anemometer or other approved apparatus).
- Déterminer l'actuel flux d'aspiration à travers le sas d'entrée de la hotte où la valeur moyenne doit être égale à la valeur spécifiée. (Utiliser un anémomètre thermique calibré ou d'autres appareils approuvés).
- Using a damp cloth, clean the exterior surfaces of the hood, particularly the front of the hood, to remove any accumulated dust.

- En utilisant un chiffon humidifié, nettoyer les parties extérieures de la hotte, en particulier le devant de la hotte pour enlever la poussière accumulée.
- Check all service valves, if so equipped, for proper operation.
- Contrôler toutes les soupapes, si présentes, pour le bon fonctionnement.
- The hood baffles should be checked for blockages behind them to ensure that the hood is maintaining proper airflow.
- Les déflecteurs de hotte devraient être contrôlés pour leur blocage arrière afin d'assurer que la hotte maintient un flux d'air correct.
- All weekly activities.
- Toutes les activités hebdomadaires.



Annually
Annuellement

- Replace the fluorescent lamps.
- Remplacer les lampes fluorescentes.
- Have the fume hood recertified by a qualified certification technician. See "Certifying the Protector Fume Hood" in *Chapter 3*.
- Recertifier la hotte aspirante par un technicien agréé en certification.Voir au Chapitre 3 « Certifier la Hotte Aspirante Protecteur ».
- All monthly activities.
- Toutes les activités mensuelles.

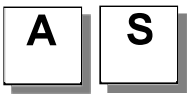
Biannually

- The sash assembly should be checked to ensure proper operation and to make sure there are no signs of abnormal wear on the sash pulleys, cables and clamps.

Routine Service Operations

Front Panel Removal:

1. Simply lift the front panel up and then away from the hood to provide access to the top.

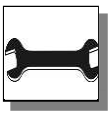


Changing the Fluorescent Lamp:

1. Turn light switch to "OFF".
2. Remove the front panel as noted earlier.
3. Reach over the front header of the hood and remove knock out plugs at both ends of fixture. Lift fixture up.
4. Remove the fluorescent lamp by pushing it out of the spring-loaded lamp socket and swinging it out of the other lamp socket.
5. Install the new lamp by reversing the removal procedure.

CHAPTER 7
MODIFYING THE PROTECTOR PVC

There are several ways to modify the fume hood for your individual requirements. These include the addition of work tops, service fixtures, air monitor, electrical duplex outlets, ceiling enclosures, and rear panels.



Installing Hardboard Support Surface

Your Protector PVC Fume Hood requires a hardboard support surface to properly support the integral work surface of the one-piece PVC liner. The hardboard support is shipped and included with the PVC Fume Hood. Be sure to secure the hardboard support per the instructions in Chapter 3.

Installing Ceiling Enclosures Above the Fume Hood

Your Protector Fume Hood has mounting holes to accept a ceiling enclosure to close off the area between the top of the hood and the ceiling. Contact Labconco Customer Service for ordering information.

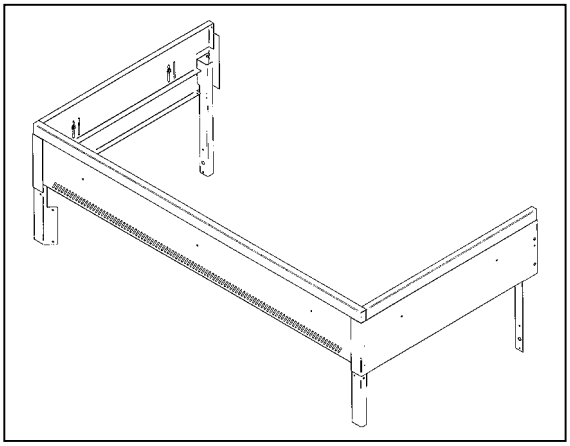


Figure 7-1

Installing Rear Panels Behind the Fume Hood

Your Protector Fume Hood can be modified to add a rear panel behind the fume hood when the fume hood is placed on an island (not available on Pass-Through Fume Hood). Contact Labconco Customer Service for ordering information.

Installing Guardian™ Digital Airflow Monitor or Guardian™ Airflow Monitor

The Guardian Airflow Monitors continuously monitor face velocity through the fume hood opening. The fume hood right corner post is factory prepared to mount either monitor. Contact Labconco Customer Service to order.

Sash Stop Kit – Field Installation (P/N 9410300)

The sash stop kit restricts how far a vertical-rising sash may be opened. This small plastic device may be easily field installed on the fixture corner post of any fume hood.

Installing an Electrical Duplex Outlet

Your Protector Fume Hood can be ordered with duplex outlets, however, if you ordered a model without an electrical duplex outlet you can have one installed in the field by a qualified electrician. Contact Labconco Customer Service for ordering information. (Not acceptable on explosion-proof hoods).

Votre Protège-capot de fumées peut être commandé avec prises doubles, cependant, si vous avez commandé un modèle sans prise de courant duplex, vous pouvez en faire installer sur le terrain par un électricien qualifié. Contactez le service clientèle Labconco pour commander. (Non acceptable sur antidéflagrants hottes).

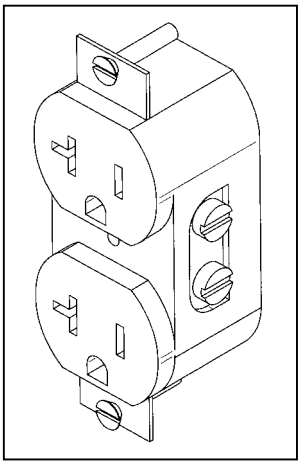


Figure 7-2

Installing the Acid Vent Kit from the Acid Cabinet

Order 3591101 Acid Vent Kit for PVC hoods to install from the Acid Cabinet below to the top of the PVC Hood. Remove the plugged 2" connection and route the tubing.

Installing Additional Washdown Valve

Order 9808310 Washdown Valve and follow the sizing guideline from Chapter 2.

CHAPTER 8
TROUBLESHOOTING

Refer to the following table if your fume hood fails to operate properly. If the suggested corrective actions do not solve your problem, contact Labconco for additional assistance.

PROBLEM	CAUSE	CORRECTIVE ACTION
Remote blower and lights won't operate	Wires not connected at junction boxes or switches.	Check connection of switches.
		Check connection to control box on top of unit.
	Circuit breakers tripped in building electrical supply.	Reset circuit breakers.
Remote blower won't operate, but lights work	Blower wiring is disconnected.	Inspect blower wiring and switch.
	Belt broken.	Replace belt.
	Blower motor is defective.	Replace blower motor.
Fume hood blower operates but lights will not operate	Lamp not installed correctly.	Inspect lamp installation.
	Lamp is defective.	Replace lamp.
	Lamp circuit breaker in building is tripped.	Reset the lamp circuit breaker.

PROBLEM	CAUSE	CORRECTIVE ACTION
Fume hood blower operates but lights will not operate	Lamp wiring is disconnected.	Inspect lamp wiring.
	Defective lamp ballasts.	Replace lamp ballasts.
Contaminants escape outside of fume hood	Improper user techniques for the fume hood.	See "Certifying the Hood" Chapter 3 and "Safety Precautions" Chapter 4 sections in the manual. (Ref. Appendix D).
	Restriction of the baffle air slots or – blockage of the exhaust outlet.	Remove baffles to ensure that all air slots and the exhaust outlet are unobstructed.
	External factors are disrupting the fume hood airflow patterns or acting as a source of contamination.	See "Location Requirements" Chapter 2, "Certifying the Hood" Chapter 3, and "Safety Precautions" Chapter 4 sections of this manual. (Ref. Appendix D)
	Fume hood has improper face velocity.	Have fume hood re-certified and check remote blower exhaust system. Hood should have average face velocity of 100 fpm.
Vertical sash no longer operates smoothly	Cable is frayed or plastic protection is damaged.	Inspect cable and replace cable if worn or damaged immediately; otherwise injury could result.
	Pulley bearing is damaged.	Replace pulley, bearing or add grease.
	Cable has slipped off the pulleys.	Re-install, cable must be replaced immediately if damaged.
	Weight has broken pulleys.	Replace weight pulleys.
Combination A-Style sash no longer operates smoothly	Horizontal-sliding glass panels have come off the tracks.	Re-install horizontal-sliding glass on tracks.

PROBLEM	CAUSE	CORRECTIVE ACTION
	Vertical-rising sash frame is distorted.	Place horizontal sliding glass symmetrically and pull sash down to air foil. Straighten damaged frame.
	Cable is frayed or has slipped off the pulleys.	Re-install, cable must be replaced immediately if damaged.
Electrical duplex outlets no longer have power	Wires not connected or faulty duplex.	Check wire connection or replace duplex.
	Circuit breakers tripped in building electrical supply.	Reset circuit breakers.
Service valves no longer operate	Faulty building supply.	Inspect building supply shut off valves and appropriate pressures below 40 PSI.
	Valve no longer operates.	Replace valve and check for leaks.
	Supply line or outlet line has leaks.	Inspect line for leaks and fix any leaking plumbing connections.
Spray Nozzles no longer work	Poor water supply	Inspect building water supply.
	Clogged nozzle	Replace spray nozzles.

APPENDIX A
PROTECTOR PVC COMPONENTS

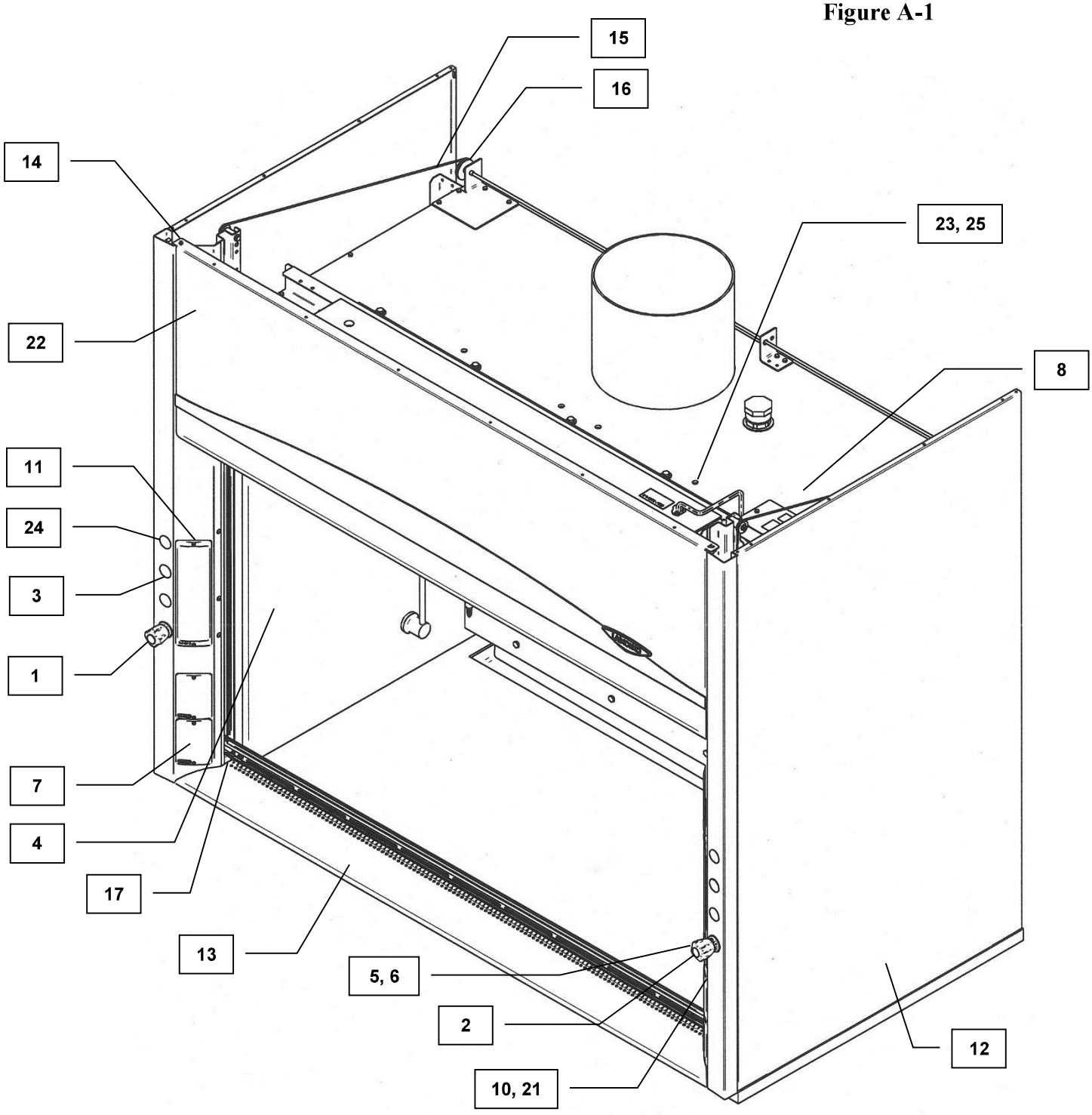
Illustration A-1 indicate the location of the following service parts:

Protector PVC Replacement Parts

Item	Quantity	Part No.	Description
1A	1	9823700	Valve, Labconco (Water) 1/4" Compression Fitting
1B	1	9823701	Valve, Labconco (Water) 3/8" Compression Fitting
1C	1	9817000	Valve, Labconco 1/4" Compression Fitting (AIR, GAS, VAC, NIT, etc.)
1D	1	9817001	Valve, Labconco 3/8" Compression Fitting (AIR, GAS, VAC, NIT, etc.)
1E	1	9823702	Valve, Labconco Deionized 1/4" Compression Fitting
1F	1	9823703	Valve, Labconco Deionized 3/8" Compression Fitting
1G	1	9818000	Nut, Valve Mounting. (Labconco)
2A	1	9826800	WaterSaver Valve/Gooseneck -GRN
2B	1	9826801	WaterSaver Valve/Connector (VAC) – YEL
2C	1	9826802	WaterSaver Valve/Connector (AIR) – ORG
2D	1	9826803	WaterSaver Valve/Connector (GAS) – BLU
2E	1	9826805	WaterSaver Valve/Connector (HOT WATER) – RED
2F	1	9826806	WaterSaver Valve/Connector (CW) – GRN
2G	1	9826807	WaterSaver Valve/Connector (STEAM) – BLK
2H	1	9826808	WaterSaver Valve/Connector (NITROGEN) – BRN
2I	1	9826809	WaterSaver Valve/Connector (OXYGEN) – LIGHT GREEN
2J	1	9826810	Swivel Gooseneck only – GRN
2K	1	9826812	Swivel Gooseneck only – WHITE
3	1	9818700 thru 08	Knobs (GRAY, GRN, BLU, ORG, YEL, RED, WHT, BLK, BRN)
4A	1	9818800	Hose Barb, GRAY – (NEUTRAL OR ARGON) – NOT SHOWN
4B	1	9818801	Hose Barb, GREEN - (COLD WATER) – NOT SHOWN
4C	1	9818802	Hose Barb, BLUE – (GAS) – NOT SHOWN
4D	1	9818803	Hose Barb, ORANGE – (AIR) – NOT SHOWN
4E	1	9818804	Hose Barb, YELLOW – (VACUUM) – NOT SHOWN
4F	1	9818805	Hose Barb, RED – (HOT WATER) – NOT SHOWN
4G	1	9818806	Hose Barb, WHITE – (DEIONIZED WATER) – NOT SHOWN
4H	1	9818807	Hose Barb, BLACK – (NEUTRAL OR STEAM) – NOT SHOWN
4I	1	9818808	Hose Barb, BROWN – (NITROGEN) – NOT SHOWN
4J	1	9819000	Nut, Hose Barb – NOT SHOWN
5	1	9825500	Label, Knob (contains all the labels)
6	1	9818900	Lens, Knob
7A	1	9947100, 01, 02	115V Duplex Receptacle (GRAY) Right, Left 4' - 6', Left 8' w/ wires
7B	1	9818200	Cover Plate 115V Duplex
7C	1	9947103, 04, 05	115V GFCI Duplex Receptacle (GRAY) Right 4' - 6', Left 8' w/ wires
7D	1	9818100	Cover Plate, 115V GFCI
7E	1	9818300	Cover Plate, Blank
8A	1	9721901	Lamp, Fluorescent (T8 x 3') – use on 4' & 8' Hoods – NOT SHOWN
8B	1	9721900	Lamp, Fluorescent (T8 x 4') – use on 5' & 6' Hoods – NOT SHOWN
8C	1	9945300	Fluorescent Light Fixture, 36" – use on 4' Hoods
8D	1	9945301	Fluorescent Light Fixture, 48" – use on 5', 6' Hoods
8E	1	9945302	Fluorescent Light Fixture, 36" Combo – use on 8' Hoods

Item	Quantity	Part No.	Description
10A	1	1302301	Switch, Rocker
10B	1	1327500	Switch, Plug (Fills cutout when switch is not used)
11	1	9818400	Access Cover
12A	1	9409800	Side Panel, 24" internal deep hoods
12B	4	1885308	Screw, Machine #10-24 x .50 Phillips
13A	1	9466400	Eco-Foil 4'
13B	1	9466401	Eco-Foil 5'
13C	1	9466402	Eco-Foil 6'
13D	1	9466403	Eco-Foil 8'
14	2	1850000	Pulley, Front, 2" Dia. Nylon
15A	2	4949902	Cable, Sash 130" – NOT SHOWN
15B	2	9414011	Cable Replacement Kit 30"
15C	1	9545800	Weight Support Bracket Kit
16	2	9709300	Plastic Pulley, (Rear 2")
17	2	9713300	Bumper, Rubber – NOT SHOWN (lower sash bumper)
18	4	1934100	Bronze Bearing, Flanged Rear – NOT SHOWN
19	4	1920100	Clamp, Cable Replacement – NOT SHOWN
20	2	9935800	Threaded Connector – NOT SHOWN (to attach weight to cable)
21	1	9946300 or 01	Wiring Harness, Main
22	1	9409601, 02, 03, 05	Front Panel, 4', 5', 6', 8'
23	1	1487100	Spray Nozzle PVC – NOT SHOWN
24	1	9817001	Washdown Control Valve
25	1	1549100	Plastic Tubing 3/8 OD x ¼ ID (125 psi W.P.) (Rigid Polyethylene – PE – NOT SHOWN)

Figure A-1



APPENDIX B
PROTECTOR PVC DIMENSIONS

PVC Model Widths

	4'	5'	6'	8'
A	48.00	60.00	72.00	96.00
B	38.25	50.25	62.25	86.25

Dimensions in inches. CAD layouts available upon request.

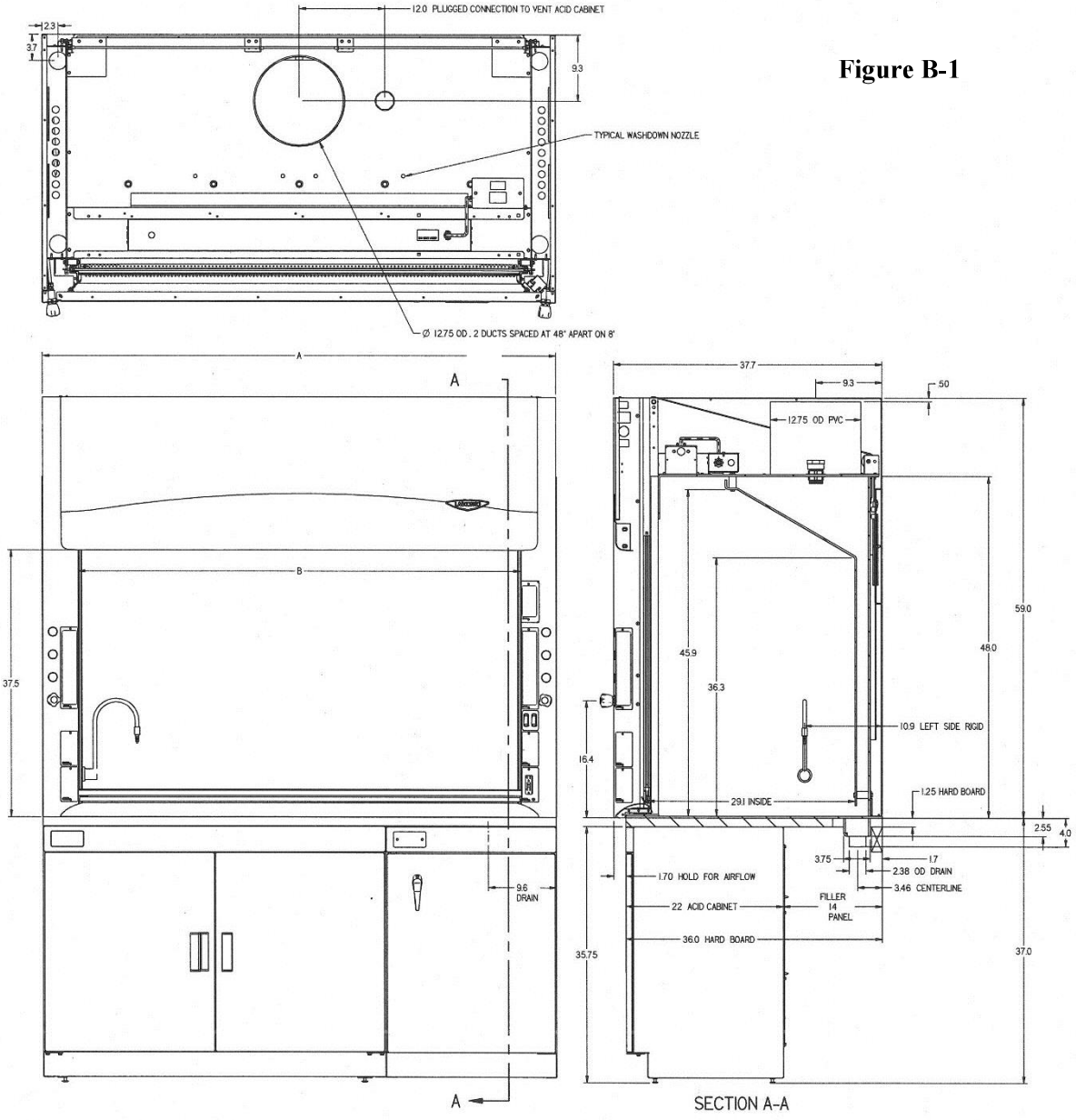


Figure B-1

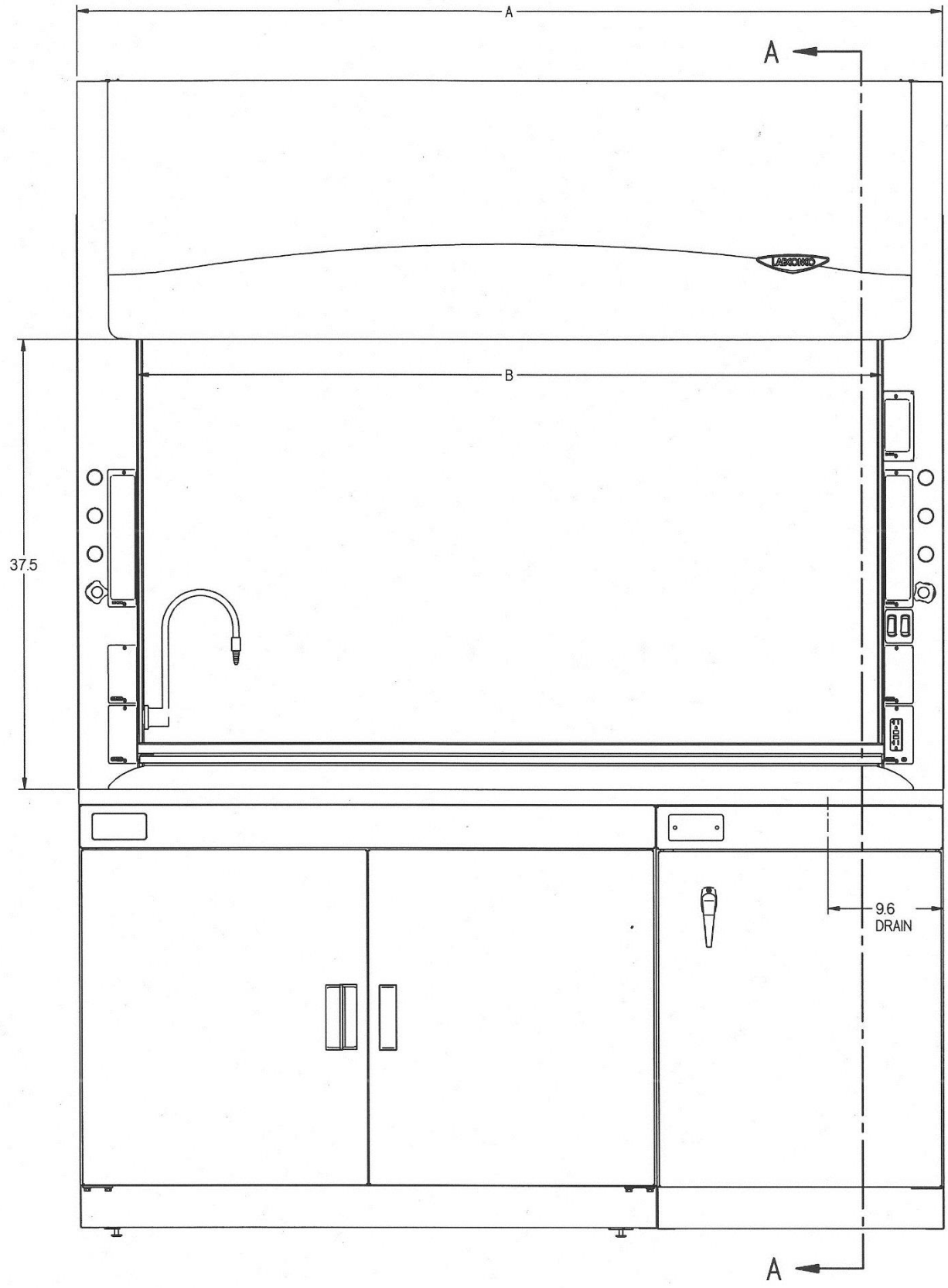


Figure B-2

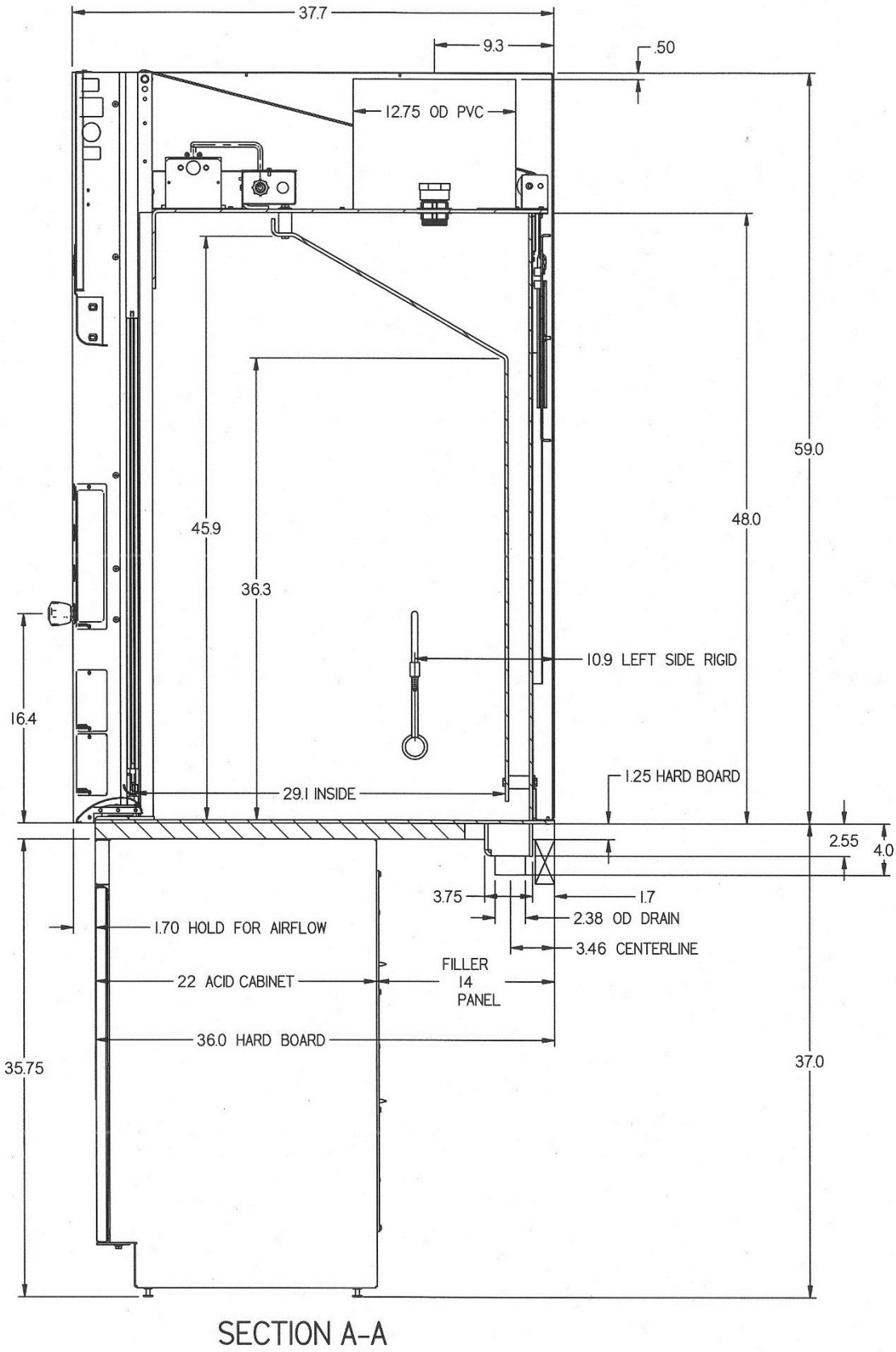

37.7
9.3
.50
12.75 OD PVC
59.0
48.0
45.9
36.3
16.4
10.9 LEFT SIDE RIGID
1.25 HARD BOARD
29.1 INSIDE
2.55
4.0
3.75
1.7
2.38 OD DRAIN
3.46 CENTERLINE
1.70 HOLD FOR AIRFLOW
22 ACID CABINET
FILLER
14
PANEL
36.0 HARD BOARD
35.75
37.0
SECTION A-A

Figure B-3

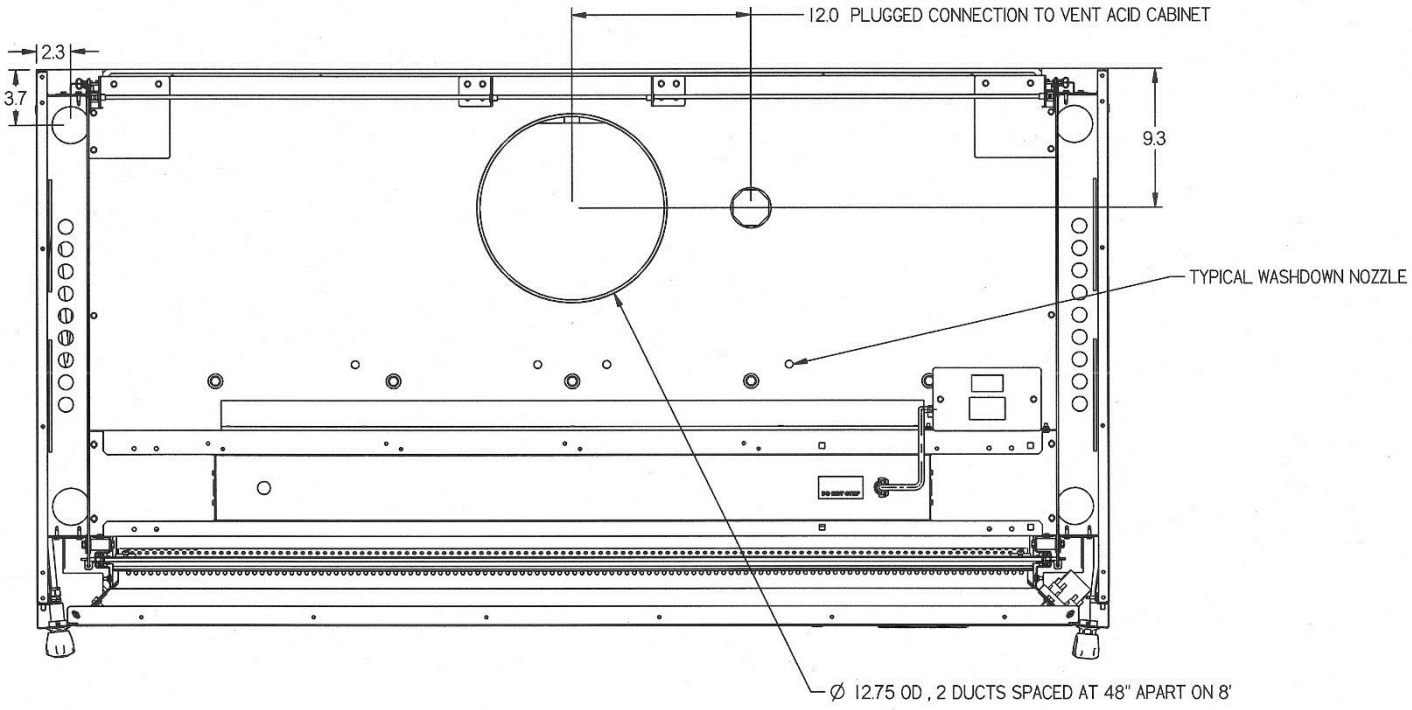

12.0 PLUGGED CONNECTION TO VENT ACID CABINET
2.3
3.7
9.3
TYPICAL WASHDOWN NOZZLE
Ø 12.75 OD , 2 DUCTS SPACED AT 48" APART ON 8'

Figure B-4

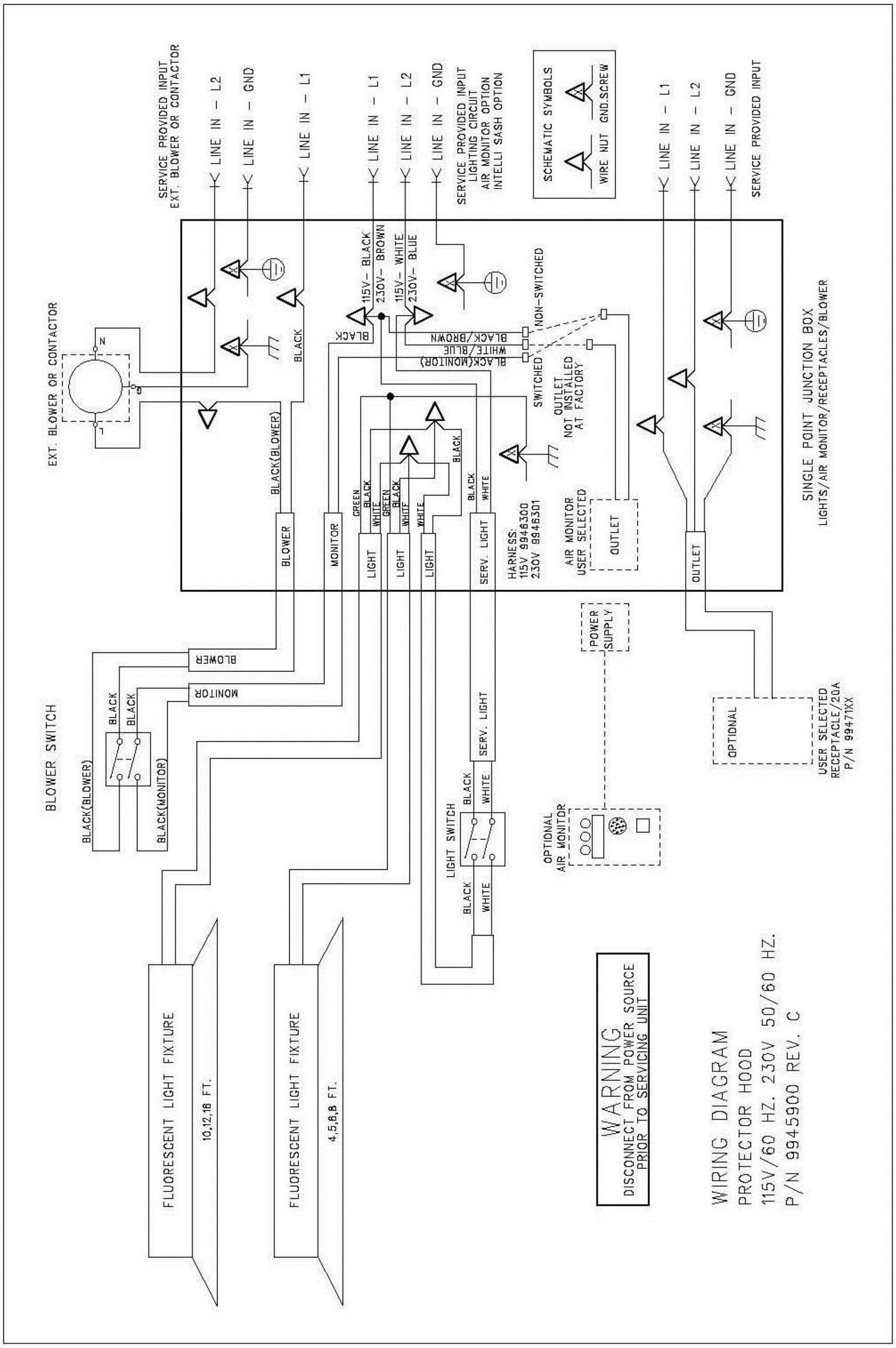
APPENDIX C
PROTECTOR PVC
SPECIFICATIONS

Environmental Conditions

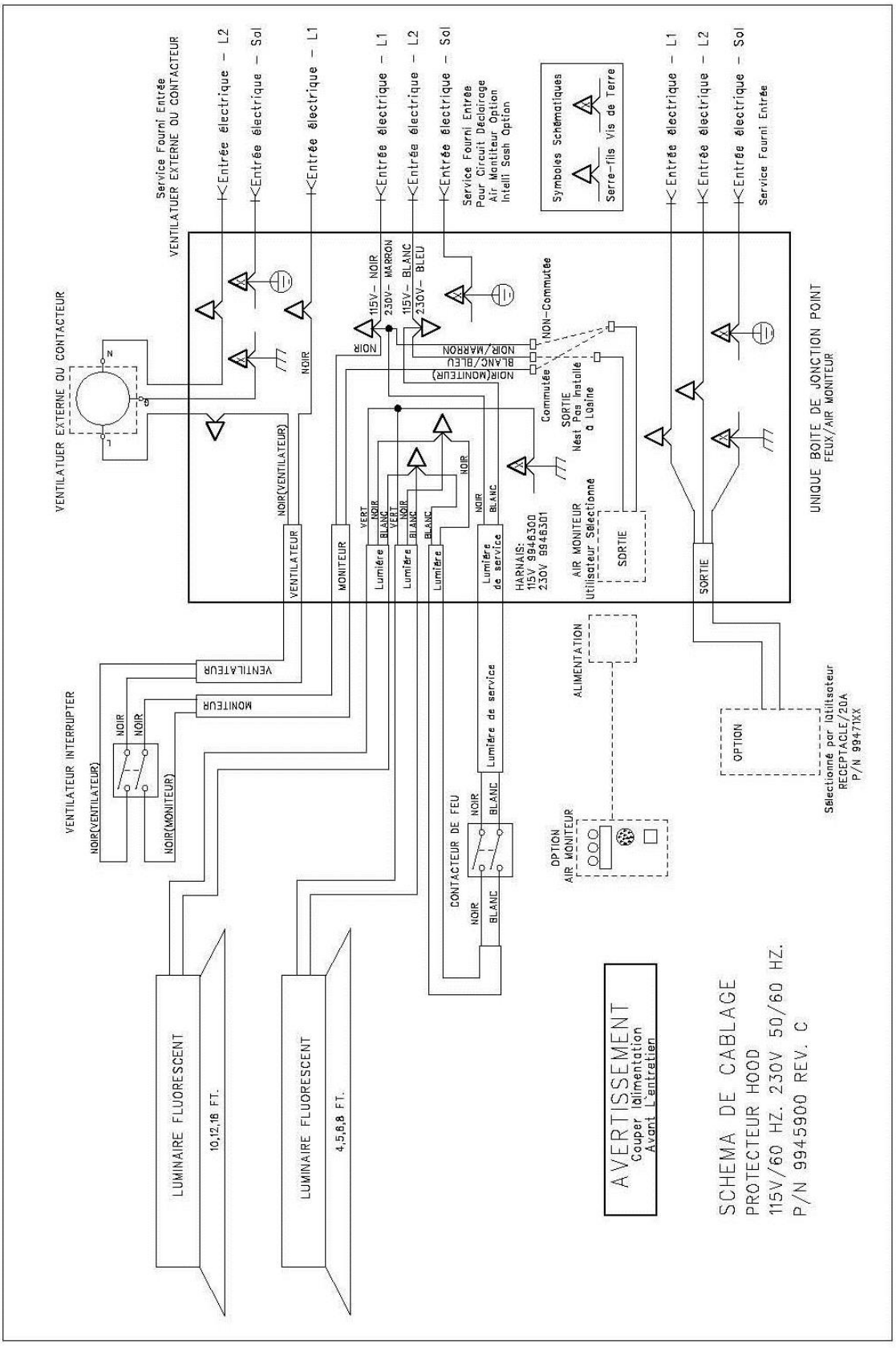
- Indoor use only.
- Maximum altitude: 10,000 feet (3,048 meters).
- Ambient temperature range: 41° to 104°F (5° to 40°C).
- Maximum relative humidity: 80% for temperatures up to 88°F (31°C), decreasing linearly to 50% relative humidity at 104°F (40°C).
- Main supply voltage fluctuations not to exceed ±10% of the nominal voltage.
- Transient over-voltages according to Installation Categories II (Over-voltage Categories per IEC 1010). Temporary voltage spikes on the AC input line that may be as high as 1500V for 115V models and 2500V for 230V models are allowed.
- Used in an environment of Pollution degrees 2 (i.e., where normally only non-conductive atmospheres are present). Occasionally, however, a temporary conductivity caused by condensation must be expected, in accordance with IEC 664.
- Electrical Ratings

Volts AC	Phase	Cycle	AMP*
115	1	50/60	10
115	1	50	10
115	1	60	10
230	1	50/60	5
230	1	50	5
230	1	60	5

*Does not include current rating of receptacles.


SERVICE PROVIDED INPUT
EXT. BLOWER OR CONTACTOR
LINE IN - L2
LINE IN - GND
LINE IN - L1
LINE IN - L1
LINE IN - L2
LINE IN - GND
SERVICE PROVIDED INPUT
LIGHTING CIRCUIT
AIR MONITOR OPTION
INTELLI SASH OPTION
SCHEMATIC SYMBOLS
WIRE NUT
GND.SCREW
LINE IN - L1
LINE IN - L2
LINE IN - GND
SERVICE PROVIDED INPUT
EXT. BLOWER OR CONTACTOR
115V- BLACK
230V- BROWN
115V- WHITE
230V- BLUE
NON-SWITCHED
BLACK
BLACK/BROWN
WHITE/BLUE
BLACK(MONITOR)
SWITCHED
OUTLET
NOT INSTALLED
AT FACTORY
BLACK(BLOWER)
BLOWER
MONITOR
LIGHT
LIGHT
LIGHT
SERV. LIGHT
GREEN
BLACK
WHITE
HARNESS:
115V 9946300
230V 9946301
AIR MONITOR
USER SELECTED
OUTLET
SINGLE POINT JUNCTION BOX
LIGHTS/AIR MONITOR/RECEPTACLES/BLOWER
BLOWER SWITCH
BLACK(BLOWER)
BLACK(MONITOR)
POWER
SUPPLY
OPTIONAL
USER SELECTED
RECEPTACLE/20A
P/N 99471XX
LIGHT SWITCH
OPTIONAL
AIR MONITOR
FLUORESCENT LIGHT FIXTURE
10,12,16 FT.
FLUORESCENT LIGHT FIXTURE
4,5,6,8 FT.
WARNING
DISCONNECT FROM POWER SOURCE
PRIOR TO SERVICING UNIT
WIRING DIAGRAM
PROTECTOR HOOD
115V/60 HZ. 230V 50/60 HZ.
P/N 9945900 REV. C

Appendix C: Protector PVC Specifications



APPENDIX D
SERIAL NUMBER TAG DESCRIPTION

Serial tag includes standard information with the following changes:

The portion of the tag for electrical information is labeled with the following units: Volts AC, Phase, Cycle, AMP.

Each hood will include one of the following:

Volts AC	Phase	Cycle	AMP ⚠ x
115	1	50/60	10X
115	1	50	10X
115	1	60	10X
230	1	50/60	5X
230	1	50	5X
230	1	60	5X

Where ⚠ may be a separate label indicating: Caution, See Manual.

The X above will be one of several possible alpha characters as defined in the manual as follows:

X: No additional duplexes on hood, noted amperage applies.

B: This fume hood includes **one** additional electrical receptacle, individually wired to the field wired box and individually rated as 115V, single phase, 60Hz, 20 Amps. Each duplex can be wired on a dedicated circuit rated at 20A or the duplexes may be ganged together on the same circuit with the total load of the ganged duplexes not exceeding the 20A electrical service they are wired to.

C: This fume hood includes **two** additional electrical receptacles, individually wired to the field wired box and individually rated as 115V, single phase, 60Hz, 20 Amps. Each duplex can be wired on a dedicated circuit rated at 20A or the duplexes may be ganged together on the same circuit with the total load of the ganged duplexes not exceeding the 20A electrical service they are wired to.

D: This fume hood includes **three** additional electrical receptacles, individually wired to the field wired box and individually rated as 115V, single phase, 60Hz, 20 Amps. Each duplex can be wired on a dedicated circuit rated at 20A or the duplexes may be ganged together on the same circuit with the total load of the ganged duplexes not exceeding the 20A electrical service they are wired to.

E: This fume hood includes **four** additional electrical receptacles, individually wired to the field wired box and individually rated as 115V, single phase, 60Hz, 20 Amps. Each duplex can be wired on a dedicated circuit rated at 20A or the duplexes may be ganged together on the same circuit with the total load of the ganged duplexes not exceeding the 20A electrical service they are wired to.

F: This fume hood includes **one** additional electrical receptacle, individually wired to the field wired box and individually rated as 230V, single phase, **60Hz**, 10 Amps. Each duplex can be wired on a dedicated circuit rated at 10A or the duplexes may be ganged together on the same circuit with the total load of the ganged duplexes not exceeding the 10A electrical service they are wired to.

G: This fume hood includes **two** additional electrical receptacles, individually wired to the field wired box and individually rated as 230V, single phase, **60Hz**, 10 Amps. Each duplex can be wired on a dedicated circuit rated at 10A or the duplexes may be ganged together on the same circuit with the total load of the ganged duplexes not exceeding the 10A electrical service they are wired to.

H: This fume hood includes **three** additional electrical receptacles, individually wired to the field wired box and individually rated as 230V, single phase, **60Hz**, 10 Amps. Each duplex can be wired on a dedicated circuit rated at 10A or the duplexes may be ganged together on the same circuit with the total load of the ganged duplexes not exceeding the 10A electrical service they are wired to.

J: This fume hood includes **four** additional electrical receptacles, individually wired to the field wired box and individually rated as 230V, single phase, **60Hz**, 10 Amps. Each duplex can be wired on a dedicated circuit rated at 10A or the duplexes may be ganged together on the same circuit with the total load of the ganged duplexes not exceeding the 10A electrical service they are wired to.

K: This fume hood includes **one** additional electrical receptacle, individually wired to the field wired box and individually rated as 230V, single phase, **50Hz**, 10 Amps. Each duplex can be wired on a dedicated circuit rated at 10A or the duplexes may be ganged together on the same circuit with the total load of the ganged duplexes not exceeding the 10A electrical service they are wired to.

L: This fume hood includes **two** additional electrical receptacles, individually wired to the field wired box and individually rated as 230V, single phase, **50Hz**, 10 Amps. Each duplex can be wired on a dedicated circuit rated at 10A or the duplexes may be ganged together on the same circuit with the total load of the ganged duplexes not exceeding the 10A electrical service they are wired to.

M: This fume hood includes **three** additional electrical receptacles, individually wired to the field wired box and individually rated as 230V, single phase, **50Hz**, 10 Amps. Each duplex can be wired on a dedicated circuit rated at 10A or the duplexes may be ganged together on the same circuit with the total load of the ganged duplexes not exceeding the 10A electrical service they are wired to.

N: This fume hood includes **four** additional electrical receptacles, individually wired to the field wired box and individually rated as 230V, single phase, **50Hz**, 10 Amps. Each duplex can be wired on a dedicated circuit rated at 10A or the duplexes may be ganged together on the same circuit with the total load of the ganged duplexes not exceeding the 10A electrical service they are wired to.

ANNEXE D
DESCRIPTION DE SÉRIE TAG NUMBER

Étiquette de série comprend des informations standard avec les modifications suivantes:

La partie de l'étiquette d'information électrique est étiqueté avec les unités suivantes: Volts AC, phase, cycle, AMP.

Chaque hotte comprendra une des opérations suivantes:

Volts AC	Phase	Cycle	AMP ⚠
115	1	50/60	10X
115	1	50	10X
115	1	60	10X
230	1	50/60	5X
230	1	50	5X
230	1	60	5X

Où ⚠ peut-être une étiquette distincte indiquant: Attention, consultez le manuel.

Le X ci-dessus sera l'un des plusieurs caractères alphabétiques possibles telles que définies dans le manuel comme suit:

X: Pas de duplex supplémentaires sur le capot, noté ampérage s'applique.

B: Cette hotte comprend un réceptacle électrique supplémentaire, individuellement raccordés aux boîtiers câblées individuellement et classé comme 115V, monophasé, 60 Hz, 20 ampères. Chaque duplex peut être branché sur un circuit dédié évalué à 20A ou les duplex peuvent être groupés ensemble sur le même circuit que la charge totale des duplex couplées ne dépassant pas le service électrique 20A ils sont câblés.

C: Cette hotte comprend deux autres prises électriques, individuellement câblés à la boîte câblées individuellement et classé comme 115V, monophasé, 60 Hz, 20 A. Chaque duplex peut être branché sur un circuit dédié évalué à 20A ou les duplex peuvent être groupés ensemble sur le même circuit que la charge totale des duplex couplées ne dépassant pas le service électrique 20A ils sont câblés.

D: Cette hotte comporte trois prises électriques supplémentaires, individuellement câblés à la boîte câblées individuellement et classé comme 115V, monophasé, 60 Hz, 20 A. Chaque duplex peut être branché sur un circuit dédié évalué à 20A ou les duplex peuvent être groupés ensemble sur le même circuit que la charge totale des duplex couplées ne dépassant pas le service électrique 20A ils sont câblés.

E: Cette hotte comprend quatre autres prises électriques, individuellement câblés à la boîte câblées individuellement et classé comme 115V, monophasé, 60 Hz, 20 A. Chaque duplex peut être branché sur un circuit dédié évalué à 20A ou les duplex peuvent être groupés ensemble sur le même circuit que la charge totale des duplex couplées ne dépassant pas le service électrique 20A ils sont câblés.

F: Cette hotte comprend un réceptacle électrique supplémentaire, individuellement raccordés aux boîtiers câblées individuellement et classé comme 230V, monophasé, 60 Hz, 10 ampères. Chaque duplex peut être branché sur un circuit dédié classé au 10A ou les duplex peuvent être groupés ensemble sur le même circuit que la charge totale des duplex couplées ne dépassant pas le service électrique 10A ils sont câblés.

G: Cette hotte comprend deux autres prises électriques, individuellement câblés à la boîte câblées individuellement et classé comme 230V, monophasé, 60 Hz, 10 ampères. Chaque duplex peut être branché sur un circuit dédié classé au 10A ou les duplex peuvent être groupés ensemble sur le même circuit que la charge totale des duplex couplées ne dépassant pas le service électrique 10A ils sont câblés.

H: Cette hotte comporte trois prises électriques supplémentaires, individuellement câblés à la boîte câblées individuellement et classé comme 230V, monophasé, 60 Hz, 10 ampères. Chaque duplex peut être branché sur un circuit dédié classé au 10A ou les duplex peuvent être groupés ensemble sur le même circuit que la charge totale des duplex couplées ne dépassant pas le service électrique 10A ils sont câblés.

J: Cette hotte comprend quatre autres prises électriques, individuellement câblés à la boîte câblées individuellement et classé comme 230V, monophasé, 60 Hz, 10 ampères. Chaque duplex peut être branché sur un circuit dédié classé au 10A ou les duplex peuvent être groupés ensemble sur le même circuit que la charge totale des duplex couplées ne dépassant pas le service électrique 10A ils sont câblés.

K: Cette hotte comprend un réceptacle électrique supplémentaire, individuellement raccordés aux boîtiers câblées individuellement et classé comme 230V, monophasé, 50 Hz, 10 ampères. Chaque duplex peut être branché sur un circuit dédié classé au 10A ou les duplex peuvent être groupés ensemble sur le même circuit que la charge totale des duplex couplées ne dépassant pas le service électrique 10A ils sont câblés.

L: Cette hotte comprend deux autres prises électriques, individuellement câblés à la boîte câblées individuellement et classé comme 230V, monophasé, 50Hz, 10 ampères. Chaque duplex peut être branché sur un circuit dédié classé au 10A ou les duplex peuvent être groupés ensemble sur le même circuit que la charge totale des duplex couplées ne dépassant pas le service électrique 10A ils sont câblés.

M: Cette hotte comporte trois prises électriques supplémentaires, individuellement câblés à la boîte câblées individuellement et classé

comme 230V, monophasé, 50Hz, 10 ampères. Chaque duplex peut être branché sur un circuit dédié classé au 10A ou les duplex peuvent être groupés ensemble sur le même circuit que la charge totale des duplex couplées ne dépassant pas le service électrique 10A ils sont câblés.

N: Cette hotte comprend quatre autres prises électriques, individuellement câblés à la boîte câblées individuellement et classé comme 230V, monophasé, 50Hz, 10 ampères. Chaque duplex peut être branché sur un circuit dédié classé au 10A ou les duplex peuvent être groupés ensemble sur le même circuit que la charge totale des duplex couplées ne dépassant pas le service électrique 10A ils sont câblés.

APPENDIX E
REFERENCES

Many excellent reference texts and booklets are currently available. The following is a brief listing:

Laboratory Ventilation Standards

Federal Register 29 CFR Part 1910
Non-mandatory recommendations from "Prudent Practices".
- Fume hoods should have a continuous monitoring device
- Face velocities should be between 60-100 linear feet per minute (lfpm)
- Average 2.5 linear feet of hood space per person

Occupational Health and Safety
U.S. Department of Labor
200 Constitution Avenue N.W.
Washington, DC 20210
(202) 523-1452

Industrial Ventilation-ACGIH
- Fume hood face velocities between 60-100 lfpm
- Maximum of 125 lfpm for radioisotope hoods
- Duct velocities of 1000-2000 fpm for vapors, gasses and smoke
- Stack discharge height 1.3-2.0 x building height
- Well designed fume hood containment loss, <0.10 ppm

Industrial Ventilation, A Manual of Recommended Practice.
24th Edition, 2001
American Conference of Governmental Industrial Hygienists
1330 Kemper Meadow drive
Cincinnati, OH 45240-1634
(513) 742-2020

ASHRAE 110-1995 Method of Testing Performance of Fume Hoods
Evaluates fume hood's containment characteristics
- Three part test: Smoke generation, Face velocity profile, Tracer gas release @ 4 liters per minute
- Rated As Manufactured (AM), As Installed (AI) and As Used (AU)

American Society of Heating, Refrigerating, and Air Conditioning Engineers
1791 Tullie Circle N.E.
Atlanta, GA 30329
(404) 636-8400

ANSI Z9.5-2011 Laboratory Standard
Covers entire laboratory ventilation system.
- New and remodeled hoods shall have a monitoring device
- Ductless hoods should only be used with non-hazardous materials

American Industrial Hygiene Association
2700 Prosperity Avenue, Suite 250
Fairfax, VA 22031
(703) 849-8888

SEFA 1-2002
- Fume hood face velocities based on toxicity levels of chemicals
  Class A – 125 to 150 fpm
  Class B – 80 to100 fpm
  Class C – 75-to 80 fpm
- Test method – face velocity profile and smoke generation

Scientific Equipment & Furniture Association
1028 Duchess Drive
McLean, VA 22102
(703) 538-6007

NFPA 45 – 2002 Fire Protection for Laboratories Using Chemicals
- Laboratory hoods should not be relied on for explosion protection
- Exhaust air from fume hoods should not be recirculated
- Services should be external to the hood
- Canopy hoods only for non-hazardous applications
- Materials of construction should have flame spread of 25 or less
- 80 to 120 fpm to prevent escape

NFPA 30 – 2000 Flammable and Combustible Liquids Code
- Approved cabinets may be metal or wood
- Vent location on cabinets are required
- Venting of cabinets not a requirement

National Fire Protection Association
1 Batterymarch Park
P.O. Box 9101
Quincy, MA 02269-9101
(800) 344-3555

General References

American Conference of Governmental Industrial Hygienists. *Industrial Ventilation, A Manual of Recommended Practice,* Cincinnati, OH

ASHRAE Standard Committee. *ASHRAE Standard* Atlanta: ASHRAE Publications Sales Department, 1995

British Standards Institution*, Laboratory Fume Cupboards*. Parts 1, 2 and 3, London: 1990

Department of Labor, Occupational Safety and Health Administration, *29 CFR Part 1910, Occupational Exposures to Hazardous Chemicals in Laboratories, Final Rule*. Vol. 55, No. 21. Washington D.C.:1990

DiBerardinis. L. et al. *Guides for Laboratory Design, Health and Safety Considerations*. Wiley & Sons, 1987

McDermott, Henry, *Handbook of Ventilation for Contaminant Control*, *2nd Edition*. Butterworth Publishers, 1985.

Miller, Brinton M. et al. *Laboratory Safety: Principles and Practices.* American Society for Microbiology, Washington, D.C.: 1986

NIH Guidelines for the Laboratory Use of Chemical Carcinogens. NIH Publication No. 81-2385.

Rayburn, Stephen R. *The Foundation of Laboratory Safety, A Guide for the Biomedical Laboratory*. Springer-Verlag, New York: 1990

Sax, N. Irving and Lewis, JR., Richard J. *Rapid Guide to Hazardous Chemicals in the Workplace*. Van Nostrand Reinhold, 1987.

Schilt, Alfred A. *Perchloric Acid and Perchlorates*. The G. Frederick Smith Chemical Company, Columbus, OH: 1979.

Steere, Norman. *CRC Handbook of Laboratory Safety, 2nd Edition*. CRC Press, 1971.

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CE Declaration of Conformity

We: Labconco Corporation
8811 Prospect Avenue
Kansas City, MO 64132 USA
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labconco@labconco.com

being the representative party in the EU solely responsible for this certification, hereby declare that the following product:

Equipment: Laboratory Equipment – Protector® PVC® Laboratory Fume Hoods

Type, Model:

14041 Series	4' Protector PVC Perchloric Acid Hood
14051 Series	5' Protector PVC Perchloric Acid Hood
14061 Series	6' Protector PVC Perchloric Acid Hood
14081 Series	8' Protector PVC Perchloric Acid Hood
14141 Series	4' Protector PVC Acid Digestion Hood
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is in conformity with the standards listed below:

EN61010-1
EN61326-1
EN55022
EN61000-3-2
EN61000-3-3

following the provisions of the following directives:

2006/42/EC
2004/108/EC
2006/95/EC

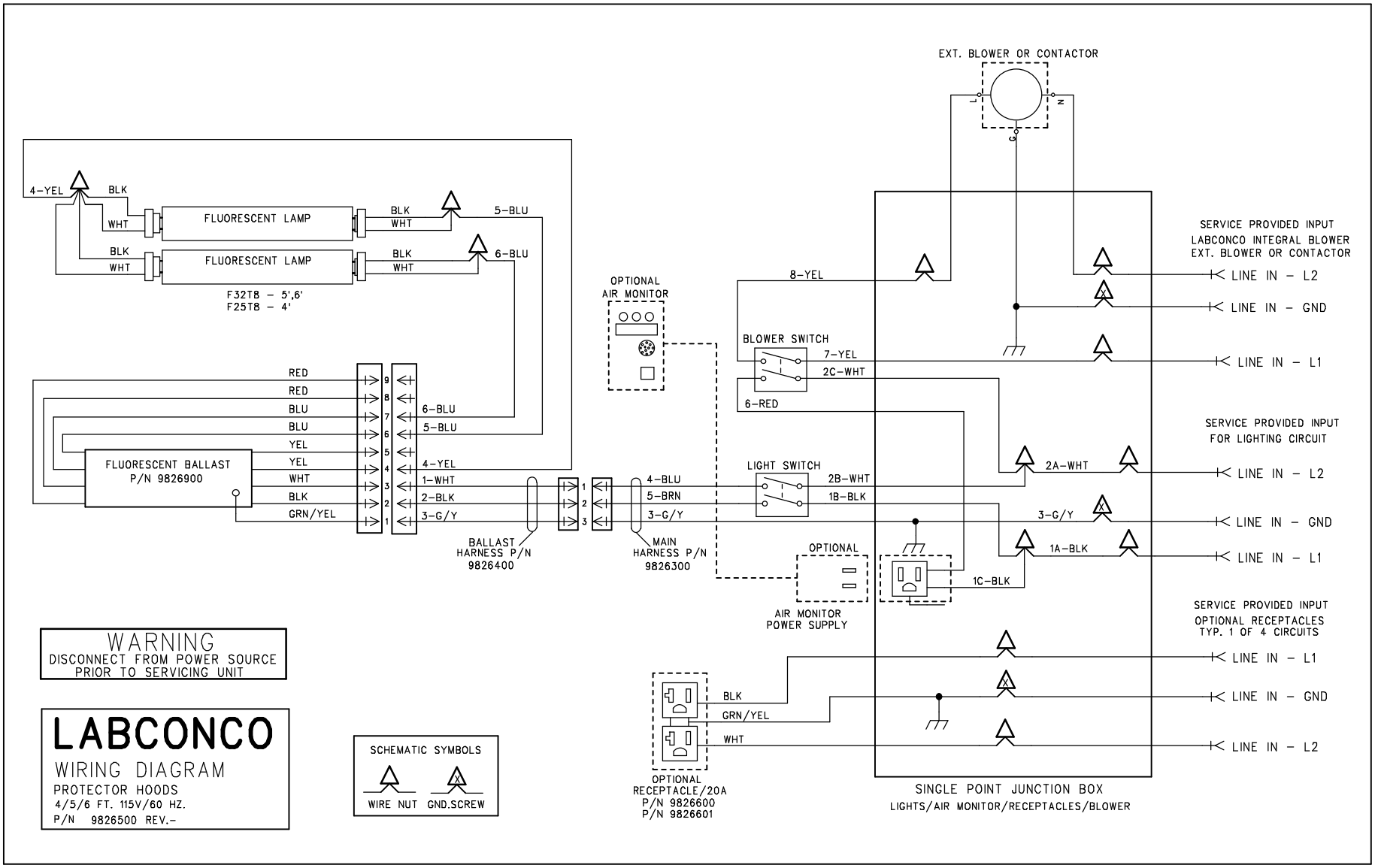
when installed and operated in accordance with the manufacturers installation and operating instructions.

Kansas City USA 03 October 2013

Mark Schmitz
Vice President, Research and Engineering
Labconco Corporation

Place and date of issue

Labconco P/N 3696093, Rev. -, ECO #H655


EXT. BLOWER OR CONTACTOR
L
N
G
4-YEL
BLK
WHT
FLUORESCENT LAMP
BLK
WHT
5-BLU
6-BLU
F32T8 – 5',6'
F25T8 – 4'
OPTIONAL
AIR MONITOR
8-YEL
BLOWER SWITCH
7-YEL
2C-WHT
6-RED
SERVICE PROVIDED INPUT
LABCONCO INTEGRAL BLOWER
EXT. BLOWER OR CONTACTOR
LINE IN – L2
LINE IN – GND
LINE IN – L1
RED
RED
BLU
BLU
YEL
YEL
WHT
BLK
GRN/YEL
FLUORESCENT BALLAST
P/N 9826900
4-YEL
1-WHT
2-BLK
3-G/Y
BALLAST
HARNESS P/N
9826400
4-BLU
5-BRN
3-G/Y
MAIN
HARNESS P/N
9826300
LIGHT SWITCH
2B-WHT
1B-BLK
SERVICE PROVIDED INPUT
FOR LIGHTING CIRCUIT
2A-WHT
LINE IN – L2
3-G/Y
LINE IN – GND
1A-BLK
LINE IN – L1
1C-BLK
OPTIONAL
AIR MONITOR
POWER SUPPLY
SERVICE PROVIDED INPUT
OPTIONAL RECEPTACLES
TYP. 1 OF 4 CIRCUITS
LINE IN – L1
LINE IN – GND
LINE IN – L2
BLK
GRN/YEL
WHT
OPTIONAL
RECEPTACLE/20A
P/N 9826600
P/N 9826601
SINGLE POINT JUNCTION BOX
LIGHTS/AIR MONITOR/RECEPTACLES/BLOWER
WARNING
DISCONNECT FROM POWER SOURCE
PRIOR TO SERVICING UNIT
LABCONCO
WIRING DIAGRAM
PROTECTOR HOODS
4/5/6 FT. 115V/60 HZ.
P/N 9826500 REV.–
SCHEMATIC SYMBOLS
WIRE NUT
GND.SCREW