PART 30: LABORATORIES

GENERAL REQUIREMENTS

Definitions **30.7.1** **In sections 30.8 to 30.11:**

"laboratory fume hood" **means an enclosed and mechanically ventilated workspace located in a laboratory, that is designed to**

(a) draw air into the workspace and to prevent or minimize the escape of airborne contaminants out of the workspace, and

(b) allow a worker to conduct physical, chemical and biological manipulations inside the workspace;

"operational face opening" **means an opening in a laboratory fume hood through which a worker may conduct work inside the hood;**

"sash" **means a vertical or horizontal panel on a laboratory fume hood that defines the operational face opening and provides a protective barrier between the worker conducting work inside the hood and the contents of the hood.**

Laboratory fume hoods **30.8** (1) ~~Controls for the operation of a fume hood and its services must be located outside the fume hood and must be immediately accessible to the laboratory worker, except that water taps may be located inside the cabinet if the main shutoff valve is in a safe location outside the cabinet.~~

A laboratory fume hood and its related ductwork must be designed, installed and maintained in accordance with the *Industrial Ventilation, A Manual of Recommended Practice*, published by the American Conference of Governmental Industrial Hygienists, as amended from time to time.

(2) ~~A fume hood must be connected to a local exhaust ventilation system which will provide minimum air velocities over the operational face area of the hood of~~

~~(a) an average of 0.5 m/s (100 fpm) but not less than 0.4 m/s (80 fpm) at any point across the face, and~~

~~(b) an average of 0.75 m/s (150 fpm) but not less than 0.65 m/s (125 fpm) at any point across the face if the fume hood is used for carcinogenic substances referred to under section 5.57(1), or for radioactive materials~~

A laboratory fume hood must

(a) be connected to a local exhaust ventilation system,

(b) provide average face velocities of 0.4 m/s (80 fpm) to 0.6 m/s (120 fpm) across the operational face opening,

(c) not have face velocities of less than 80% of the average face velocity required in paragraph (b) at any point across its operational face opening, and

(d) not have face velocities of more than 120% of the average face velocity required in paragraph (b) at any point across its operational face opening.

(2.1) A laboratory fume hood must have a sash that is positioned to protect the upper body and face of a worker working in the laboratory fume hood from accidental releases of the contents of the hood while allowing hand and arm access to equipment inside the hood.

(2.2) A laboratory fume hood with a movable sash must be clearly marked to identify the maximum size of the operational face opening that will maintain the average face velocities required in subsection (2) (b).

(2.3) The employer must ensure

(a) that before it is used, a commercially manufactured laboratory fume hood has been certified as being tested by the manufacturer, and

(b) following installation and before it is used, a custom built laboratory fume hood is tested on site by a qualified person.

(2.4) A laboratory fume hood tested under subsection (2.3) must demonstrate containment not greater than the control level of 0.05 ppm when tested under "as manufactured" test conditions in accordance with the methods described in *ANSI/ASHRAE Standard 110-1995, Method of Testing Performance of Laboratory Fume Hoods*.

(2.5) The installation of a laboratory fume hood must be certified by a professional engineer.

(3) A **laboratory** fume hood must be located to prevent cross drafts or other disruptive forces from lowering the air flow across the ~~operational face to unacceptable levels~~ **operational face opening to unacceptable levels**.

(4) A **laboratory** fume hood and its ductwork must be constructed from materials compatible with its use.

(5) ~~A fume hood must be clearly labelled with any restrictions on use that apply to it.~~

A laboratory fume hood that will be or is being used for working with

(a) radioactive material in amounts that exceed the exemption quantity specified by the Canadian Nuclear Safety Commission, or
(b) perchloric acid

must be clearly labelled with applicable restrictions on its use.

(6) A **laboratory** fume hood must not be used for storage of chemicals unless it is used exclusively for this purpose and is labelled with this limitation.

(7) Controls for the operation of a laboratory fume hood and its service fixtures must be

(a) located on the outside of the laboratory fume hood, and

(b) immediately accessible to the worker conducting work in the laboratory fume hood.

(8) Despite subsection (7), water taps may be located inside a laboratory fume hood if the main shutoff valve for the water is located outside the laboratory fume hood.

(9) Equipment being used in a laboratory fume hood must

(a) be kept at least 15 cm (6 in.) from the operational face opening of the laboratory fume hood, and

(b) not adversely affect airflow into the laboratory fume hood.

(10) Written procedures must be developed and implemented to ensure safe use and operation of a laboratory fume hood.

Airflow and containment monitoring **30.9** ~~(1) Air velocities over the operational face area of a fume hood must be measured and recorded at least annually and after any repair or maintenance which could affect the air flows.~~

~~(2) Airflow in a fume hood used for very toxic or radioactive materials must be monitored continuously if there is risk to workers in the event of loss of airflow.~~

~~(3) A fume hood with an adjustable sash must be marked to identify the maximum height the sash may be set at and still maintain the required air flows.~~

(1) Face velocities over the operational face opening of a laboratory fume hood must be quantitatively measured and recorded.

(2) The ability of a laboratory fume hood to

(a) maintain an inward flow of air across the operational face opening, and

(b) contain contaminants

must be assessed and recorded using a smoke tube or other suitable qualitative method.

(3) The actions described in subsections (1) and (2) must be performed

(a) after the laboratory fume hood is installed and before it is used,

(b) at least once in each 12 month period after installation, and

(c) after any repair or maintenance that could affect the air flow of the hood.

(4) If a laboratory fume hood is found to be operating with an average face velocity of less than 90% of the average face velocity required in section 30.8 (2), the employer must immediately take corrective action to bring the average face velocity within the required range of velocities.

(5) Airflow in a laboratory fume hood must be monitored continuously if loss of airflow will result in risk to a worker.

(6) A laboratory fume hood that is being installed must have an alarm capable of indicating when the average face velocity falls below the minimum average face velocity level required in section 30.8 (2) when the hood is in use.

Ducting **30.10** (1) ~~A fume hood must not be connected to a common exhaust duct if~~

~~(a) there is a danger of explosive reaction occurring in the duct,~~

~~(b) carcinogenic substances or radioactive materials are used in the hood, or~~

~~(c) there is a danger of backdrafts which could result in contaminants from one fume hood being discharged into the laboratory from another fume hood.~~

Laboratory fume hoods located in the same room or separate rooms may be connected to a common exhaust duct or manifold system if the following conditions are satisfied:

(a) the requirements of section 5.3.2 of *ANSI/AIHA Standard Z9.5-2003, Laboratory Ventilation* are met;

(b) controls to prevent backdrafts and pressure imbalances between rooms are installed;

(c) the ventilation design and installation of the common exhaust duct or manifold system is certified by a professional engineer.

(2) ~~Fume hoods located in separate rooms must not be connected to a common exhaust duct unless effective controls prevent pressure imbalances and prior written permission has been obtained from the Board.~~

Despite subsection (1), laboratory fume hoods that are or will be used for working with

(a) radioactive materials in amounts that exceed the exemption quantity specified by the Canadian Nuclear Safety Commission, or

(b) perchloric acid

must not be connected to a manifold system.

(3) Ducting used in the installation of a **laboratory** fume hood must be designed in accordance with established engineering principles.

Exhaust discharge **30.11** ~~Fume hood~~ **Laboratory fume hood** local exhaust ventilation systems must discharge to the atmosphere in such a manner that the discharged air will not be recirculated into the laboratory or other work areas.

Biological safety cabinets **30.12** (1) The limitations of a biological safety cabinet must be clearly posted on the unit and followed by workers.

(2) Biological safety cabinets must be certified by a qualified person at least annually and before use after

(a) initial installation,

(b) change of the HEPA (high efficiency particulate air) filter,

(c) moving of the unit, and

(d) any repair or maintenance that could affect the seal of the HEPA filter.

(3) Certification procedures used for compliance with subsection (2) must meet the requirements of the ~~*National Sanitation Foundation (NSF) Standard 49-1992, Class II (Laminar Flow) Biohazard Cabinetry*~~ ***National Sanitation Foundation (NSF) Standard 49-2002, Class II (Laminar Flow) Biohazard Cabinetry***, and a record of the results must be maintained.

(4) Recirculation of exhaust air into a workspace from a biological safety cabinet is not permitted where volatile toxic materials or flammable liquids or gases are used in the cabinet, ~~or where radioactive materials are used in amounts greater than specified by the Atomic Energy Control Board, or any successor agency.~~ **or where volatile radioactive materials are used in amounts that exceed the exemption quantity specified by the Canadian Nuclear Safety Commission.**

(5) ~~Any recirculated air must be directed through a HEPA filter.~~

(6) ~~Biological organisms listed as Risk Groups 3 or 4 under the Medical Research Council of Canada (MRCC) or World Health Organization (WHO) system of risk groups must be handled in biological safety cabinets that exhaust to the outdoors through dedicated ducting.~~

Biological safety cabinets used for handling a biological agent that is designated as a hazardous substance in section 5.1.1 must be operated and ventilated in accordance with the *Laboratory Biosafety Manual* issued by the World Health Organization, as amended from time to time, and the *Laboratory Biosafety Guidelines* issued by Health Canada, as amended from time to time.

Explanatory Notes

In consideration of the number and complexity of variances received to date by WorkSafeBC, there was a need to review Part 30 to ensure the requirements pertaining to laboratory fume hoods are up-to-date with current design technologies and standards covering the safe operation of this equipment. Both oral and written feedback to the proposed amendments received during the public consultation process and at the public hearings was carefully considered and a number of further revisions were made to the proposed amendments. These revisions are described below.

Based on feedback received during the public consultation process, the definition for “laboratory fume hood” (new section 30.7.1) was revised and expanded. It is based, in part, on the US Occupational Safety and Health Agency (“OSHA”) Standard 1910.1415(b) “scope and application” section and the California OSHA Code of Regulations, Title 8, Section 5154.1(b) and its “definitions” section. Further to the feedback received, definitions were added for the terms “operational face opening”, and “sash”. These are significant additions to clarify the intent of revised sections 30.8 (2.1) and (2.2). Based on feedback received during the public hearings in June 2007, the definition for “laboratory fume hood” received further clarification; the phrase “located in a laboratory” was added to the definition.

As a result of feedback received during the consultation phase, a general duty clause was added to section 30.8(1). This clause states that a hood, its ductwork and controls must be designed, installed and maintained using established engineering principles. This is consistent with the general duty clause that prefaces sections 5.60 to 5.71 pertaining to industrial ventilation for the control of airborne contaminant emissions.

The proposed amendments to section 30.8 (2) bring the requirements in line with current standards covering airflow velocities entering a laboratory fume hood, to ensure uniform airflow into the hood, and to ensure contaminants generated within the hood do not escape and create a hazard for the worker. These amendments are based, in part, on specifications detailed in the *ANSI/AIHA Z9.5-2003, Laboratory Ventilation* standard and the general guidelines outlined in the American Conference of Governmental Industrial Hygienists (ACGIH) *Industrial Ventilation Manual.* Face velocities as high as those currently prescribed (i.e., 150 feet/min) have been demonstrated to cause escape of contaminants from the hood due to turbulence, potentially

exposing workers. This section stipulates that the average face velocity must not exceed 120 feet/min or be less than 80 feet/min.

Based on feedback received at the public hearings, subsection 30.8 (2.3) received a further revision as a result of the concerns raised. Testing criteria per the proposed amendments and in accordance with the ANSI/ASHRAE standard – of specific concern is the tracer gas test – has been revised. Basically if an employer chooses to purchase an off-the-shelf commercially available fume hood that is certified as having tested in accordance with the ANSI/ASHRAE standard, the employer has, in essence, in complied with subsection 30.8 (2.3)(a) and no further ANSI/ASHRAE testing is required. However, if an employer chooses to custom built a fume hood on the company's premises, the hood must be tested by a qualified person following installation and before use, as per revised subsection 30.8 (2.3)(b). In either case, a hood must demonstrate or provide containment not greater than the control level of 0.05 ppm when tested under "as manufactured" test conditions before it can be declared as safe for use by workers (revised subsection 30.8 (2.4)).

With respect to the tracer gas test specified by ANSI/ASHRAE Standard 110-1995 it should be noted that this test is not conducted with the sash of the fume hood in the fully open position. The standard stipulates that the tracer gas test be conducted with the sash fully opened to the "design opening" position (i.e., clause 7.12.1 of the standard stated "the [test] manikin shall be located at the appropriate test position [pictured in Figure 1 of the standard] with the sash at the design opening". This is the position of the sash set by the manufacturer based on the various performance tests and is usually set towards the bottom of the sash sliding track – the working sash level. Manufacturers commonly lock the sash in the design opening.

Proposed amendment 30.8 (2.5) stipulates that the installation of a fume hood must be certified by a professional engineer. This applies to both commercially manufactured units as well as custom built units.

Based on feedback from stakeholders during the consultation period, face velocities specified under section 30.8 (2) are linked to the sash position which defines the operational face opening when the hood is in use. In accordance with proposed amendment 30.8 (2.1), the position of the sash must be clearly marked to ensure the maximum operational face opening that will maintain the average face velocities as specified by section 30.8 (2). This amendment incorporates the provisions of current section 30.9 (3). Furthermore, to ensure the worker's mid-torso and facial area is protected from accidental releases from the hood, the sash must be positioned in front of the worker, to serve as a protective barrier or shield (proposed amendment 30.8 (2.1).

Consistent with the ANSI/AIHA and other standards, the distinction between airflow requirements specific to carcinogens and radioactive materials and the airflow requirements for other hazardous substances have been removed from section 30.8 (2). Based on feedback received at the public hearings, sections 30.8 (5) and 30.10 (2) have been further clarified with respect to the exemption quantity as specified by the Canadian Nuclear Safety Commission. This means that fume hoods used for working with radioactive material in amounts less than the "exemption quantity" need not be labelled (nor restrictive provisions specified) and hoods can be connected to a manifold system if the exemption quantity for the particular radioactive material used within a connecting fume hood is not exceeded. This is consistent with section 30.12 (3), a section that was revised based on earlier suggestions received during the consultation phase. Hence this section applies when working with volatile radioactive material used in amounts that exceeds the exemption quantity specified by the Canadian Nuclear Safety Commission.

Subsection 30.8 (1) covering controls for the hood were revised and relocated to subsections 30.8 (7) and (8).

Proposed new sections 30.8 (9) and (10) addresses two concerns. Firstly, equipment used within a fume hood, such as distillation columns and heaters, must be placed at least 15 cm (6 inches)

away from the operational face opening to minimize interference of the flow of air across the sash. In response to public consultation feedback, the phrase “or not otherwise adversely affect airflow into the hood” was added since it is acknowledged that equipment placed directly onto the working surface of the hood can also affect inward airflow; this situation can be ameliorated by raising the equipment on stands or pedestals allowing airflow underneath bulky equipment. Subsection (10) is proposed to ensure that in order to ensure a hood is operated safely, written procedures must be developed and implemented.

The intent of the proposed amendments to section 30.9 (1) and proposed new sections 30.9 (1.1) and (1.2) is to establish timelines and trigger point criteria for testing airflows, to ensure that a fume hood is operated in a safe manner whenever it is used, and to ensure corrective action is taken when the hood is not operating properly. The indicated value of 90% is based on information provided by *ANSI/AIHA Standard Z9.5-2003*.

Proposed new section 30.9 (2.1) brings newly installed equipment up-to-date with current fume hood designs by requiring the installation of alarms when the airflow drops below acceptable levels as defined in section 30.8 (2) when the hood is in use. This ties this section in with proposed new section 30.9 (1.2).

The proposed amendments to section 30.10 will bring this section up-to-date with new ventilation design technologies for fume hoods. These new technologies are covered, in part, by current ANSI/AIHA and ANSI/ASHRAE standards, which allow for multiple fume hood exhaust ducts to be routed to a single exhaust duct or manifold. This is not permitted under the current requirements. A key amendment is the proposed requirement that the ventilation design and installation of the manifold system is certified by a professional engineer.

The proposed amendment to section 30.12 covering biological safety cabinets bring it into line with the proposed amendments to Part 6 covering infectious agents and materials. Reference to the National Sanitation Foundation Standard has been updated to reflect the most current edition (subsection (3)). Subsection (6), as it is proposed, includes a link to section 5.1.1 and “biological agent”. The revised amendment now states that a biological safety cabinet used for handling a biological agent designated as a hazardous substance in section 5.1.1 must be operated and ventilated in accordance with the biosafety guidelines issued by the World Health Organization and Health Canada, as amended from time to time.