<5.4.6.2. Design, Operation and Maintenance

1) The design, operation and maintenance requirements relating to dipping and coating processes shall conform to NFPA 34, "Dipping and Coating Processes Using Flammable or Combustible Liquids."**>**

Section 5.5. Laboratories

5.5.1. Scope

5.5.1.1. Application

1) This Section applies to laboratories where *dangerous goods*, including *flammable liquids* and *combustible liquids*, are used. **<**(See Appendix A.)**>**

2) Except as otherwise specified in this Section, the use, handling and storage of *dangerous goods*, including *flammable liquids* and *combustible liquids*, shall conform to Parts 3, 4 and 5.

5.5.2. Construction

5.5.2.1. Interior Finish Materials

1) Interior finish materials, floors, fixed furniture and equipment shall be chemically resistant to *dangerous goods* being used in a laboratory to minimize their deterioration, in conformance with Articles 3.2.7.7. and 3.2.7.8.

5.5.2.2. Separation

1) A laboratory shall be separated from other parts of the *building* by *fire separations* conforming to this Code and the BCBC, but having a *fire-resistance rating* of not less than 1 h.

5.5.3. Fire Prevention and Protection

5.5.3.1. Emergency Planning

1) Except as provided in Sentences (2) to (6), a laboratory shall conform to the requirements for emergency planning in Section 2.8. and for a fire safety plan in Subsection 5.1.5.

2) Fire drills required in Sentence 2.8.3. shall be held at intervals not greater than 3 months in a laboratory.

3) Personnel working in a laboratory shall be trained in the safe handling and use of *dangerous goods*, in conformance with Article 3.2.7.15.

4) *Dangerous goods* shall be identified in conformance with Article 3.2.7.13.

5) The laboratory shall be clearly designated as an area containing *dangerous goods* in conformance with Article 3.2.7.14.

6) Measures shall be taken to prevent access to the laboratory by unauthorized persons.

5.5.3.2. Combustible Materials

1) Where combustible materials, such as packaging materials, are used in a laboratory, their quantity shall not be greater than the supply for one day of normal operation.

2) Combustible materials in excess of those permitted in Sentence (1) shall be stored outside of the laboratory in conformance with Section 3.2.

5.5.3.3. Spill Control

1) Absorbent and neutralizing materials shall be provided in the laboratory and in the *dangerous goods* storage areas in conformance with Sentence 3.2.7.11.(2).

5.5.3.4. Electrical Equipment

1) Except as provided in Sentence 5.5.3.5.(3), electrical equipment located in areas where the concentration of flammable vapours is sufficient to create a hazard shall conform to **<**the British Columbia Safety Standards Act and pursuant regulations**>**, for the hazardous locations.

2) Electrical equipment located inside a power-ventilated enclosure required in Article 5.5.4.2. and its exhaust duct system shall

a) conform to Sentence (1), and

b) be designed and maintained to prevent the accumulation of combustible or reactive deposits.

5.5.3.5. Ignition Sources

1) Smoking shall not be permitted in a laboratory and signs shall be posted in conformance with Article 2.4.2.2.

2) Where overheating of unattended equipment using heat can cause a fire or an explosion, such equipment shall be equipped with a high temperature limit switch fitted to

a) sound an alarm, and

b) shut off the heat.

3) An ignition source that is an integral part of an operation involving flammable vapours shall be permitted provided

a) the supply of *flammable liquids* or *combustible liquids* for this operation is controlled and kept to a strict minimum,

b) flammable vapours and combustion fumes are exhausted in conformance with Article 5.5.4.2.,

c) there is no other source of ignition capable of igniting the flammable vapours in an uncontrolled manner, and

d) there is no combustible material in the immediate vicinity of this operation.

5.5.3.6. Inspection and Maintenance

1) Electrical equipment, mechanical systems, piping, valves, and automatic and manual control and safety devices shall be inspected, tested and maintained in good operating condition at all times.

2) The ventilation systems serving a laboratory shall be inspected and cleaned to prevent the accumulation of combustible or reactive deposits, and the intervals between inspections shall be not greater than

a) 12 months for the ventilation systems of the laboratory and *dangerous goods* storage areas, and

b) 6 months for the ventilation system of a power-ventilated enclosure required in Article 5.5.4.2.

5.5.4. Ventilation

5.5.4.1. General Ventilation

1) A laboratory shall be provided with continuous mechanical ventilation designed and maintained to ensure that *dangerous goods* vapours and particles

a) do not accumulate in the laboratory,

b) are prevented from migrating to other parts of the *building*,

c) do not accumulate in the ventilation system,

d) are exhausted to the outdoors, and

e) are not returned to the *building*.

2) A ventilation system required in this Section shall be provided with monitoring devices to

a) indicate that the ventilation system is in operation, and

b) sound an alarm if the ventilation system is malfunctioning.

5.5.4.2. Power-Ventilated Enclosure

1) The use of *dangerous goods* in a laboratory shall be confined inside a power-ventilated enclosure conforming to Articles 5.5.4.3. and 5.5.4.4. when

a) their use releases flammable vapours or causes runaway or potentially explosive reactions,

b) liquids are heated to a temperature equal to or greater than their *flash point*, or

c) Class I liquids or *unstable liquids* are used.

2) A power-ventilated enclosure required in Sentence (1) shall not be used for the storage of *dangerous goods*, and any quantity in excess of the supply necessary for normal operations shall conform to Subsection 5.5.5.

5.5.4.3. Enclosure Exhaust Ventilation

1) The ventilation system for a power-ventilated enclosure required in Article 5.5.4.2. shall

a) conform to NFPA 91, "Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids,"

b) provide continuous exhaust ventilation at an air velocity sufficient to prevent the accumulation of combustible or reactive deposits in the power-ventilated enclosure and its exhaust duct system,

c) confine *dangerous goods* vapours and particles to the area where they are generated and exhaust them to the outdoors,

d) not return the exhausted air to the *building*, and

e) be provided with well identified control switches that are

i) located outside of the power-ventilated enclosure, and

ii) readily accessible in case of an emergency.

2) Where the deposits referred to in Clause (1)(b) can accumulate in the power-ventilated enclosure and its exhaust duct system and create a fire or explosion hazard,

a) provisions shall be made to remove such deposits so they do not create a fire or explosion hazard, or

b) an automatic fire suppression system shall be provided.

5.5.4.4. Enclosure Construction

1) The power-ventilated enclosure required in Article 5.5.4.2. and its exhaust duct system shall

a) except as provided in Sentences (2) and (3), be constructed of noncombustible materials compatible with and chemically resistant to the *dangerous goods* vapours and particles being exhausted,

b) be provided with access doors to permit inspection and maintenance of the fan assembly and exhaust ducts,

c) be provided with instructions for its use and the operation of the ventilation system, and

d) be provided with means to control accidental spillage.

2) Combustible materials are permitted in systems described in Clause (1)(a) if

a) such materials are required by the corrosive or reactive properties of the *dangerous goods* being used, and

b) their *flame-spread rating* is not more than 25.

3) The *flame-spread rating* required in Sentence (2) is permitted to be greater than 25 if an automatic fire suppression system is provided inside the power-ventilated enclosure and its exhaust duct system.

5.5.5. Dangerous Goods

5.5.5.1. Maximum Quantities

1) The quantity of *dangerous goods* kept in a laboratory shall be minimized and shall not exceed the lesser of

a) the supply necessary for normal operation, or

b) when located in

i) a Group A, Division 2 educational or a Group D *major occupancy*, 300 L of *flammable liquids* and *combustible liquids*, of which not more than 50 L shall be Class I liquids, or

ii) a Group B *major occupancy*, the quantities of *flammable liquids* and *combustible liquids* permitted in Sentence 4.2.6.3.(1).

<(See Appendix A.)>

2) Quantities of *flammable liquids* and *combustible liquids* in excess of those permitted in Sentence (1) shall be stored in

a) cabinets conforming to Subsection 4.2.10. except that, in laboratories described in Clause (1)(b), the total quantity of *flammable liquids* and *combustible liquids* stored in such cabinets shall not exceed the quantity permitted for one cabinet, or

b) a room conforming to Subsection 4.2.9.

3) Quantities of *dangerous goods* other than *flammable liquids* and *combustible liquids* in excess of those permitted in Sentence (1) shall be stored outside of the laboratory in conformance with Part 3.

5.5.5.2. Containers for Flammable and Combustible Liquids

1) Except as provided in Sentences (2) and (3), *flammable liquids* or *combustible liquids* in a laboratory shall be kept in containers conforming to Subsection 4.2.3.

2) Where Class I liquids are required to be kept in individual containers having a capacity greater than 5 L in a laboratory, such containers shall

a) be safety containers conforming to ULC/ORD-C30, "Safety Containers," and

b) have a capacity of not more than 25 L.

3) Containers of *flammable liquids* or *combustible liquids* shall be kept closed when not in use.

5.5.5.3. Compressed Gases

1) Storage cylinders and piping systems for Class 2 gases used in a laboratory shall be firmly secured and protected against mechanical damage.

2) Each point of supply and each point of use of cylinders or piping systems for Class 2 gases shall be provided with

a) labels identifying the gas being supplied, and

b) a manual shut-off valve.

3) A Class 2 gas cylinder valve shall be closed when not in use.

5.5.5.4. Refrigerated Storage

1) Refrigerators described in Sentence 4.1.4.1.(2) shall be identified in conformance with Article 3.2.7.14.

2) Class I liquids that are stored in refrigerators shall be kept in *closed containers*.