

## CHAPTER 38

# HIGHER EDUCATION LABORATORIES

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### User note:

**About this chapter:** Chapter 38 addresses the unique needs of laboratories in higher education institutions. These academic institutions often have chemistry, biology, medical, engineering and other laboratories where hazardous materials are used. This chapter addresses both new and existing buildings and new and existing laboratories. Applying the general hazardous material provisions has been difficult because of the way these laboratories operate. Often there are many small laboratories with very small quantities of hazardous materials that individually do not exceed the maximum allowable quantities (MAQs). In aggregate, the quantities will exceed the MAQs and could result in the need for a Group H occupancy classification. However, it is believed that the lower density of hazardous materials often mitigates the overall risk. This chapter also addresses the use of certain materials typically prohibited for existing buildings not protected throughout with a sprinkler system. These allowances come with certain safety measures such as the use of storage cabinets and fume hoods. Note that Section 428 of the International Building Code® addresses the construction requirements found in this chapter for laboratory suites.

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### SECTION 3801 GENERAL

**3801.1 Scope.** Higher education laboratories complying with the requirements of this chapter shall be permitted to exceed the maximum allowable quantities of hazardous materials in *control areas* set forth in Chapter 50 without requiring classification as a Group H occupancy. Except as specified in this chapter, such laboratories shall comply with all applicable provisions of this code and the *International Building Code*.

**3801.2 Application.** The provisions of this chapter shall be applied as exceptions or additions to applicable requirements of this code. Unless specifically modified by this chapter, the storage, use and handling of hazardous materials shall comply with the provisions in Chapters 50 through 67 and the *International Building Code* for quantities not exceeding the maximum allowable quantity.

### SECTION 3802 DEFINITIONS

**3802.1 Definitions.** The following terms are defined in Chapter 2:

**CHEMICAL FUME HOOD.**

**GLOVE BOX.**

**HIGHER EDUCATION LABORATORY.**

**LABORATORY SUITE.**

**SPECIAL EXPERT.**

### SECTION 3803 GENERAL SAFETY PROVISIONS

**3803.1 Scope.** Laboratories and *laboratory suites* applying the requirements of this chapter shall be in accordance with the general safety provisions in Sections 3803.1.1 through 3803.2.2.

**3803.1.1 Chemical safety reviews.** Operating and emergency procedures planning and documentation shall be provided in accordance with Sections 5001.3.3.11 through 5001.3.3.17. Such documentation shall be prepared by laboratory safety personnel or *special experts*, and shall be made available in the workplace for reference and review by employees. Copies of such documentation shall be made available to the *fire code official* for review upon request.

**3803.1.2 Chemical handling.** Receiving, transporting on site, unpacking and dispensing of hazardous materials shall be carried out by persons trained in proper handling of such materials and shall be performed in accordance with Chapters 50 through 67, as applicable.

**3803.1.3 Warning signage.** Warning signs shall be provided in accordance with Section 5003.5.

**3803.1.4 Maintenance of equipment, machinery and processes.** Maintenance of equipment, machinery and processes used with hazardous materials shall comply with Section 5003.2.6.

**3803.1.5 Time-sensitive materials.** Containers of materials that have the potential to become hazardous during prolonged storage shall be dated when first opened, and shall be managed in accordance with NFPA 45, Section 8.3.4.4.1.

**3803.1.6 Hazardous wastes.** Storage, dispensing, use and handling of hazardous waste shall comply with this chapter and Chapters 50 through 67, as applicable.

**3803.1.7 Automatic fire-extinguishing systems.** New laboratories in new or existing buildings that increase maximum allowable quantities of hazardous materials based on the requirements in this chapter shall be equipped throughout with an *approved automatic sprinkler system* in accordance with Section 903.3.1.1.

**3803.2 Hazardous materials storage and use.** Hazardous materials storage, handling and use in laboratories and *laboratory suites* complying with Chapter 38 shall be in accordance with this chapter and Chapters 50 through 67.

**3803.2.1 Container size.** The maximum container size for all hazardous materials shall be 5.3 gallons (20 L) for liquids, 50 pounds (22.7 kg) for solids, 100 cubic feet (2.83 m<sup>3</sup>) for *health-hazard* gases per Table 5003.1.1(2) and 500 cubic feet (14.15 m<sup>3</sup>) for all other gases in accordance with Table 5003.1.1(1).

**Exception:** Hazardous waste collection containers, for other than Class I *flammable liquids* and Class II combustible liquids, are permitted to exceed 5.3 gallons (20 L) where *approved*.

**3803.2.2 Density.** Quantities of Class I *flammable liquids* in storage and use shall not exceed 8 gallons (30 L) per 100 square feet (9.29 m<sup>2</sup>) of floor area. Densities shall be reduced by 25 percent on the 4th through 6th floors of the building, and by 50 percent above the 6th floor. Regardless of the density, the *maximum allowable quantity per control area or laboratory suite* in accordance with this chapter, shall not be exceeded.

**Exception:** Designated hazardous waste collection areas or rooms within a *laboratory suite* or *control area* are not limited, but such materials shall not exceed the maximum allowable quantity per *laboratory suite* or *control area*.

## SECTION 3804 LABORATORY SUITE CONSTRUCTION

**3804.1 General.** Where *laboratory suites* are provided, they shall be constructed in accordance with this chapter and Section 428 of the *International Building Code*.

**3804.1.1 Laboratory suites.** The number of *laboratory suites* and percentage of maximum allowable quantities of hazardous materials in *laboratory suites* shall be in accordance with Table 3804.1.1.

**TABLE 3804.1.1  
DESIGN AND NUMBER OF LABORATORY SUITES PER FLOOR**

FLOOR LEVEL		PERCENTAGE OF THE MAXIMUM ALLOWABLE QUANTITY PER LAB SUITE <sup>a</sup>	NUMBER OF LAB SUITES PER FLOOR	FIRE-RESISTANCE RATING FOR FIRE BARRIERS IN HOURS <sup>b</sup>
Above grade plane	21+	Not Allowed	Not Allowed	Not Allowed
	16–20	25	1	2 <sup>c</sup>
	11–15	50	1	2 <sup>c</sup>
	7–10	50	2	2 <sup>c</sup>
	4–6	75	4	1
	3	100	4	1
	1–2	100	6	1
Below grade plane	1	75	4	1
	2	50	2	1
	Lower than 2	Not Allowed	Not Allowed	Not Allowed

a. Percentages shall be of the maximum allowable quantity per control area shown in Table 5003.1.1(1) and Table 5003.1.1(2), with all increases allowed in the footnotes to those tables.

b. Fire barriers shall include walls, floors and ceilings necessary to provide separation from other portions of the building.

c. Vertical fire barriers separating laboratory suites from other spaces on the same floor are permitted to be 1-hour rated.

**3804.1.1.1 Separation from other nonlaboratory areas.** *Laboratory suites* shall be separated from other portions of the building in accordance with the most restrictive of the following:

1. *Fire barriers* and *horizontal assemblies* as required in Table 3804.1.1. *Fire barriers* shall be constructed in accordance with Section 707 of the *International Building Code* and *horizontal assemblies* shall be constructed in accordance with Section 711 of the *International Building Code*.

**Exception:** Where an individual *laboratory suite* occupies more than one story, the *fire-resistance rating* of intermediate floors contained within the *laboratory suite* shall comply with the requirements of the *International Building Code*.

2. Separations as required in Section 508 of the *International Building Code*.

**3804.1.1.2 Separation from other laboratory suites.** *Laboratory suites* shall be separated from other *laboratory suites* in accordance with Table 3804.1.1.

**3804.1.1.3 Floor assembly fire resistance.** The floor assembly supporting *laboratory suites* and the construction supporting the floor of *laboratory suites* shall have a *fire-resistance rating* of not less than 2 hours.

**Exception:** The floor assembly of *laboratory suites* and the construction supporting the floor of *laboratory suites* are permitted to be 1-hour fire-resistance- rated in buildings of Types IIA, IIIA and VA construction, provided that the building is three or fewer stories.

**3804.1.1.4 Maximum number.** The maximum number of *laboratory suites* shall be in accordance with Table 3804.1.1. Where a building contains both *laboratory suites* and *control areas*, the total number of *laboratory suites* and *control areas* within a building shall not exceed the maximum number of *laboratory suites* in accordance with Table 3804.1.1.

**3804.1.1.5 Means of egress.** *Means of egress* shall be in accordance with Chapter 10.

**3804.1.1.6 Standby or emergency power.** Higher education *laboratory suites* shall be provided with emergency or standby power in accordance with Section 1203.2.14.

**3804.1.1.7 Ventilation.** Ventilation shall be in accordance with the *International Mechanical Code* and Chapter 7 of NFPA 45.

**3804.1.1.8 Liquid-tight floor.** Portions of *laboratory suites* where hazardous materials are present shall be provided with a liquid-tight floor.

**3804.1.1.9 Automatic fire-extinguishing systems.** Buildings containing *laboratory suites* shall be equipped throughout with an *approved automatic sprinkler system* in accordance with Section 903.3.1.1.

**3804.1.2 Percentage of maximum allowable quantity in each laboratory suite.** The percentage of maximum allowable quantities of hazardous materials in each *laboratory suite* shall be in accordance with Table 3804.1.1.

## SECTION 3805 NONSPRINKLERED LABORATORIES

[S] **3805.1 Scope.** Storage and use of hazardous materials in existing laboratories located within existing buildings not equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 is permitted where such use complies with Section 3803, Chapters 50 through 67, as applicable, and Sections 3805.2 through 3805.4.

### Exceptions:

1. Existing laboratories that have a current Seattle Fire Department permit.
2. Substantial alterations in existing buildings shall comply with Sections 3801 through 3804.

**3805.2 Nonsprinklered laboratories.** The maximum allowable quantities of hazardous materials in storage and use in *control areas* in laboratories located in buildings not equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 shall be in accordance with Table 5003.1.1(1), Table 5003.1.1(2) and Table 5003.8.3.2, except as modified by Sections 3805.2.1 and 3805.2.2.

**3805.2.1 Restricted materials storage.** Where *approved by the fire code official*, storage of the following hazardous materials prohibited by Table 5003.1.1(1) in buildings not equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 shall be allowed within a *laboratory control area* at 25 percent of Table 5003.1.1(1) limits for a building equipped throughout with an *automatic sprinkler system*.

1. Class 4 oxidizers.
2. Pyrophorics.

The percentage of the *maximum allowable quantity per control area* shown in Table 3805.4 shall be applied to 25 percent of Table 5003.1.1(1) limits for Class 4 oxidizers or pyrophoric materials.

Additional quantity increases shall be prohibited, and such materials shall be stored in accordance with all of the following:

1. Containers shall be completely sealed and stored in accordance with the manufacturers' recommendations.
2. Storage shall be within *approved* hazardous material storage cabinets in accordance with Section 5003.8.7, or shall be located in an inert atmosphere glove box in accordance with NFPA 45, Section 7.11.

3. The storage cabinet or *glove box* shall not contain any storage of *incompatible materials*.

**3805.2.2 Restricted materials use.** Where *approved* by the *fire code official*, use of the following hazardous materials prohibited by Table 5003.1.1(1) in buildings not equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, shall be allowed within a laboratory *control area* at 25 percent of Table 5003.1.1(1) limits for buildings equipped throughout with an *automatic sprinkler system*.

1. Class 4 oxidizers.
2. Pyrophorics.

The percentage of the *maximum allowable quantity per control area* shown in Table 3805.4 shall be applied to 25 percent of Table 5003.1.1(1) limits for Class 4 oxidizers or pyrophoric materials.

Additional quantity increases shall be prohibited, and such materials shall be stored in accordance with all of the following:

1. Use shall be within an *approved* chemical fume hood *listed* in accordance with UL 1805, or in an inert atmosphere glove box in accordance with NFPA 45, Section 7.11, or other *approved* equipment designed for the specific hazard of the material.
2. Combustible materials shall be kept not less than 2 feet (610 mm) away from the work area, except for those items directly related to the research.
3. A portable fire extinguisher appropriate for the specific material shall be provided within 20 feet (6096 mm) of the use in accordance with Section 906.

**3805.3 Restricted materials automatic fire detection.** An automatic fire detection system shall be installed in all existing laboratories in nonsprinklered buildings in accordance with this section. Detectors shall be connected to the building's fire alarm control unit where a fire alarm system is provided. Detector initiation shall activate the occupant notification system in accordance with Section 907.5 where connected to the building's fire alarm control unit. Activation of the detection system shall sound a local alarm in buildings not equipped with a fire alarm notification system.

**3805.3.1 System supervision and monitoring.** Automatic fire detection systems shall be electronically supervised and monitored by an *approved* supervising station or, where *approved*, shall initiate an audible and visual signal at a constantly attended, on-site location.

**3805.4 Percentage of maximum allowable quantity per control area.** The percentage of *maximum allowable quantities per control area* of hazardous materials shall comply with Table 3805.4.

**TABLE 3805.4  
DESIGN AND NUMBER OF CONTROL AREAS IN EXISTING NONSPRINKLERED LABORATORIES**

FLOOR LEVEL		PERCENTAGE OF THE MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA <sup>a, e</sup>	NUMBER OF CONTROL AREAS PER FLOOR	FIRE-RESISTANCE RATING FOR FIRE BARRIERS IN HOURS <sup>b, c, d</sup>
Above grade plane	Higher than 9	5	1	2 <sup>c</sup>
	7–9	10	2	2 <sup>c</sup>
	4–6	25	2	2 <sup>c</sup>
	3	75	2	1
	1–2	100	4	1
Below grade plane	1	100	3	1
	2	75	2	1
	Lower than 2	Not Allowed	Not Allowed	Not Allowed

a. Percentages shall be of the maximum allowable quantity per control area shown in Table 5003.1.1(1) and Table 5003.1.1(2), excluding all increases allowed in the footnotes to those tables.

b. Fire barriers shall include walls, floors and ceilings necessary to provide separation from other portions of the building.

c. Vertical fire barriers separating control areas from other spaces on the same floor are permitted to be 1-hour fire-resistance rated.

d. See Section 414.2.4 of the *International Building Code* for additional requirements.

e. The percentage of the maximum allowable quantity per control area shown in Table 3805.4 shall be applied to 25 percent of Table 5003.1.1(1) limits for Class 4 oxidizers or pyrophoric materials.

## SECTION 3806 EXISTING SPRINKLERED LABORATORIES

[S] **3806.1 Scope.** Storage and use of hazardous materials in existing laboratories within buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 shall be in accordance with Section 3803 and with Chapters 50 through 67, as applicable, except as modified by this section.

**Exceptions:**

1. Existing laboratories that have a current Seattle Fire Department permit.
2. Substantial alterations in existing buildings shall comply with Sections 3801 through 3804.

**3806.2 Hazardous materials storage and use.** Storage and use of hazardous materials within *control areas* in new and existing laboratories equipped with an *automatic sprinkler system* shall be in accordance with this section and Chapters 50 through 67, as applicable.

**Exception:** Existing laboratories in buildings equipped throughout with an automatic sprinkler system meeting the requirements for *laboratory suites* are permitted to comply with Section 3804.

**3806.2.1 Percentage of maximum allowable quantities per control area.** The percentage of *maximum allowable quantities per control area* of hazardous materials shall be in accordance with Table 3806.2.1.

**TABLE 3806.2.1  
DESIGN AND NUMBER OF CONTROL AREAS IN EXISTING SPRINKLERED LABORATORIES**

FLOOR LEVEL		PERCENTAGE OF THE MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA <sup>a</sup>	NUMBER OF CONTROL AREAS PER FLOOR	FIRE-RESISTANCE RATING FOR FIRE BARRIERS IN HOURS <sup>b, d</sup>
Above grade plane	21+	5	1	2 <sup>c</sup>
	11–20	10	1	2 <sup>c</sup>
	7–10	25	2	2 <sup>c</sup>
	4–6	50	2	2 <sup>c</sup>
	3	75	3	1
	1–2	100	4	1
Below grade plane	1	100	3	1
	2	75	2	1
	Lower than 2	Not Allowed	Not Allowed	Not Allowed

a. Percentages shall be of the maximum allowable quantity per control area shown in Table 5003.1.1(1) and Table 5003.1.1(2), with all increases allowed in the footnotes to those tables.

b. Fire barriers shall include walls, floors and ceilings necessary to provide separation from other portions of the building.

c. Vertical fire barriers separating control areas from other spaces on the same floor are permitted to be 1-hour fire-resistance rated.

d. See Section 414.2.4 of the *International Building Code* for additional requirements.

