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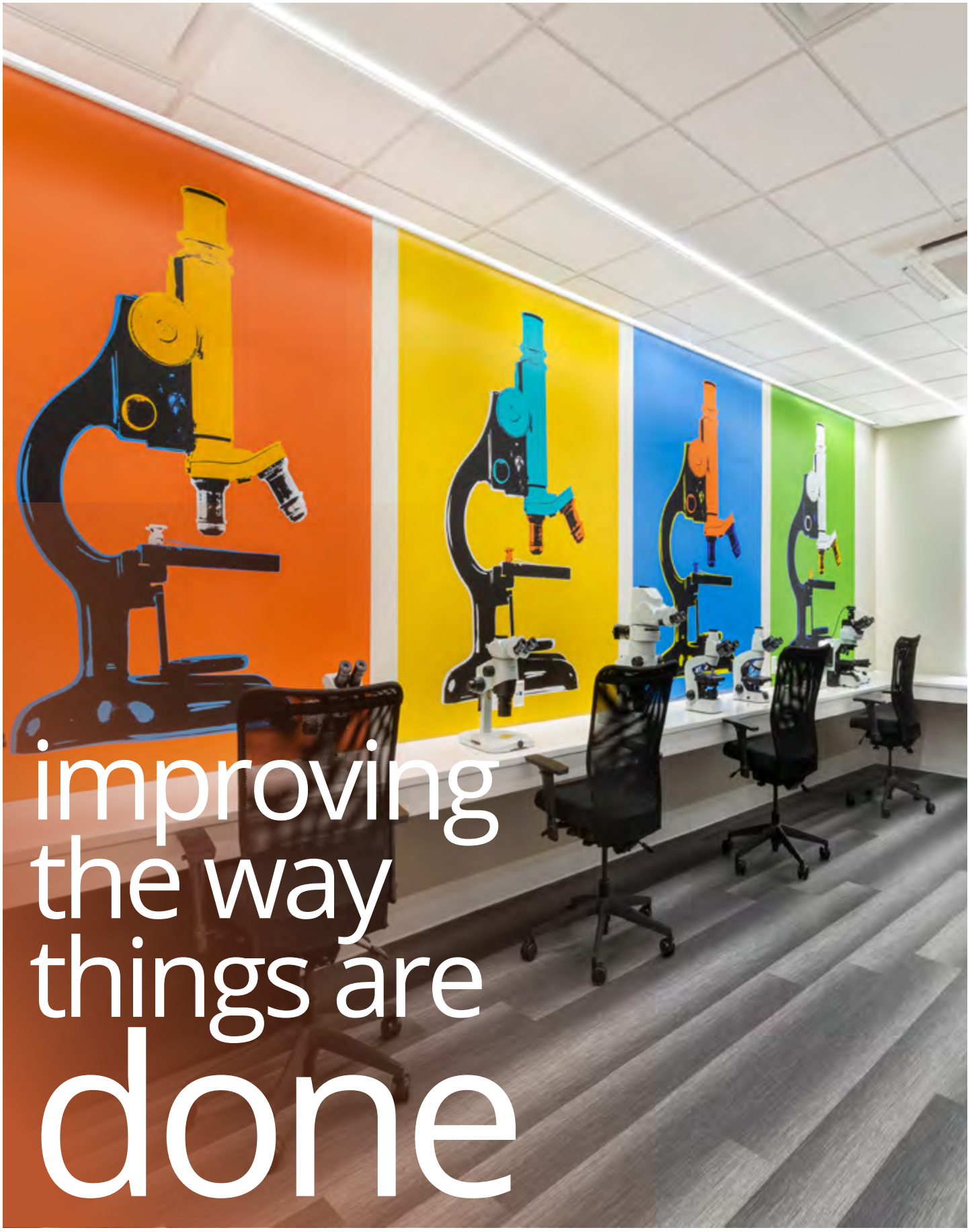


improving the way things are done

HAZARDOUS MATERIALS LAB & OVERLAPPING CODES AIA course

AIA COURSE OUTLINE

Hazardous Materials: Laboratory Design, Making Sense of Overlapping Codes

Dear Participant,

Code compliance can be a confusing topic to most. But we're here to help! We believe code compliance is an important aspect to any project, particularly code compliance for hazardous materials. It's meant to establish requirements to safeguard public health, safety and general welfare from fire and other hazards in the built environment.

In this presentation you will get an in depth look at hazmat codes, how they overlap, and the associations that have become the standard most commonly adopted for the design and protection of new and renovated buildings.

The following pages are intended to serve as an accompanying guide to the presentation. We are pleased to have you join us!

Sincerely,

Andy Shanahan, PE
Senior Project Manager

COURSE DESCRIPTION

The storage and use of hazardous materials in labs is highly regulated by building codes, fire prevention codes and NFPA standards, as well as by insurance underwriters.

We'll dig deep in to the hazmat codes for labs, explaining IBC and NFPA, and how to apply the codes that overlap. We'll explain how to design a lab space to meet these complicated requirements, including designing control areas and maximum allowable quantities of hazardous materials. We'll also go in-depth into the different lab classifications, lab protection by building class type, and chemical restrictions.

LEARNING OBJECTIVES

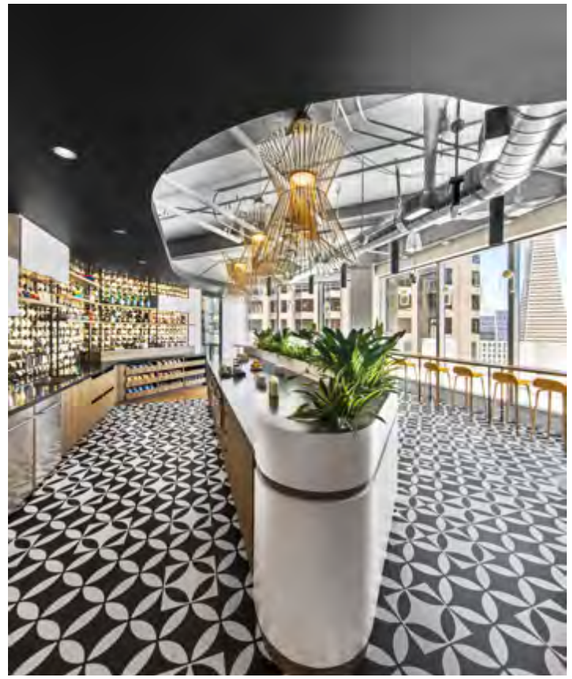
After course completion, participants will be able to:

1. Understand the codes that apply to designing labs that contain hazardous materials, including IBC and NFPA
2. Explain when NFPA 45 does and does not apply to lab design
3. Describe how to design a lab to comply with codes, including considerations for maximum allowable quantities
4. Understand lab classifications, lab protection by building class type, and chemical restrictions

(50 minute course, plus 10 minute Q&A)

Course Number: WBCCHAZMAT

AIA Learning Unit: One (1) LU/HSW



MASSACHUSETTS STATE BUILDING CODE CONTROL AREA METHODOLOGY

This Maximum Allowable Quantity (MAQ) Decision Tree outlines the decision process for compliance with the Massachusetts State Building Code's requirements for hazardous materials compliance.

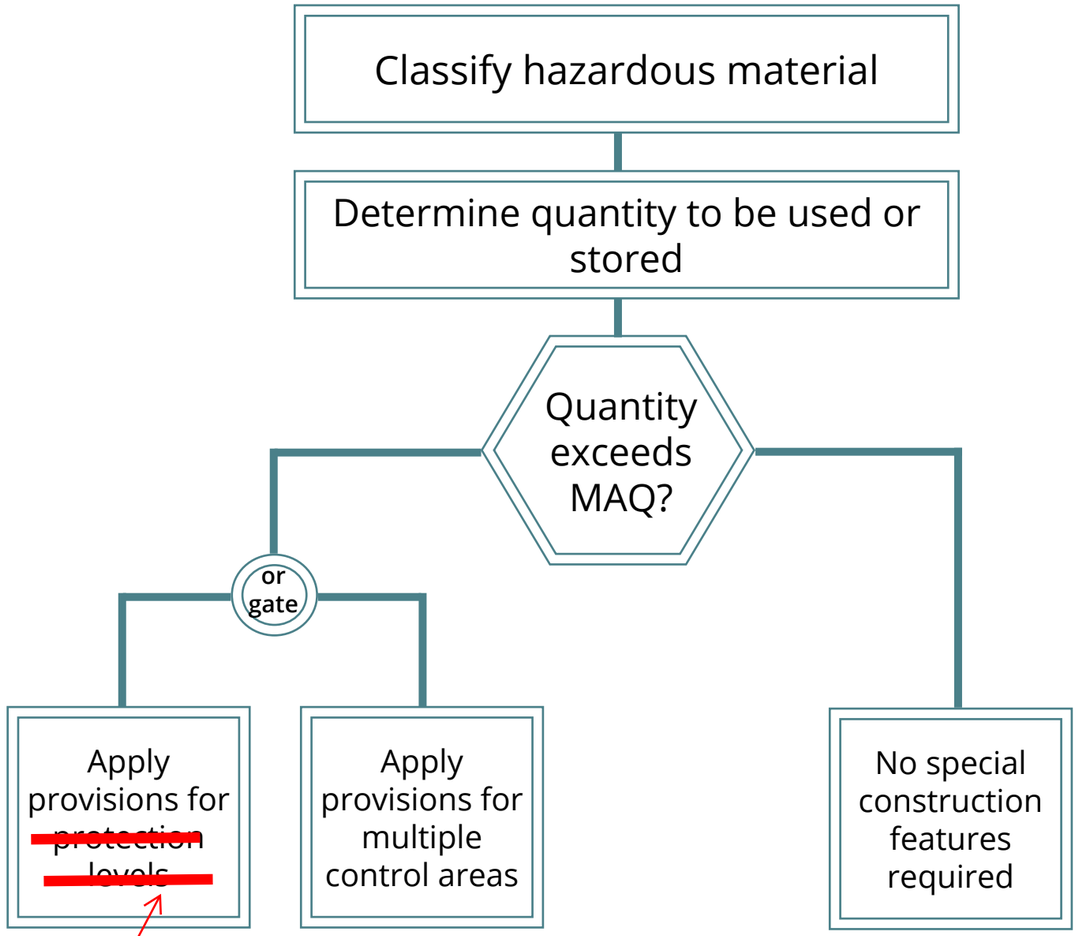


Figure 1: MAQ Process Decision Tree

STEP 1: HAZARDOUS MATERIAL CLASSIFICATION

flammable and combustible liquids

All chemicals must be classified based on the following information, which can be found on the Material Safety Data Sheet.

TYPE	CLASS	FLASHPOINT	BOILING POINT
Flammable	IA	<73^{0}F	<100^{0}F
	IB	<73^{0}F	>100^{0}F
	IC	>73^{0}F and <100^{0}F	
Combustible	II	>100^{0}F and <140^{0}F	
	IIIA	>140^{0}F and <200^{0}F	
	IIIB	>200^{0}F	

Figure 2: Flammable and Combustible Liquid Chemical Classification

STEP 2: DETERMINE THE WORST-CASE QUANTITY FOR THE BUILDING OR AREA

STEP 3: DOES THE QUANTITY EXCEED THE MAQ FOR THE BUILDING?

Once the classification of chemicals is complete, and the required quantity determined, 780 CMR Table 307.1(1) should be used to determine the specific MAQ for the project.

Material	Class	Storage MAQ*	In-use MAQ*
Flammable Liquid	IA	30 Gallons	10 Gallons
Flammable Liquid	IB	120 Gallons	30 Gallons
Combustible Liquid	II	120 Gallons	30 Gallons
Combustible Liquid	IIIA	330 Gallons	80 Gallons
Combustible Liquid	IIIB	13,200 Gallons	3,300 Gallons
Flammable Gas	Gaseous	1,000 cubic feet	1,000 cubic feet
Oxidizing Gas	Gaseous	1,500 cubic feet	1,500 cubic feet

Figure 3: MAQ Summary (excerpted from IBC Table 307.1(1)

*MAQ values can be doubled for fully-sprinklered buildings and for storage within listed safety cabinets.

Once the MAQ is determined for the building, Figure 4 can be used to determine if the MAQ is reduced based on the location within the building.

Additionally, the number of control areas per floor is limited by 780 CMR, Section 414.2.2. Control areas must be separated from each other and the balance of the building by 1-hour fire-rated construction on the lower levels and 2-hour on Floors 4+.

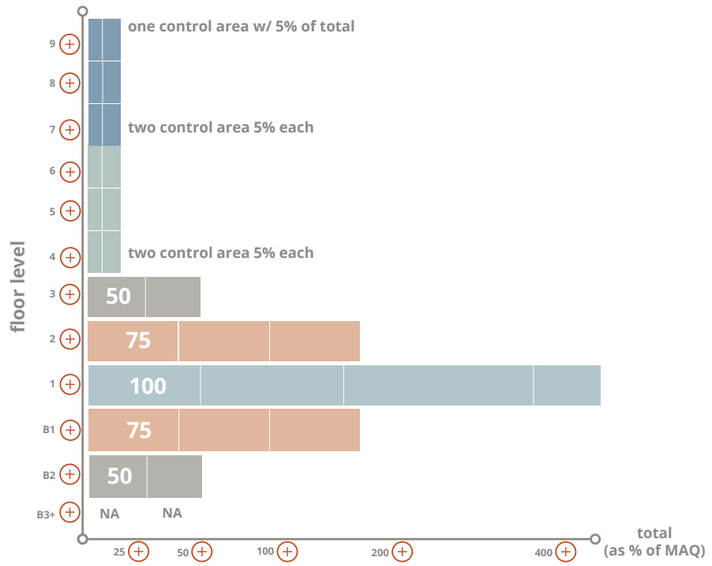


Figure 4: Control Area Limitations (excerpted from IBC Table 414.2.2)
The figure above is for reference only.

If the quantity of chemicals can not be made to comply with these limitations, it may require a Group H, High-Hazard Occupancy designation.

the location of this should be swapped with the paragraph below

Laboratory Unit Fire Hazard Class	Flammable & Combustible Liquid Class A	Quantities in use*: Max Quantity B per 100 ft² of Lab Unit C (gal)	Quantities in use*: Max Quantity B per Lab Unit (gal)	Quantities in use & storage*: Max Quantity B per 100 ft² of Lab Unit C (gal)	Quantities in use & storage*: Max Quantity B per Lab Unit (gal)
A (high fire hazard)	I I,II and IIIA	10 20	480 800	20 40	480 1300
B[d] (moderate fire hazard)	I I,II and IIIA	5 10	300[d] 400	10 40	480 800
C[e] (low fire hazard)	I I,II and IIIA	2 4	150[e] 200	4 8	300 400
D[e] (minimal fire hazard)	I I,II and IIIA	1 1	75 75	2 2	150 150

Figure 4: Laboratory Classifications (excerpted from NFPA 45, Table 9.1.1(b))

NFPA 45 LABORATORY METHODOLOGY

NFPA 45 Compliance: NFPA 45 does not utilize control areas. It subdivides the building into laboratories that may or may not require fire-rated separations. Figure 5 requires Steps 1 and 2 from above to be followed prior to its application. Once the chemicals are classified and quantified, the table assists in classifying the laboratory. It identifies the laboratory classifications under NFPA 45 (Class A-D) and provides maximum quantities per lab for both Class I chemicals as well as total of Classes I, II, and IIIA. In addition to the quantity per lab values, a density (gallons per 100 sf) maximum is also provided.

the previous page

NFPA 45 also requires

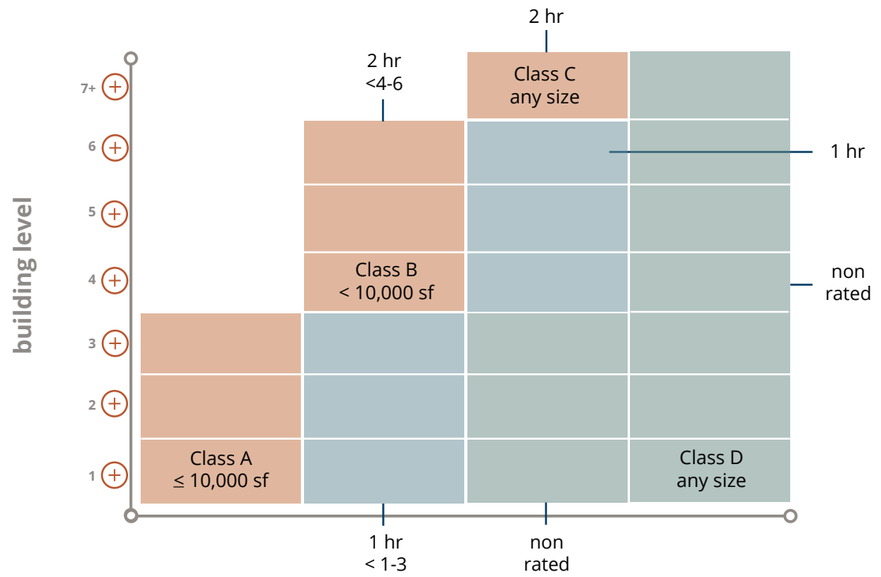
Tables 4 and 5

The following table outlines how the maximum capacities identified in Figure 4: Laboratory Classifications, must be reduced where the laboratory is located above the third floor.

Laboratory Fire Hazard Classification

FLOOR	CLASS A	CLASS B	CLASS C	CLASS D
1	100%	100%	100%	100%
2	100%	100%	100%	100%
3	100%	100%	100%	100%
4	Not Permitted	50%	75%	75%
5	Not Permitted	50%	75%	75%
6	Not Permitted	50%	75%	75%
7-9	Not Permitted	Not Permitted	50%	50%
>9	Not Permitted	Not Permitted	50%	50%

Figure 5: Laboratory Classifications (excerpted from NFPA 45, Table 5.1.1)



Finally, the classification of the laboratory has fire-rated construction implications and limitations in accordance with the figure to the left.

If the building or area can utilize control areas to reduce the quantity per control area to below the MAQ and the individual labs can meet the requirements of the above tables, a Group H/liquid storage room will not be required. Otherwise, additional protection measures will be required.

* Disclaimer: This handout contains general requirements and is provided for reference only. It is not intended to be comprehensive nor is it intended to be used to determine the compliance of any specific project. Many exceptions and specific application limitations apply. Any hazardous materials analysis should be performed by a professional engineer with expertise in hazardous material consulting.

WHO WE ARE

WB Engineers+Consultants are communicators, client advocates, and trusted advisors with offices in Andover, Austin, Baltimore, Boston, Denver, East Bay, Fishkill, Iselin, Miami, New York, Ronkonkoma, and Washington, DC. Founded in 1999, WB has specialized in mechanical, electrical, plumbing and fire protection engineering.

We have a talented team of over 185 professionals, well educated in their respective disciplines and many with great credentials behind their names. Beyond that, Improving the Way Things are Done is important to who we are as a company. We are always thinking about ways to use technology more effectively, design more efficiently, and communicate better. The services we offer are the following:

code consulting?

- Mechanical Engineering
- Electrical Engineering
- Plumbing/FP Engineering
- Due Diligence Studies
- Design Build
- Energy/LEED Consulting
- IT/Security Consulting
- AV Consulting
- Commissioning
- Base Building Engineering
- Special Inspections
- 3D Scanning

WHAT WE DO

Improving the way things are done is our moto. We embrace change and are always looking for ways to do what we do, even better.

We find solutions for workplace, critical facilities, life sciences, retail, educational, and many other project types in between.

Our ability to integrate engineering services across various market sectors allows us to keep our “finger on the pulse” and help clients innovate. We work in the following markets:

+ Asset Strategy & Repositioning
+ Critical Facilities
+ Education
+ Government
+ Hospitality
+ Industrial
+ Infrastructure
+ Life Sciences
+ Retail
+ Workplace