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Maximum Allowable Quantities and the Fire Hazard Analysis

Presented by

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Facility Use and Classification

- Ion beam irradiation for materials research utilizing three accelerators (HVEE, tandem, pelletron)
- Study material defects and their effect on electronic, photonic and/or mechanical properties
- Limited hazardous materials
- No vital DOE programs or safety-class systems

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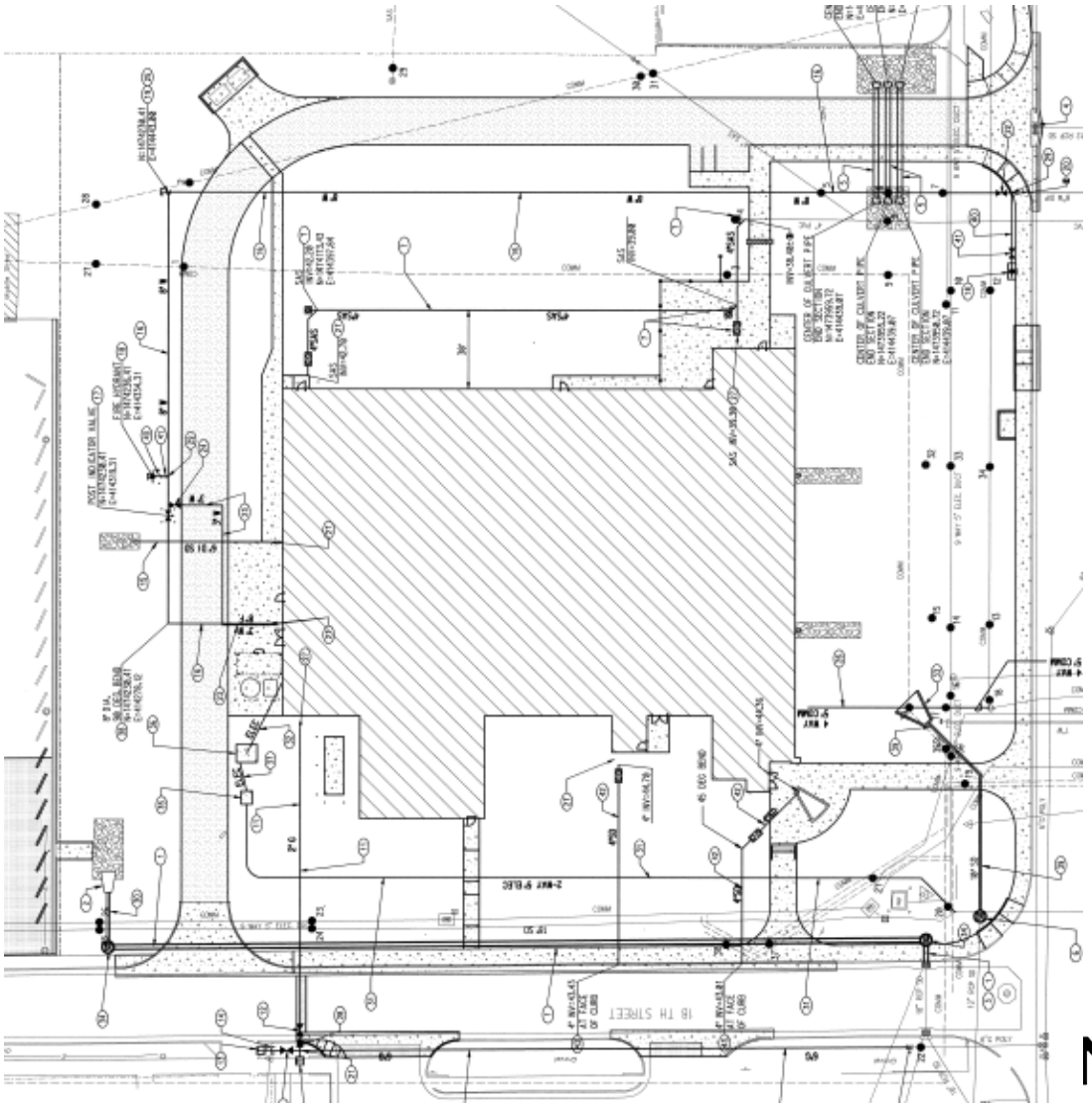
Site Layout



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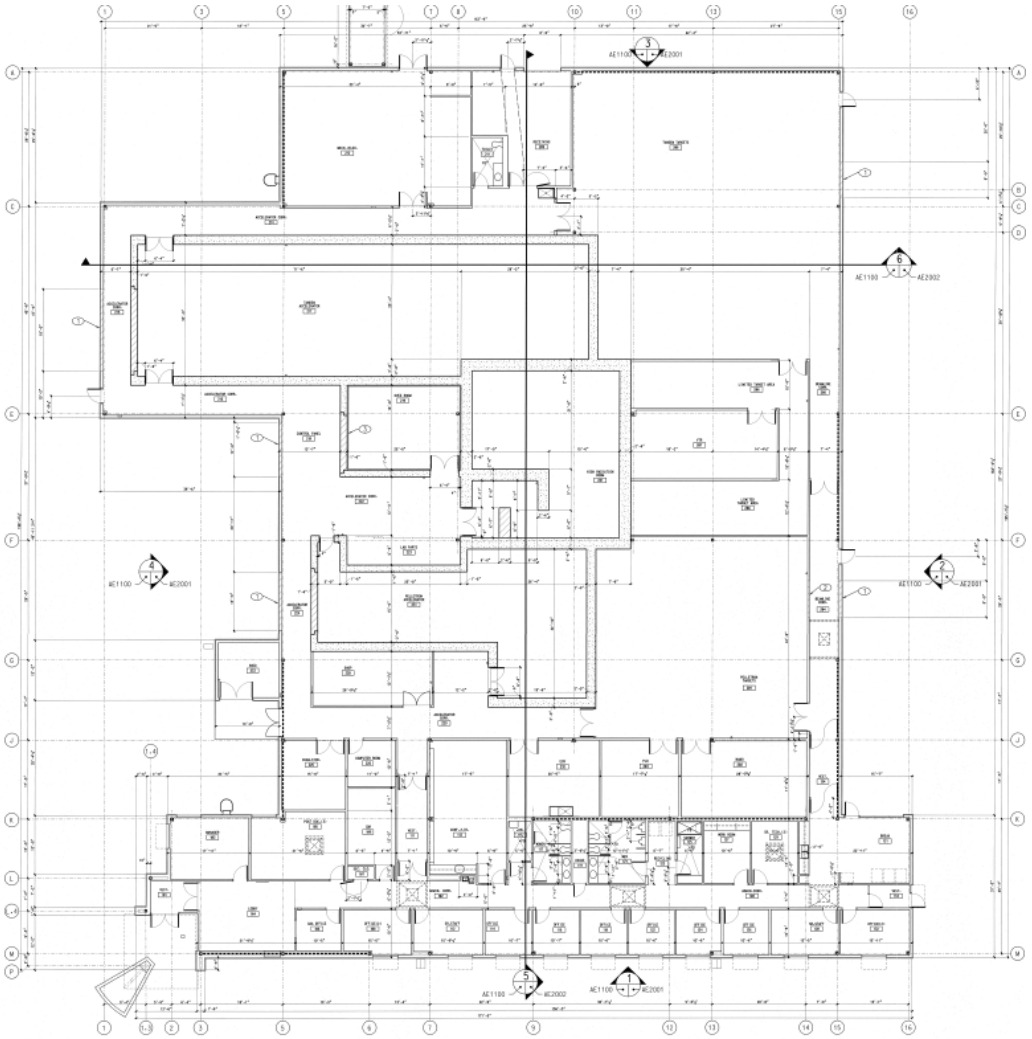
Floor Plan



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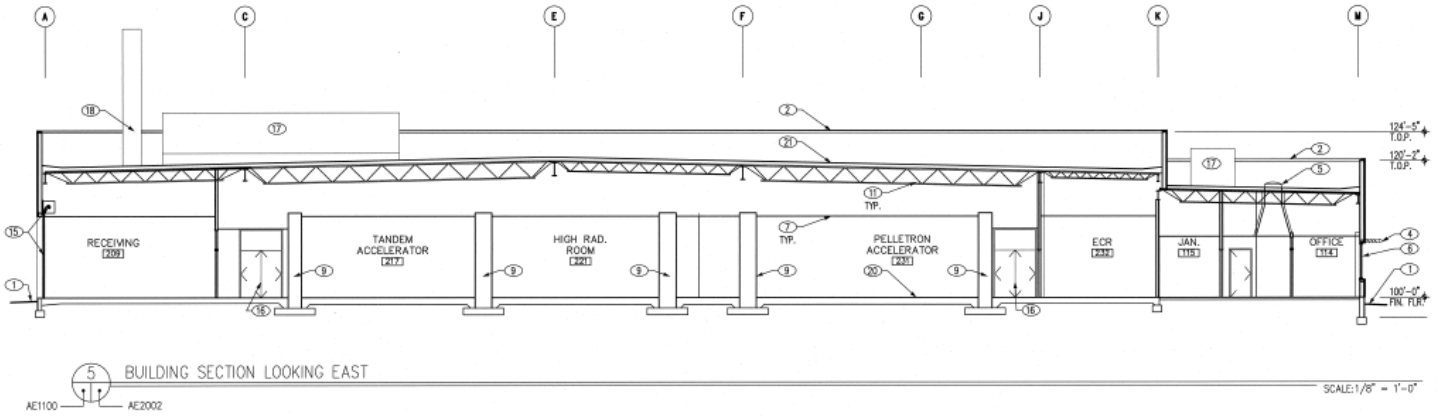
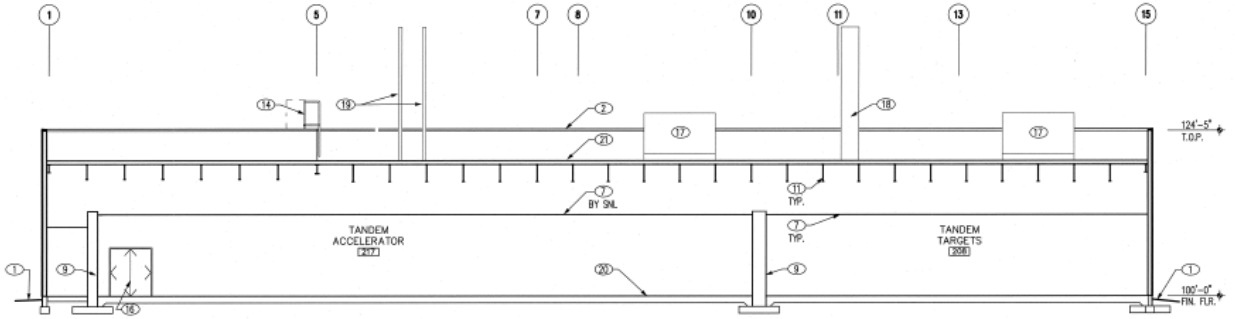
Sectional View



5 BUILDING SECTION LOOKING EAST

AE1100 — AE2002

SCALE: 1/8" = 1'-0"



6 BUILDING SECTION LOOKING NORTH

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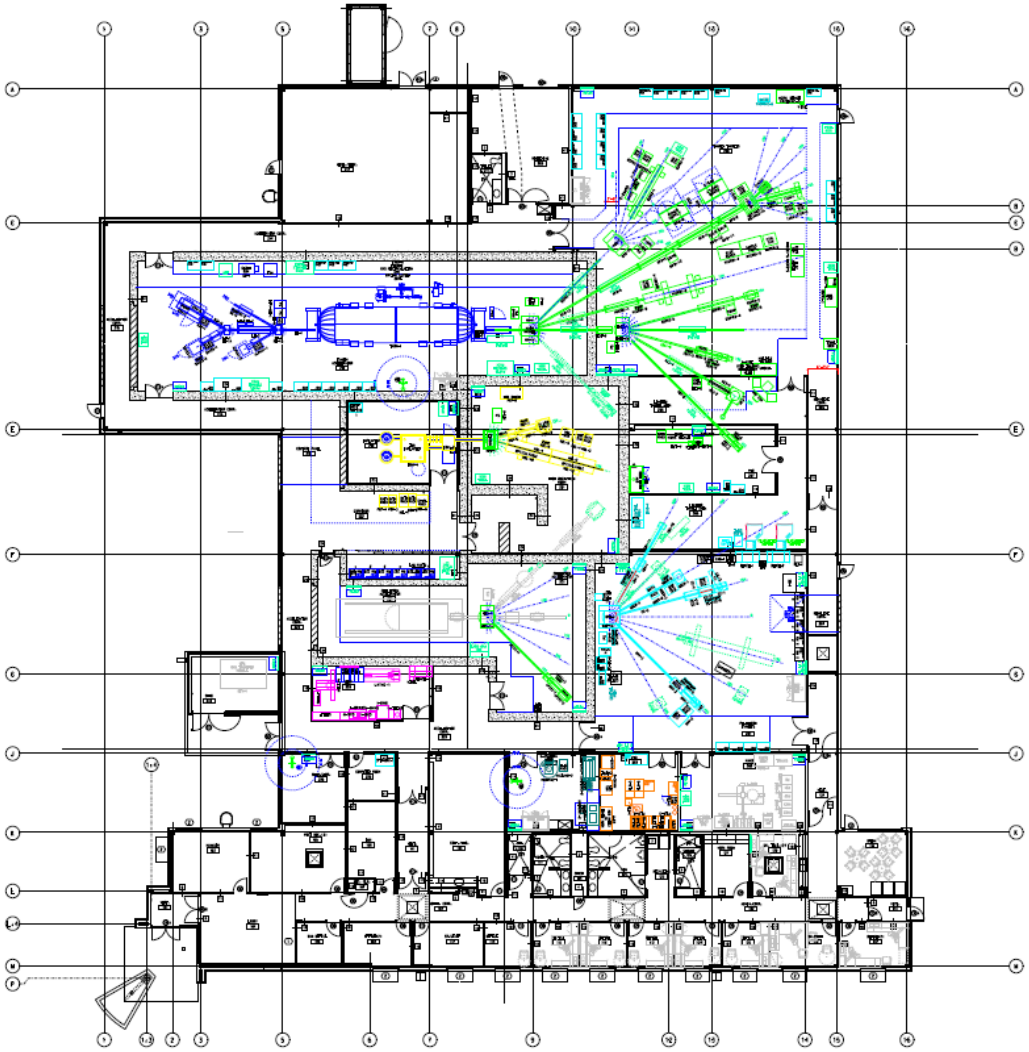
Beam Lines



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Project Description

- *FHA for Newly Constructed Ion Beam Lab*
  - In-depth technical assessment of fire protection and life safety features
  - Facility fire safety objectives of DOE Order 420.1B
  - Life safety objectives of DOE Order 420. 1B and DOE Order 440.1B
  - “Highly Protected Risk” objectives of DOE Order 420.1B

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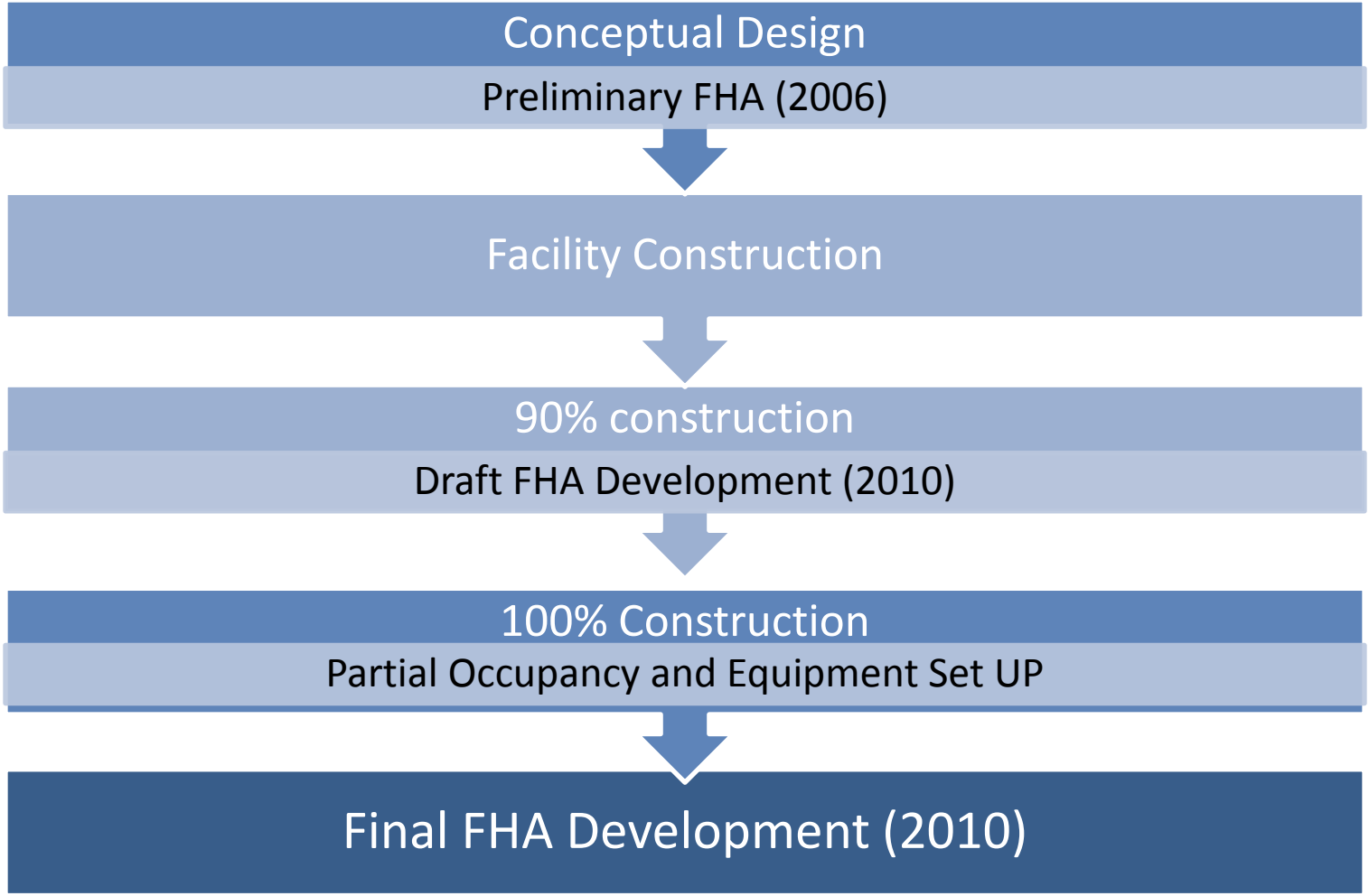
Fire Hazard Analysis Process



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Preliminary FHA (PFHA)

- Required to fulfill requirements of DOE orders and Sandia National Laboratory requirements
- Establishes critical path for entire project

  Identification of Code of Record

    IBC and IFC,2006 edition

    NFPA 101, 2003 edition
- Occupancy Classification

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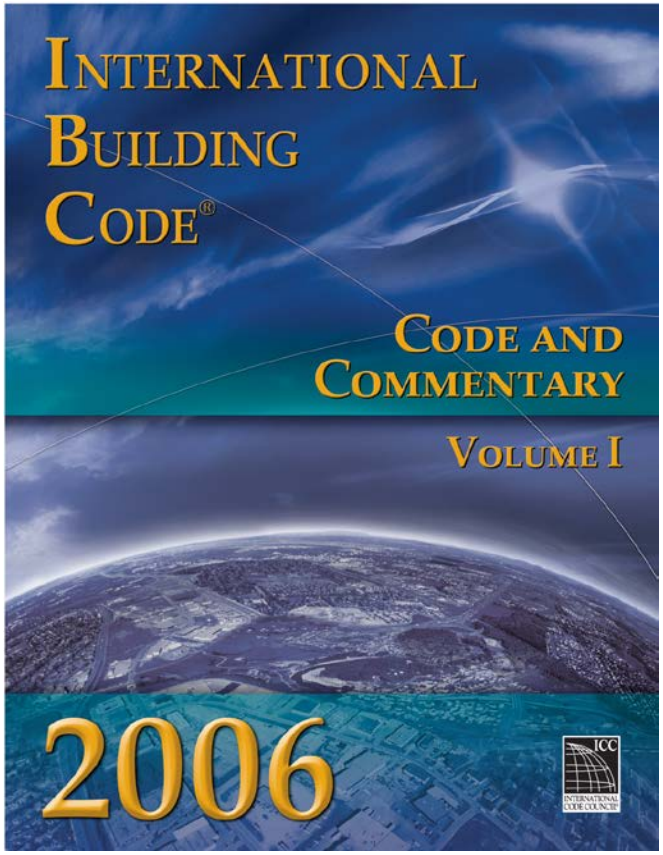
Occupancy Classification



Section 304-Business Group B

Laboratories: testing and research

This section identifies the general characteristics and lists examples of occupancies that are classified in Group B.

Note that the description recognizes the need for limited storage spaces that are incidental to office occupancies.

Must not exceed maximum quantities of hazardous materials allowed in Section 307.

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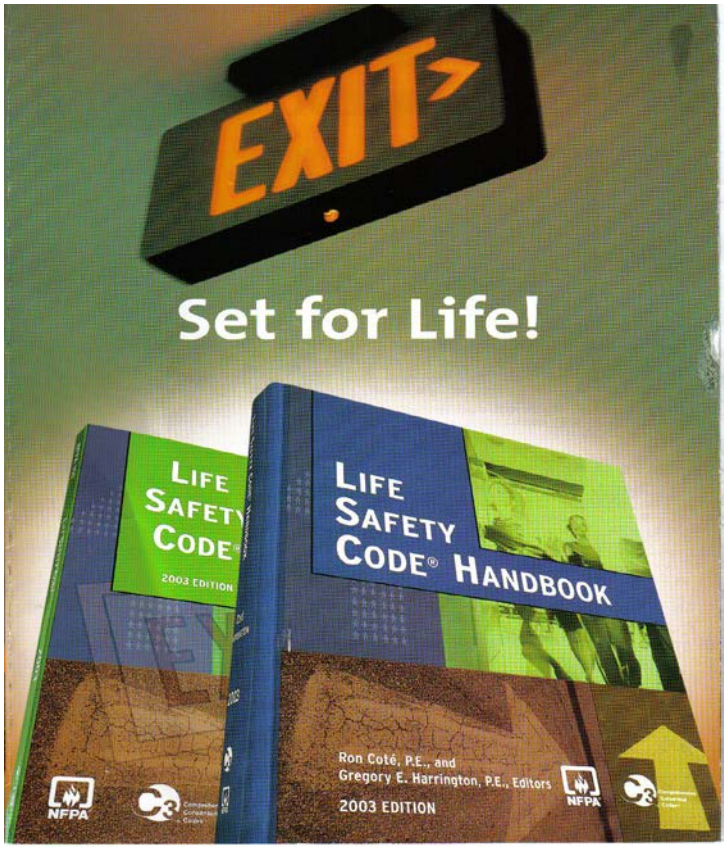
Occupancy Classification

NFPA 101

*Business Occupancy

* *Based upon associated hazard and intended use at time of PFHA*



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Site Visit for FHA

Users Involvement Challenges:

- Use of labs
- Chemicals
- Users “wish list” of materials
- Classification of Liquids
- Use of future materials, unknown

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Classification of Materials

- Type of material
- Quantity of material
- Storage practice
  - Container type
  - location

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Material Storage Limitation

- Control Areas (MAQ's)
  - Indoor (2)
  - Outdoor
- IBC Requirement
- IFC Requirements
- NFPA 45
- NFPA 1

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Control Area

Inside a building, a control area is *a space bounded by exterior walls, fire walls, fire barriers, horizontal assemblies, roofs or a combination of these.*

The amount of hazardous materials stored and used in a control area must be equal to or less than the MAQ (IBC).

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Control Area

The MAQ is based on the physical state, situation and hazard classification of the material. Up to the MAQ for each class of hazardous material is permitted in each control area (IBC).

The concept of the control area is to limit the maximum allowable quantity (MAQ) of hazardous materials per control area rather than per building, and then limit the number of control areas within each building (IBC).

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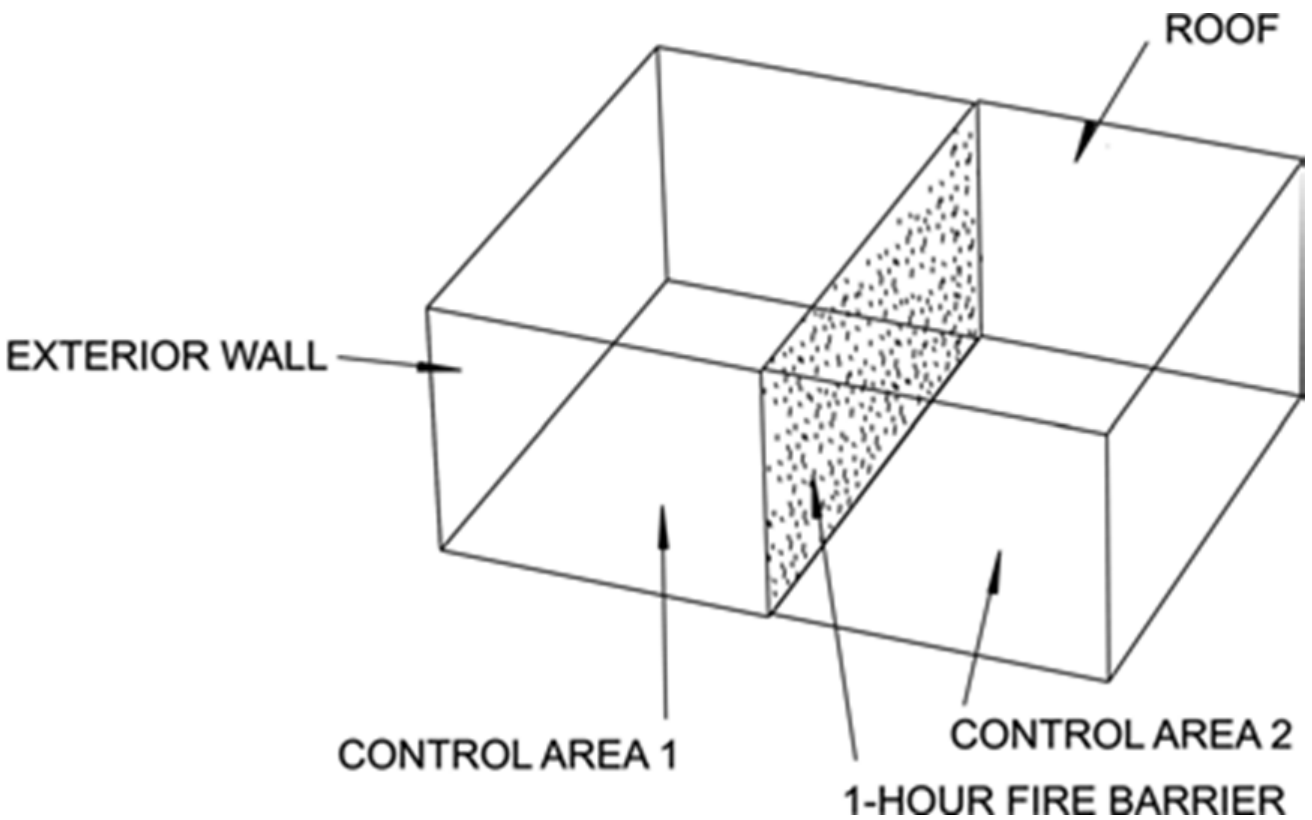
Control Area



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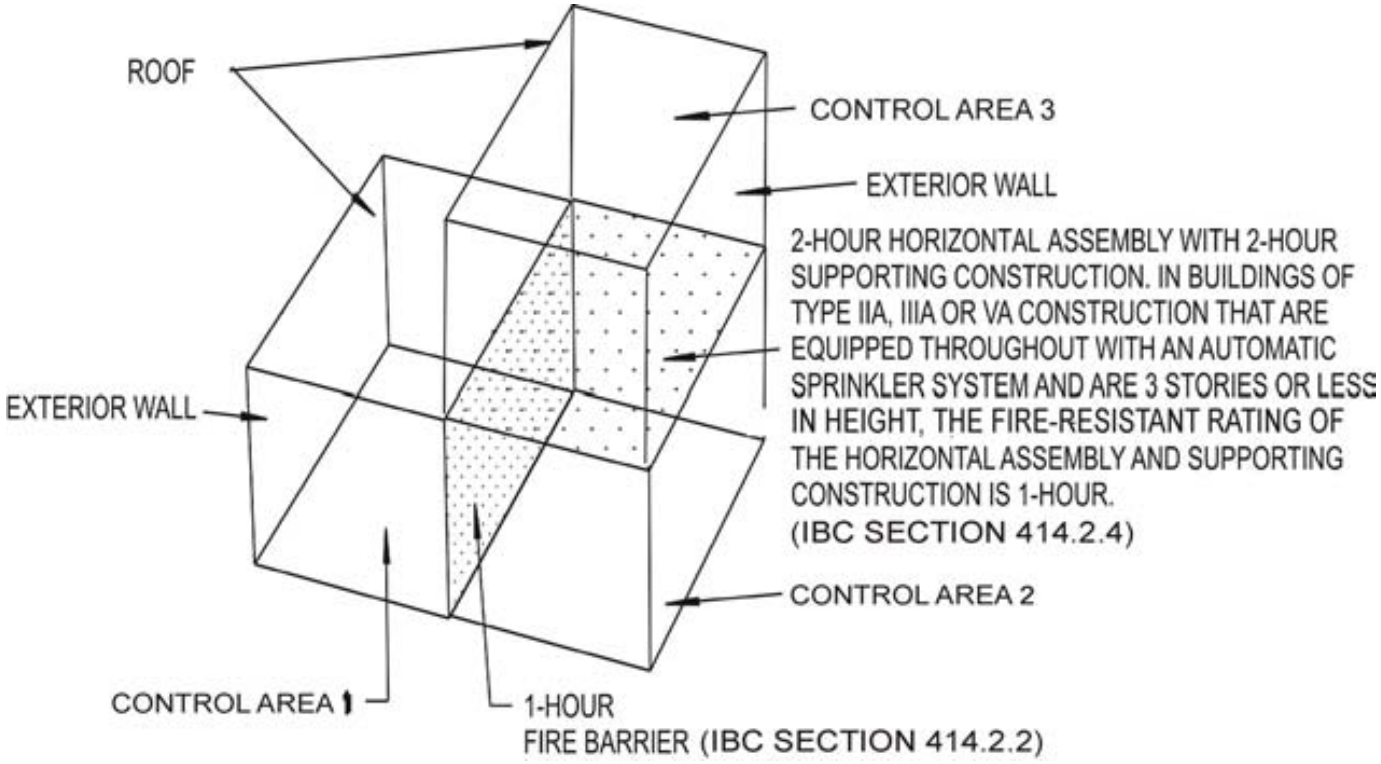
Control Area



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Development of FHA

- MAQ's Identified (Business Occupancy)
- Tables summarize **General limitations**

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FHA Comments

- Identify Materials with Classification
- Identify MAQ's for ***Actual*** Quantities
  - Tables need to Reflect Actual Materials, *not* in General Terms
- Apply later edition of NFPA 1 (2006)
- Modify Occupancy Classification from Business Occupancy to Industrial

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Comment Resolution

- Development of Material Inventory
- Tables reflect actual user materials
- Used code of record
- No need to change occupancy classification (MAQ not exceeded)

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Code Change Impact

- NFPA 1 (2003 Ed)- MAQ's same for both occupancies (one table)

60.2.2.1 General Quantity Limits for Indoor and Outdoor Storage and Use. Maximum allowable quantities permitted in control areas shall be as specified in Table 60.2.2.1(a) and Table 60.2.2.1(b), except that occupancies having special quantity limits in 60.2.3 through 60.2.3.6.6 shall also comply with those limits.

60.2.3.2 Business and Industrial Occupancies.

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Code Change Impact

- NFPA 1, (2006 Ed)
  - Tables were added for specific occupancies such as business
  - 2006 Industrial Occupancy Table is the same as the 2003 Business/Industrial
  - 2006 Business Occupancy Table is different

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Material Inventory Example

Inventory as of 8/31/10

Location	Containers	Emergency Management Quantity	RUnit	Fire Protection Rollup Quantity	FP Unit	Physical State	Name	Health	Fire	React	Special	Classification	Classification	Classification	Classification
NM/720/225	1	0.001321703	GAL	0.001321703	GAL	Liquid	2110 & 2400 CIRCUIT WORKS CONDUCTIVE EPOXY PART B-EPOXY HARDENER	1	1	0	N/A	Class IIIB Combustible Liquid	Irritant		
NM/720/225	2	0.0617288	LBS	0.0617288	LBS	Solid	2110 & 2400 CIRCUIT WORKS CONDUCTIVE SILVER EPOXY KIT PART A RESIN / PART B EPOXY	2	1	0	N/A	Class IIIB Combustible Liquid	Irritant		
NM/720/225	1	0.25	GAL	0.25	GAL	Liquid	3116K HIGH SPEED TURBO OIL	1	1	0	N/A	Class IIIB Combustible Liquid			
NM/720/203	1	1	LBS	1	LBS	Solid	44 ROSIN FLUX CORED SOLDER	1	2	0	N/A	Class IIIB Combustible Liquid	Irritant	Sensitizer	
NM/720/203	1	2.4948	LBS	20	CUFT	Gas	5% FLUORINE BAL HELIUM	3	0	1	N/A				
NM/720/217	1	0.1875	LBS	0.1875	LBS	Solid	5920 COPPER HIGH PERFORMANCE RTV SILICONE GASKET MAKER	1	1	0	N/A	Class IIIB Combustible Liquid	Irritant		
NM/720/201	1	0.008289828	GAL	0.008289828	GAL	Liquid	5-MINUTE EPOXY HARDENER	3	1	0	N/A				
NM/720/225	1	0.022046	LBS	0.022046	LBS	Solid	69 GRADE ALUMINUM	U	U	U	U	No MSDS available			
NM/720/225	1	0.055115	LBS	0.055115	LBS	Solid	69 GRADE ANTIMONY	U	U	U	U	No MSDS available			
NM/720/225	1	0.055115	LBS	0.055115	LBS	Solid	69 GRADE TIN	U	U	U	U	No MSDS available			
NM/720/201	1	1	GAL	1	GAL	Liquid	75724 SKELLITE	1	4	0	N/A				
NM/720/201	1	0.125	LBS	0.125	LBS	Solid	A-1 FIX & PATCH, PART 1/2	U	U	U	U				
NM/720/201	1	0.2641721	GAL	0.2641721	GAL	Liquid	ACETONE	2	3	0	N/A	Class IB			
NM/720/225	2	1.3208605	GAL	1.3208605	GAL	Liquid	ACETONE	2	3	0	N/A	Class IB			
NM/720/201	1	10	LBS	10	LBS	Solid	ACTIVATED CARBON, >1% QUARTZ	1	1	1	N/A	Unstable Reactive Class 1	Irritant	Combustible Dust	Asphyxiant
NM/720/225	2	0.5141721	GAL	0.5141721	GAL	Liquid	ALCATEL 100 AND ALCATEL 120 OIL	1	0	0	N/A	Class IIIB Combustible Liquid	Irritant	Carcinogen	
NM/720/201	1	4	LBS	4	LBS	Solid	ALCONOX	0	0	0	N/A	Irritant			
NM/720/225	1	4	LBS	4	LBS	Solid	ALCONOX	0	0	0	N/A	Irritant			
NM/720/228	1	0.5	LBS	0.5	LBS	Unknown	ALL STATE SILVER BRAZING FLUX 110	3	0	0	N/A	Corrosive			
NM/720/228	1	0.089480654	GAL	0.089480654	GAL	Liquid	ALL-STATE 430 FLUX, DUZALL FLUX	3	3	0	N/A	Class IB Flammable Liquid	Irritant		
NM/720/225	1	1	LBS	1	LBS	Solid	ALUMINUM, METALLIC, POWDER	1	3	1	N/A	Combustible Dust	Flammable Solid	Class 1 Water Reactive	Other Health Hazard
NM/720/217	5	0.043659	LBS	0.35	CUFT	Gas	AMMONIA (90%)/NITROGEN 15 (BAL)	3	1	0	N/A				
NM/720/201	1	1	LBS	1	LBS	Solid	ANTIMONY	2	2	0	N/A	Combustible Dust	Irritant	Other Health Hazard	
NM/720/225	1	1	LBS	1	LBS	Solid	ANTIMONY	2	2	0	N/A	Combustible Dust	Irritant	Other Health Hazard	
NM/720/217	1	0.031322904	GAL	0.031322904	GAL	Liquid	ANTISTATIC SCREEN CLEANER	1	3	0	N/A	Class IB Flammable Liquid	Irritant		
NM/720/201	5	0.033042566	GAL	0.033042566	GAL	Liquid	APIEZON L	1	1	0	N/A	Combustible Liquid			
NM/720/207	1	0.006608513	GAL	0.006608513	GAL	Liquid	APIEZON L	1	1	0	N/A	Combustible Liquid			
NM/720/208	2	0.002643405	GAL	0.002643405	GAL	Liquid	APIEZON L	1	1	0	N/A	Combustible Liquid			
NM/720/221	4	0.026434053	GAL	0.026434053	GAL	Liquid	APIEZON L	1	1	0	N/A	Combustible Liquid			

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IFC MAQ's per Control Area

		Storage			Use-Closed Systems			Use-Open Systems	
Material	**Class**	**Solid pounds (cubic feet)**	**Liquid gallons (pounds)**	**Gas (cubic feet at NTP)**	**Solid Pounds (cubic feet)**	**Liquid gallons (pounds)**	**Gas (cubic feet at NTP)**	**Solid pounds (cubic feet)**	**Liquid gallons (pounds)**
Combustible liquid	II IIIA IIIB	N/A	120 [1,2] 330 [1,2] 13,200[2,3]	N/A	N/A	120[1] 330[1] 13,200[3]	N/A	N/A	30[1] 80[1] 3,300[3]
Flammable gas	Gaseous Liquefied	N/A N/A	N/A 30 [1,2]	1,000 [1,2] N/A	N/A	N/A 30[1,2]	1,000[1,2] N/A	N/A	N/A
Flammable liquid	1A, 1B and 1C	N/A N/A	30 [1,2] 120 [1,2]	N/A N/A	N/A	30[1] 120[1]	N/A	N/A	10 [1] 30 [1]
Combination flammable (1A, 1B, 1C)	N/A	N/A	120 [1,2,5]	N/A	N/A	120[1,5]	N/A	N/A	30[1,5]
Flammable solid	N/A	125[1,2]	N/A	N/A	N/A	125[1]	N/A	25[1]	N/A
Organic peroxide	UD I II III IV V	1[2,4] 5[1,2] 50[1,2] 125[1,2] NL NL	(1)[2,4] (5) [1,2] (50) [1,2] (125) [1,2] NL NL	N/A N/A N/A N/A N/A N/A	0.25[4] 1[1] 50[1] 125[1] N/L N/L	(0.25)[4] (1) (50)[1] (125)[1] N/L N/L	N/A N/A N/A N/A N/A N/A	0.25[4] 1[1] 10[1] 25[1] N/L N/L	(0.25)[4] (1)[1] (10)[1] (25)[1] N/L N/L
Oxidizer	4 3[6] 2 1	1[2,4] 10[1,2] 250[1,2] 4,000[2,3]	(1)[2,4] (10)[1,2] (250)[1,2] (4,000)[2,3]	N/A N /A N/A N/A	0.25[4] 2[1] 250[1] 4,000[3]	(0.25)[4] (2)[1] (250)[1] (4,000)[3]	N/A N /A N/A N/A	0.25[4] 2[1] 50[1] 1,000[3]	(0.25)[4] (2)[1] (50)[1] (1,000)[3]
Oxidizing gas	Gaseous liquefied	N/A N/A	N/A 15[1,2]	1,500[1,2] N/A	N/A N/A	N/A 15[1,2]	1,500[1,2] N/A	N/A N/A	N/A N/A
Pyrophoric material	N/A	4 [2,4]	(4)[2,4]	50[2,4]	1[4]	(1)[4]	10[2,4]	0	0
Unstable (reactive)	4 3 2 1	1[2,4] 5[1,2] 50[1,2] NL	(1) [2,4] (5)[1,2] (50)[1,2] NL	10 50[1,2] 250[1,2] N/L	0.25[4] 1[1] 50[1] NL	(0.25)[4] (1)[1] (50)[1] NL	2 [2,4] 10[1,2] 250[1,2] NL	0.25[4] 1[1] 10[1] NL	0.25)[4] (1)[1] (10)[1] NL
Water reactive	3 2 1	5[1,2] 50[1,2] NL	(5)[1,2] (50)[1,2] NL	N/A N/A N/A	5[1] 50[1] NL	(5)[1] (50)[1] NL	N/A N/A N/A	1[1] 10[1] NL	(1)[1] (10)[1] NL

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Lessons Learned

- Establish an occupancy classification to provide flexibility for future
- Identify actual materials during PFHA
- Identify quantity of material during PFHA
- Partner with user of facility and have open communication to meet everyone's needs

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Questions?

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