Do I Operate a Group H Occupancy?

How Hazardous Materials Use and Storage Impacts Your Facility's Occupancy Classification

Mike Snyder, PE, CSP, CFPS
Vice President, Operational Risk Management
(609) 578-8441 | Mike.Snyder@dekra.com
https://www.linkedin.com/in/SafetySnyder/

Michigan Safety Conference | Chemical Division
April 13, 2021

Safety Challenge

Let's Share More about Safety!

- Find at least one thing to take back to your facility to share with others
- Connect on LinkedIn and continue the discussion
- Ask questions!

? Please chat during the webinar and feel free to reach out to me with additional questions or comment.

Outline for Today's Discussion

- Provide an overview of the Hazardous Materials section of the International Fire Code (IFC).
- Explain the Group H (Hazardous) Occupancies in the IFC.
- 3-Step Process to determine if your operations are required to be located in a structure meeting Group H requirements.
- Overview unique requirements for Occupancy Classification involving Combustible Dust.

Understanding the Basis of Safety: Hand Sanitizer Manufacturing

Good Intentions Can Overlook Flammable Liquid Hazards

- Equipment Design
- Electrical Equipment Hazard Ratings
- Proper Ventilation
- Dispensing Hazards
- Increase Storage Volumes – Fire & Building Code Limits

! Look at these Hazards through the Lens of Today's Presentation.


It’s built, you’re ready!
All you need is a permit.
But then the Inspector
tells you about Group H.

International Fire Code

part of the International Code Council

ICC's Reach

- 15 Codes
- 377 Chapters
- 55 countries
- 64,000 members

ICC's Scope

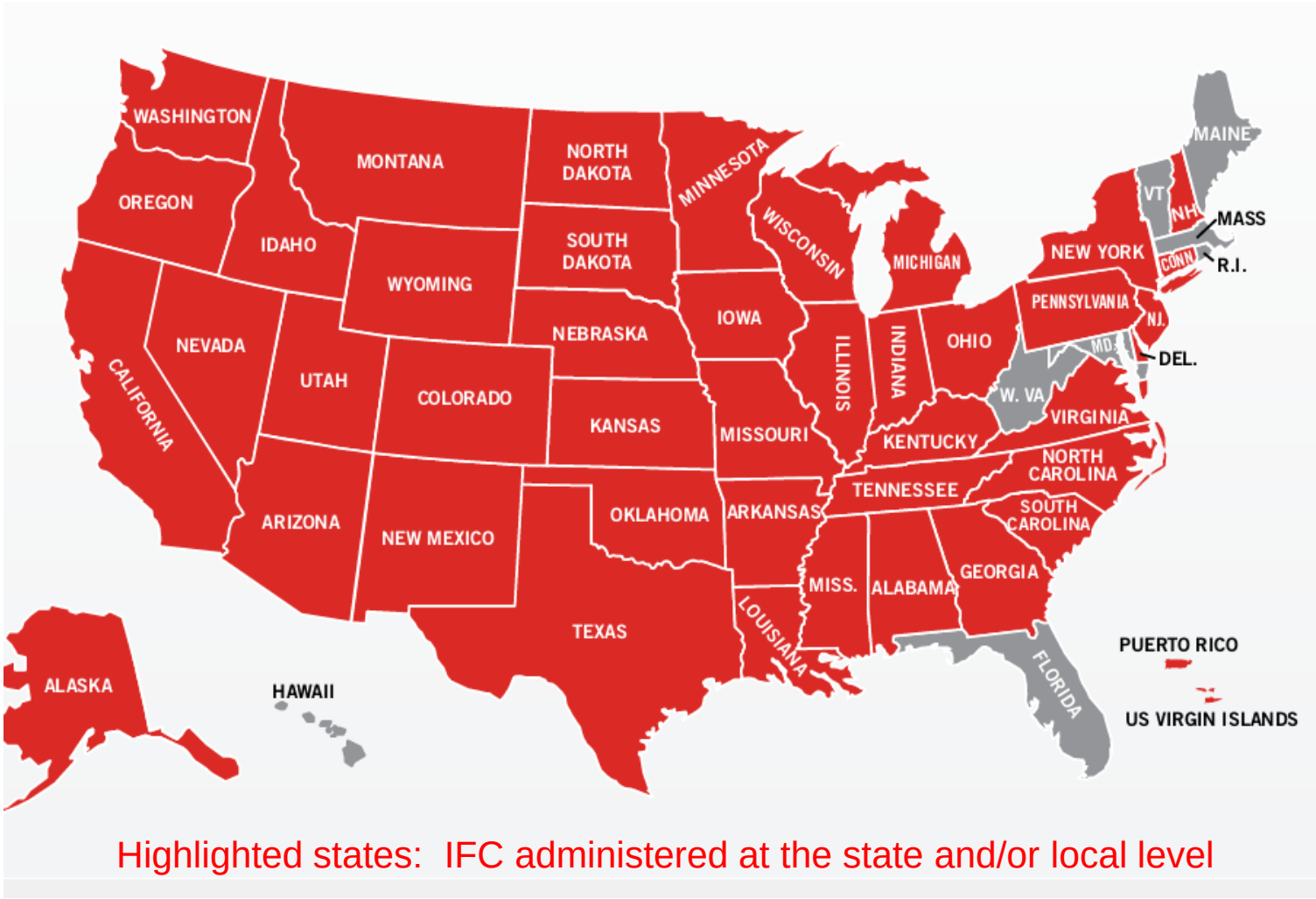
- Buildings
- Energy
- Zoning

Relevance

- IFC last updated in 2021

Click here to access an online copy of the IFC.

State Adoption as Law



Highlighted states: IFC administered at the state and/or local level

Enforcement

Administered by *Fire Code Officials*

- Code Inspectors
- Fire Officials
- Building Inspectors

Permit Requirements

- Building Permits
- Occupancy Permits

Intent

- Establish Minimum Requirements
- Life Safety
- Property Protection
- Fire Fighter & Emergency Responder Safety

Group H Occupancies

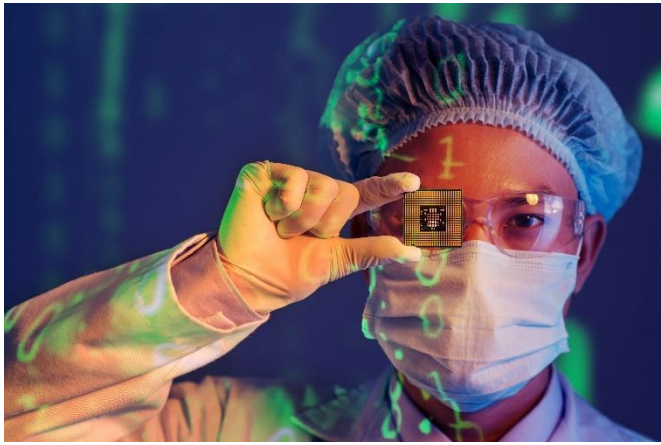
Occupancy Types

- Group A | Assembly Areas
- Group B | Business
- Group E | Educational
- Group F | Factory
- Group H | High Hazard
- Group I | Institutional
- Group R | Residential
- Group S | Storage
- Group U | Miscellaneous

Group H Occupancies

More than one Group may apply!

- Group H-1: Detonation Hazards
- Group H-2: Deflagration Hazards
- Group H-3: Physical Hazards
- Group H-4: Health Hazards
- Group H-5: Semiconductor fabrication and R&D



Control Area Requirements (IBC sections 414 & 415)

CONTROL AREA SIZE

MAXIMUM NUMBER OF CONTROL AREAS

CONTROL AREA HEIGHT RESTRICTIONS

Group H Occupancies

Other IBC 414 and 415 Requirements

- Fire and gas detection
- Sprinklers & alarms
- Construction methods, fire barriers & fire resistance
- Separation distances
- Containment and drainage
- Means of egress

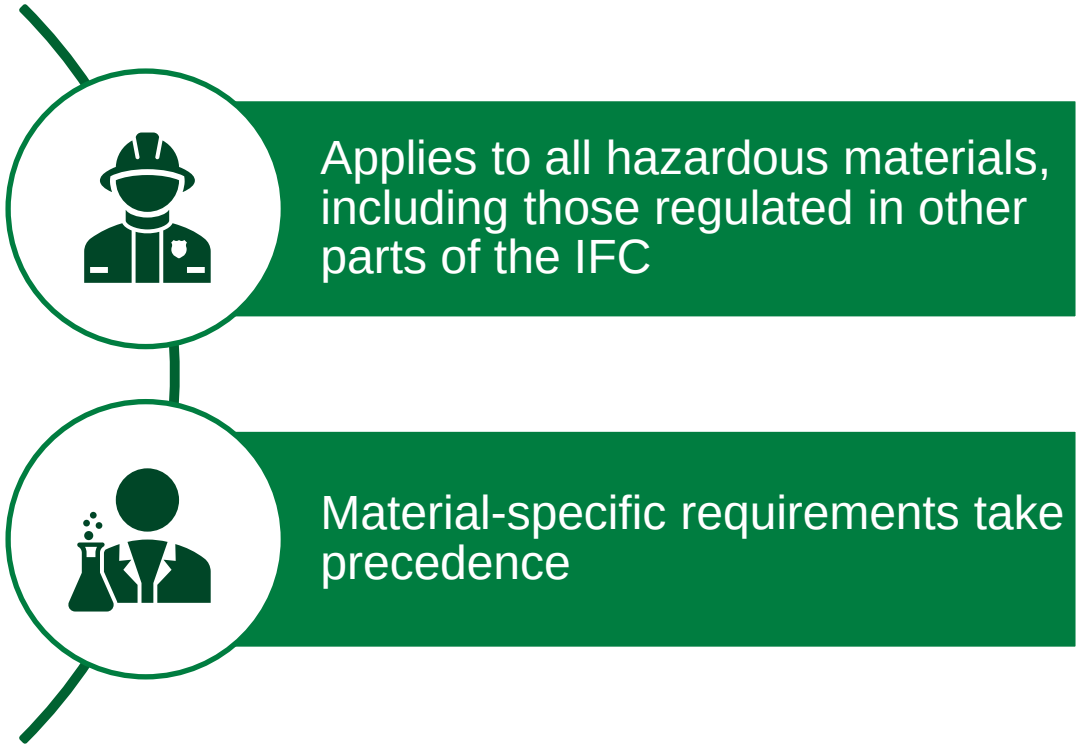
Part V – Hazardous Materials

Chapters 50 – 67 include “General Requirements” and 16 hazard-specific chapters.

- Aerosols
- Compressed Gases
- Corrosive Materials
- Cryogenic Fluids
- Explosives and Fireworks
- Flammable / Combustible Liquids
- Flammable Gases and Cryogenic Fluids
- Toxic Materials
- LPG
- Organic Peroxides
- Oxidizers
- Pyrophorics
- Pyroxylin Plastics
- Reactive materials
- Water reactives

Chapter 50 Intent

Prevention, control and mitigation of dangerous conditions related to storage, dispensing, use and handling of hazardous materials



Occupancy Classification 3-Step Process:

1. Characterize the Hazardous Material(s) Planned or Used

2. Determine Use Category of Each Hazardous Material

3. Properly Account for the Quantity of Hazardous Material

MATERIAL

CLASS

SOLID, LIQUID AND GAS PHASES

STORAGE, CLOSED SYSTEM AND OPEN SYSTEM USE

OCCUPANCY GROUP WHEN EXEMPT QUANTITY IS EXCEEDED

Material Classification

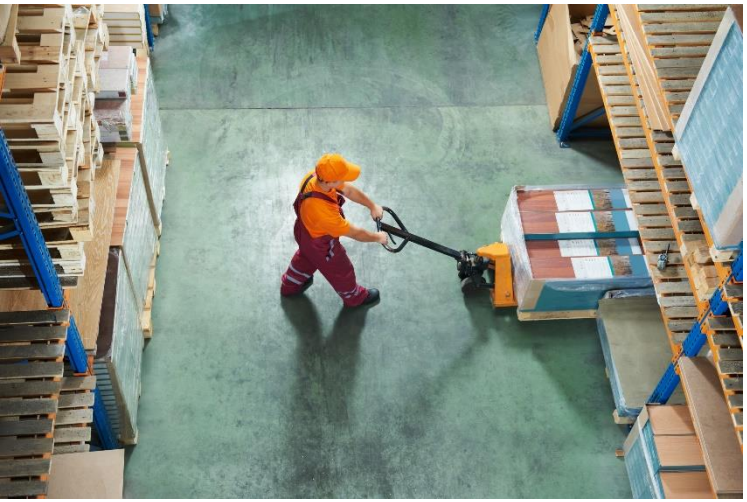
Note on Mixtures

Classified in accordance with the hazards of the mixture as a whole

Physical Hazard Categories

- Explosive / Blasting Agent
- Combustible (Dusts & Fibers)
- Flammable
- Organic Peroxide
- Oxidizers / Oxidizing Gases
- Pyrophoric
- Unstable (reactive)
- Water Reactive
- Cryogenic

Material Classification



Health Hazard Categories

Toxic Materials

Highly Toxic Materials

Corrosive Materials

Note on Mixtures

Classified in accordance with the hazards of the mixture as a whole

Hazardous Material Uses

STORAGE

The keeping, retention or leaving of hazardous materials in closed containers, tanks, cylinders or similar vessels, or vessels supplying operations through closed connections.

CLOSED SYSTEM
Vessel or System that remains closed during operation

OPEN SYSTEM Vessel or system that is continuously open (or the product is exposed) to the atmosphere during normal operations and vapors are liberated

Maximum Allowable Quantities are specified per Control Area by hazard type

Control Area

- Spaces within a building where quantities of hazardous materials do not exceed the MAQ per control area are stored, dispensed, used or handled

Outdoor Control Area

- An outdoor area that contains hazardous materials in amounts not exceeding the MAQ
- Some MAQs are different for Outdoor vs. Indoor Control Areas

Maximum Allowable Quantity

Separate tables for Physical and Health Hazards

Indoor Control Areas

Chapter 50 Table 5003.1.1(1) for Physical Hazards

Chapter 50 Table 5003.1.1(2) for Health Hazards

Outdoor Control Areas

Chapter 50 Table 5003.1.1(3) for Physical Hazards

Chapter 50 Table 5003.1.1(4) for Health Hazards

A Brief Example:
"I want to use some Flammable Liquids"

Table 5003.1.1(1)
MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIALS POSING A PHYSICAL HAZARD (a,j,n,m,p)

MATERIAL	CLASS	GROUP WHEN THE MAXIMUM ALLOWABLE QUANTITY IS EXCEEDED	STORAGE (b)			USE-CLOSED SYSTEMS (b)			USE-OPEN SYSTEMS (b)	
			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)
Flammable Liquid (c)	IA	H-2 or H-3	NA	30 (d,e)	NA	NA	30 (d)	N/A	NA	10 (d)
	IB and IC			120 (d,e)			120 (d)			30 (d)
			1	2		3		4		5

1 – Chemical Category

2 – Occupancy Classification if Allowable Quantity is Exceeded

3 – Maximum Quantity for Storage (Maximum Base Quantity Allowed)

4 – Maximum Quantity for Closed Systems

5 – Maximum Quantity for Open System

ICC Sponsored Tool:
HMEx Assistant™
www.Hmexassistant.com

MAQ for Combustible Dust: A Special Consideration

DEKRA

!

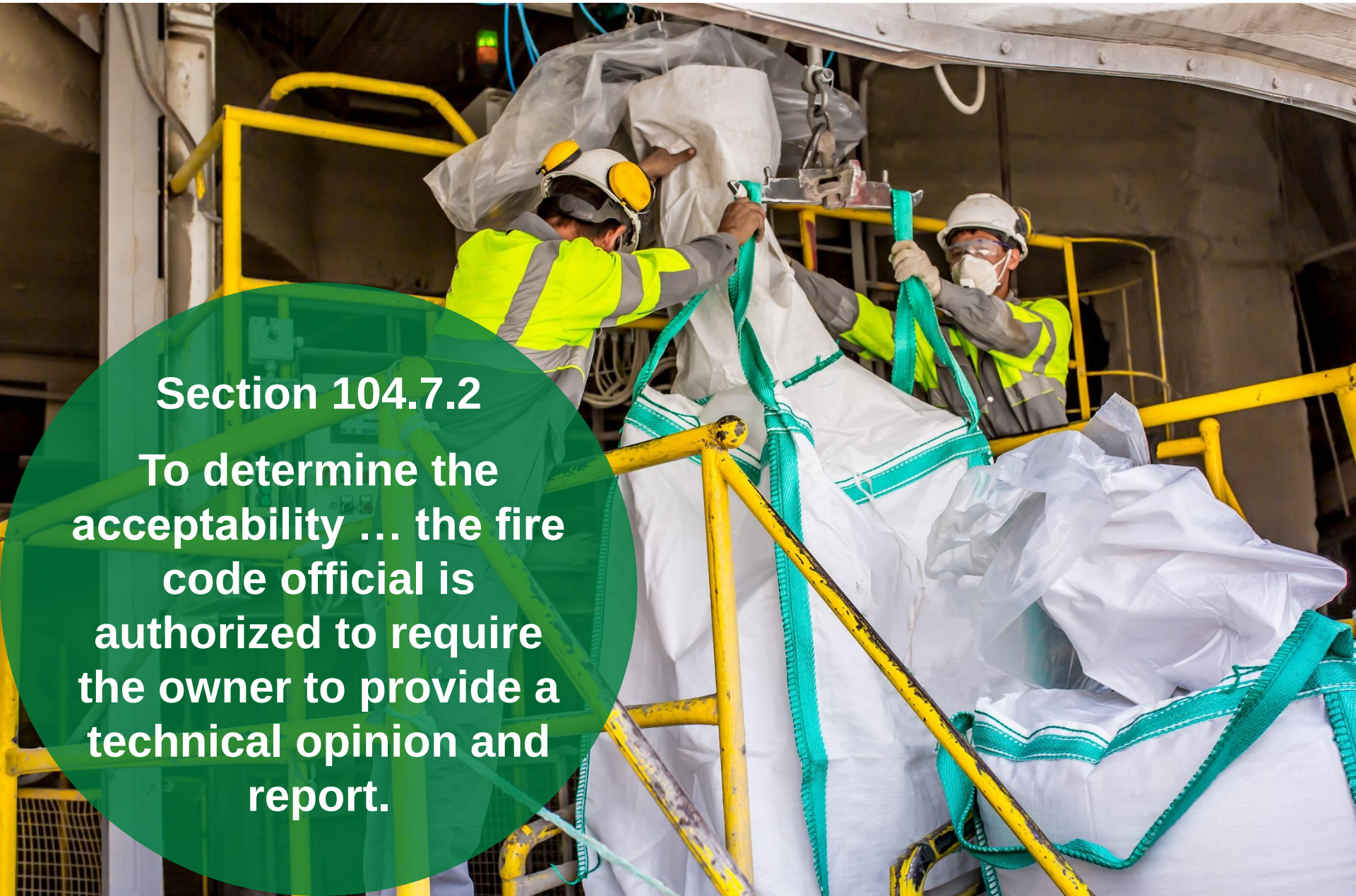
Tables do not list an MAQ for Combustible Dust!
Use **footnote (q) from Table 5003.1.1(1)**

Where manufactured, generated or used in such a manner that the concentration and conditions create a fire or explosion hazard based on the information prepared in accordance with Section 104.7.2

If you have combustible dust per (above), follow Section 104.7.2!

MAQ for Combustible Dust

DEKRA



Section 104.7.2

To determine the acceptability … the fire code official is authorized to require the owner to provide a technical opinion and report.

MAQ for Combustible Dust

Technical Report Requirements

- Qualified engineer or specialist
- Analyze the fire safety of the design, operation and use of the buildings / premises
- Recommend changes
- May require PE stamp
- Must be approved by the fire code official

Specific Hazards

DEKRA

IFC Chapters		
51 - Aerosols	58 – Flammable Gases & Flammable Cryogenic Fluids	64 - Pyrophoric Materials
53 - Compressed Gases	59 – Flammable Solids	65 - Pyroxylin (Cellulose Nitrate) Plastics
54 - Corrosive Materials	60 – Highly Toxic and Toxic Materials	66 - Unstable (reactive) materials
55 - Cryogenic Fluids	61 – LPG	67 - Water-Reactive Solids and Liquids
56 - Explosives and Fireworks	62 – Organic Peroxides	
57 - Flammable and Combustible Liquids	63 - Oxidizers, Oxidizing Gases and Oxidizing Cryogenic Fluids	

Performance-based Design

Technical Mitigation

- Spill Mitigation
- Ignition Hazard Mitigation
- Protection of Hazardous Materials
- Exposure Mitigation
- Release Detection
- Ventilation
- Reliable Power Source

Management Systems

- Properties & hazards shared with Fire Code Official
- Reliability of Equipment & Operations
- Pre-Startup Safety Review
- Management of Change
- Emergency Plan
- Accident Procedures
- Consequence Analysis
- Safety Audits

Need Help?

1. **Explore options early** in the project life-cycle, considering changes that might occur at your facility.
2. **Contact us** to help with Occupancy Classification questions and to explore engineering assessment options.
3. **Don't ignore** combustible dust and other material hazards. **Learn more** about hazards that exist at your facility.

Flammable Liquids, Vapors and Gases

- Request a class at your facility (5 person min.)
- Request a public class near your city

2-Day Course:

Combustible Dust Fundamentals (NFPA 652)

4-Day Virtual Course: $895

- April 19-22, 2021 - Virtual Training
- May 24-27, 2021 - Virtual Training
- Request a class at your facility (5 person min.)

Concluding Thoughts

Concluding Thoughts

- **Hazardous Materials storage & use matters!**
  (It can have significant impact to the building configuration)
- **Building modifications & changes to operations matter!**
  (Changes can impact license to operate)
- **Proper Occupancy Classification determination is Key!**
  - ✓ Characterize the Hazardous Material(s) Planned or Used
  - ✓ Determine Use Category of Each Hazardous Material
  - ✓ Properly Account for the Quantity of each Hazardous Material
- **Awareness of potential for Group H-2 Occupancy classification issues related to Combustible Dust**

Thank you!

Mike Snyder, PE, CSP, CFPS

(609) 578-8441 | Mike.Snyder@dekra.com

www.Dekra.us/process-safety

Do I Operate Group H Occupancy? (Article) CLICK HERE

Chemical Engineering Progress Feb 2021 Article: Demystifying Building Code Occupancy Classification CLICK HERE

Request Training CLICK HERE

References (with Free Access)

- 2018 IBC: International building code. (2017), International Code Council; Accessed through: https://codes.iccsafe.org/content/IBC2018
- 2018 IFC: International fire code. (2017), International Code Council; Accessed through: https://codes.iccsafe.org/content/IFC2018
- DEKRA Process Safety: **SAFETY GUIDE** : A strategic guide to characterization and understanding Handling Dusts and Powders Safely
- National Fire Protection Association, "NFPA 400: Hazardous Materials Code", 2019, http://www.nfpa.org/400
- Snyder, M.D. (2021). Demystifying Building Occupancy Code Classification. *Chemical Engineering Progress*, 117(2), 45-51