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Integrating Early Hazard Coordination

MEET SAFETY + QUALITY STANDARDS WHILE PREVENTING UNEXPECTED APPROVAL DELAYS

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Speaker

Director

Christopher Unangst, PE (ChE), PE (FP), CSP, PMP

Christopher is an Engineering Director whose primary responsibilities include safety systems design and evaluation. His responsibilities include leading Dust Hazard Analyses (DHAs), Hazard Mitigation Analyses (HMAs), and facilitating Process Hazard Analyses (PHAs). As a Certified Safety Professional (CSP), he has extensive knowledge in OSHA, EPA, and NFPA regulations. He is a principal on the technical committees of NFPA 660, Standard for Combustible Dusts and Particulate Solids, and NFPA 800, Battery Safety Code.

Agenda

01 Historical Examples

02 Early Engagement

03 Performance-Based Design Strategies

04 Coordination Across Cross-Disciplinary Teams

05 Key Takeaways

01 – Historical Examples

Historical Examples

Drag + Drop!

- Life safety
- Allowable areas / heights and construction type
- Building risk category
- Risk-based versus prescriptive

Historical Examples

Changing Dynamics

+ Shell before process
+ Technological advances
+ Changing user requirements

02 – Early Engagement

Early Engagement

Engage Early + Align

- Identify stakeholders
  - Owner/Operator
  - Construction manager
  - Designer/Builder
  - Building official
  - Fire official
  - Insurance
  - Workplace health and safety

Early Engagement

Engage Early + Align

- Codes and standards
- Establish means of communications
  - Typical
  - Special circumstances
- Align on common goals
- Establish respect and trust

03 – Performance-Based Design Strategies

Performance-Based Design Strategies

Code Approaches

Prescriptive

+ Formulaic	+ Specific
+ Predictable	+ Contextualized
+ Familiar	+ Unique
+ Built on lessons learned	+ Stakeholder collaboration required

Performance-Based

+ Generally easier to resolve requirement conflicts

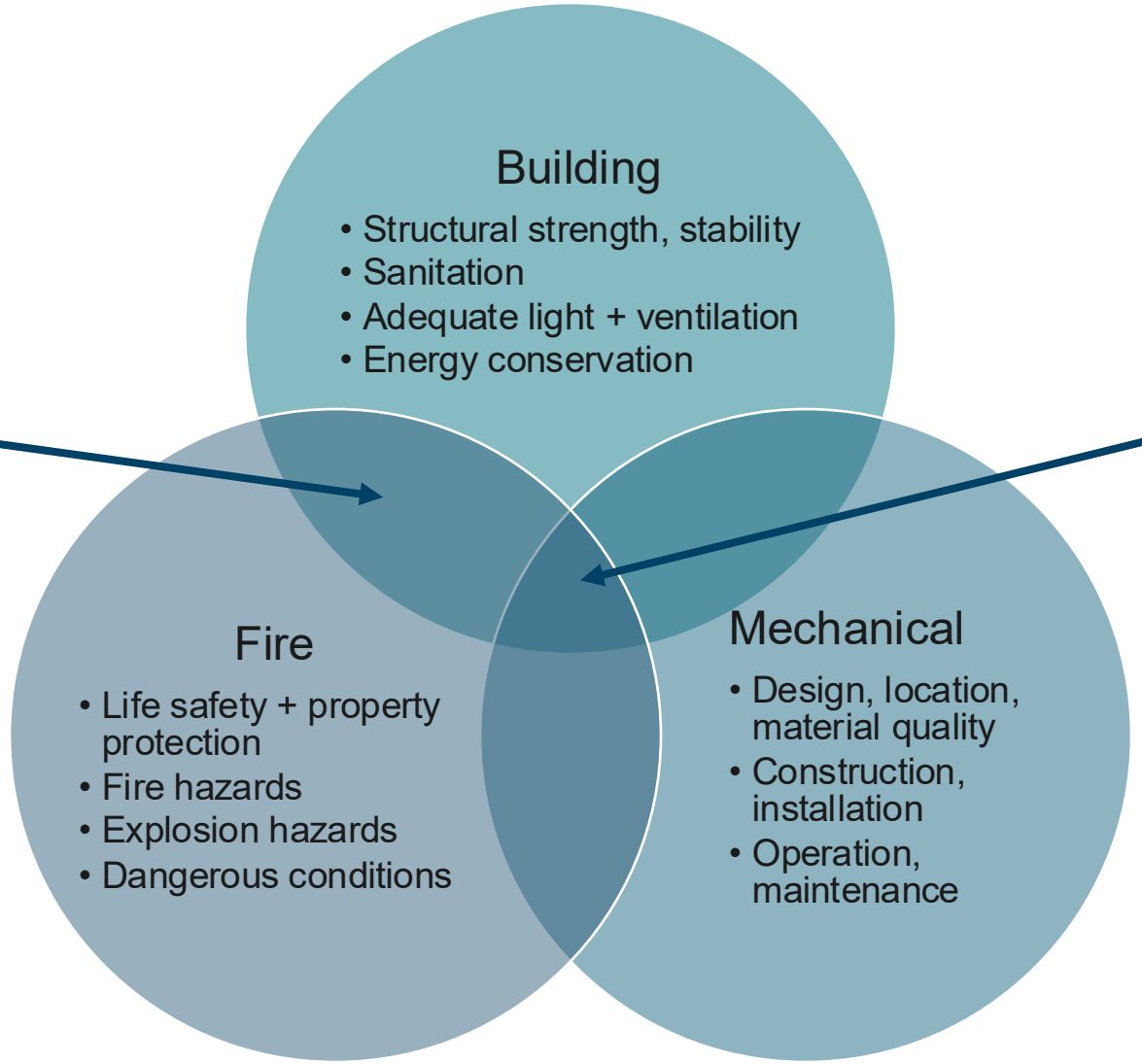
What is the Intent?

Performance-Based Design Strategies

Code Orientation

IBC/IFC/IMC 101.3

Emergency responders "reasonably safe" during emergency operations



"Reasonable level" of safety, public health, public welfare, property protection

Performance-Based Design Strategies

Simplified Approach

Individual Prescriptive Requirements

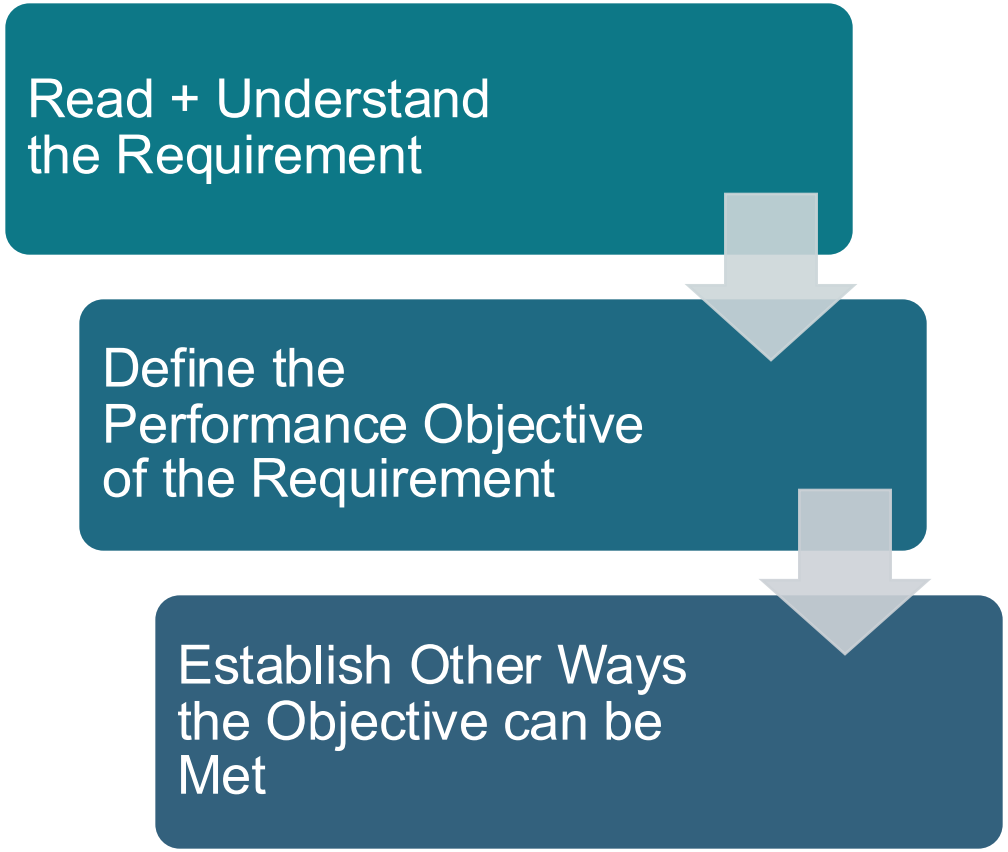
+ Travel distance

Entire Systems

+ Ductless fume hoods

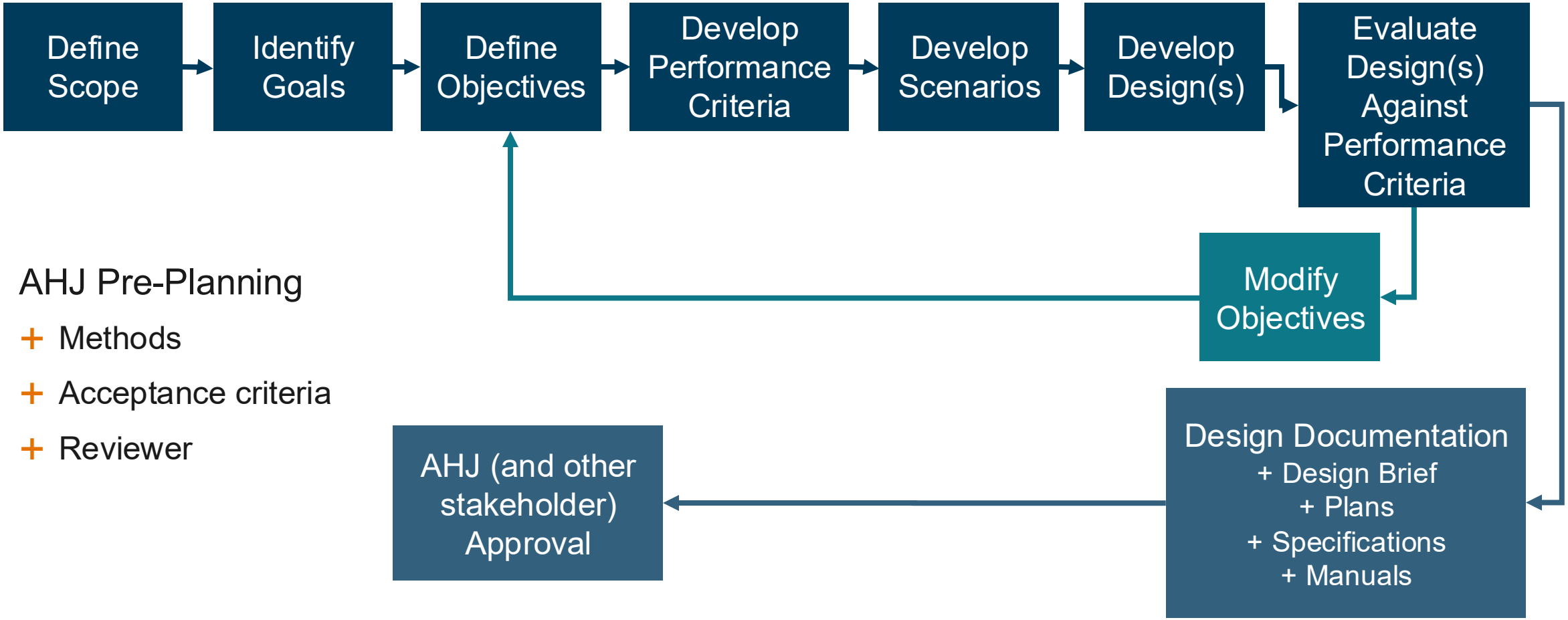
Entire Projects

+ New construction type



Performance-Based Design Strategies

Detailed Approach



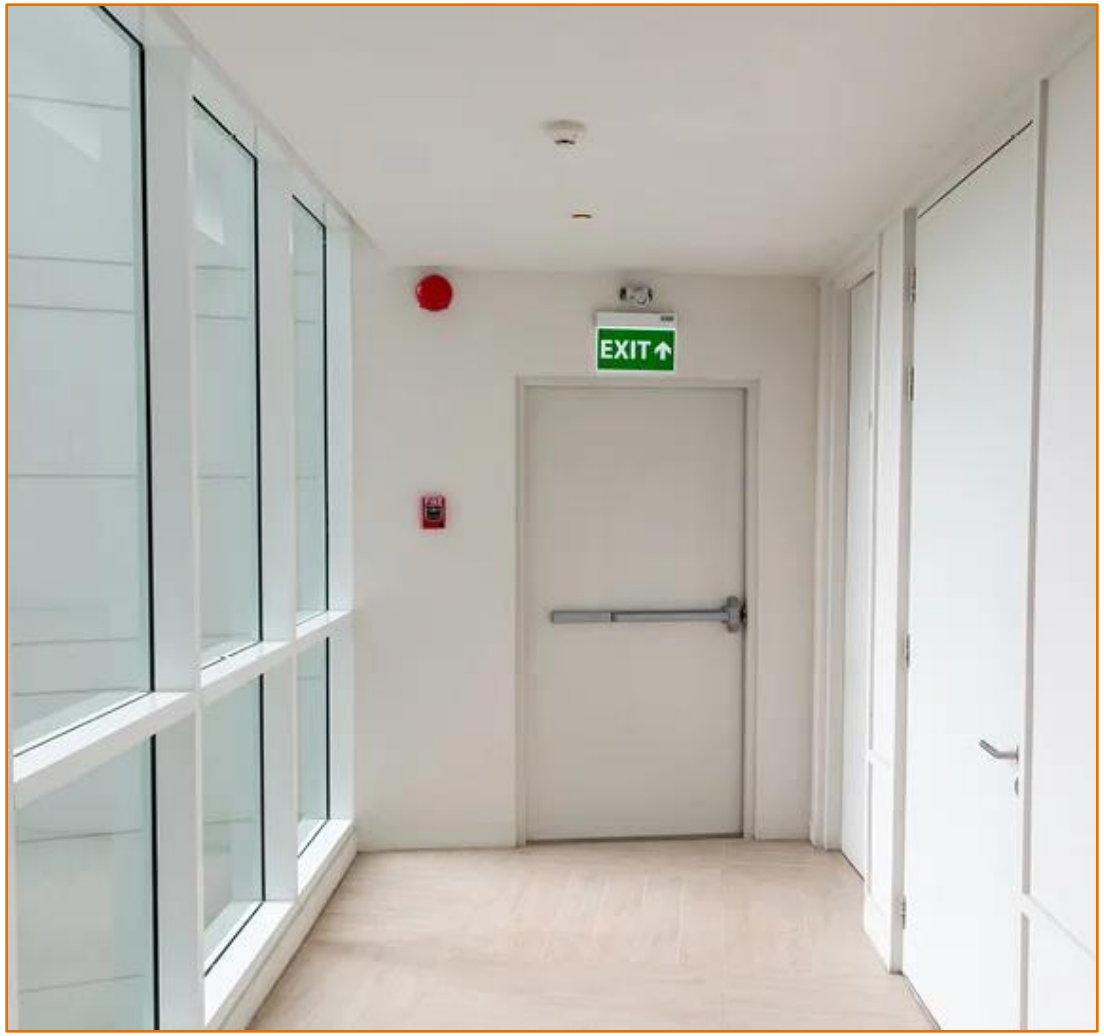
AHJ Pre-Planning

+ Methods
+ Acceptance criteria
+ Reviewer

Performance-Based Design Strategies

Egress – Travel Distance

- Provide an egress evaluation and smoke control analysis to demonstrate that an increased maximum travel distance for egress from within the an area can be achieved
  - Goal: To use a quantifiable objective to meet code
  - Analysis Goal: To show that tenable conditions are maintained for the duration of occupant egress
- Evaluate tenability conditions
- Model actual hazards present within the space
- **Remove egress corridors**



Performance-Based Design Strategies

Egress - Assembly

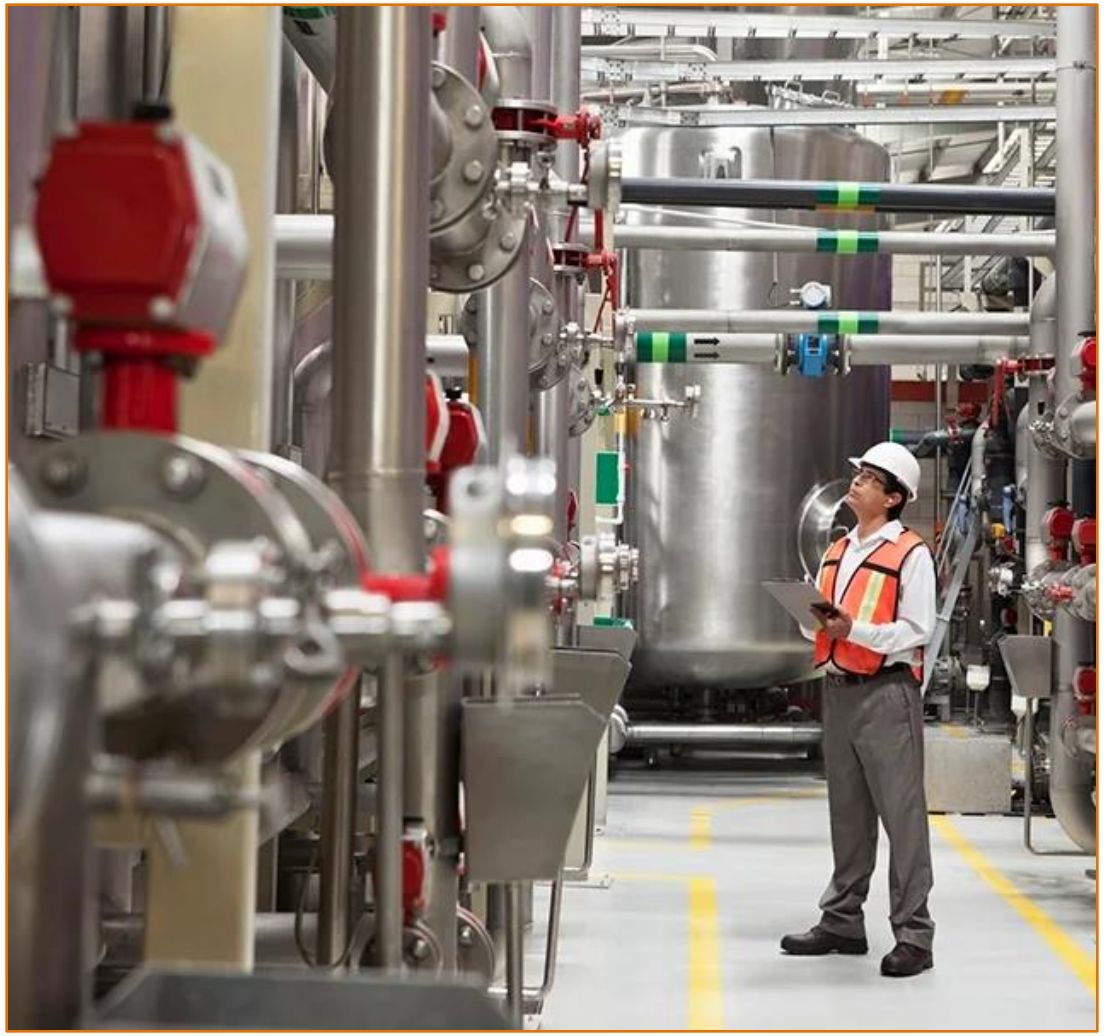
- Meeting places with great views on top of industrial occupancies
- Provisions
  - High-rise buildings
    - Any building with an occupied floor or occupiable roof located **more than 75 feet** above the lowest level of fire department vehicle access
  - Occupancy height and area

Performance-Based Design Strategies

Hazardous Materials

IFC 5001.3 – Design Alternative

- Largely follows guidelines in OSHA for Process Safety Management (PSM)
- Use for large open spaces with materials exceeding MAQ
  - Battery manufacturing
  - Bottling distilled spirits



Performance-Based Design Strategies

Hazardous Materials

- Allowable area and height
- Location
- Ventilation
- Containment
- Fire separation

Performance-Based Design Strategies

HAC = Hazardous Area Classification

- Practice of controlling ignition sources in areas with potential releases of flammable materials
  - **Flammable liquids *(and combustible liquids, if heated above flash point or atomized)***
  - Flammable gases
  - Combustible dusts
- Ignition sources
  - Electrical equipment and wiring
  - Heated surfaces
  - Hot work
  - Electrostatic discharge

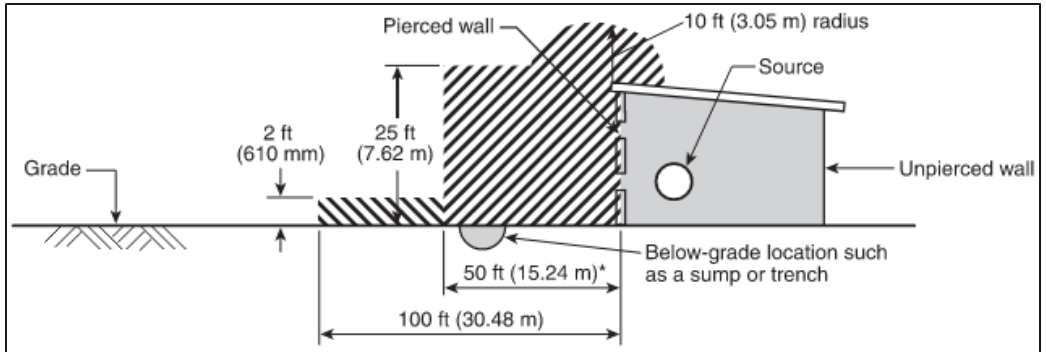
Performance-Based Design Strategies

HAC = **H**azardous **A**rea **C**lassification

- Identify flammable material release points (normal, abnormal)
- Categorize relative magnitude of equipment size, flow rate, and pressure ***(in some cases)***
- Identify "closest" scenario/diagram (e.g., NFPA 497 Section 5.10)

OR

- International Electrotechnical Commission (IEC) 60079-10-1: C*lassification of Areas – Explosive Gas Atmospheres* recognized as a hand calculation method for performance-based HAC



* "Apply" horizontal distances of 50 ft from the source of vapor or 10 ft beyond the perimeter of the building, whichever is greater, except that beyond unpierced vaportight walls the area is unclassified.

Material: Flammable liquid

	Small/low	Moderate	Large/high
Process equipment size		X	X
Pressure			X
Flow rate		X	X

Division 1

Division 2

Additional Division 2 location. Use extra precaution where large release of volatile products may occur.

FIGURE 5.10.1(i) Leakage Located Indoors, Adjacent to an Opening in an Exterior Wall. Ventilation is not adequate. The material being handled is a flammable liquid.

Performance-Based Design Strategies

Building Risk Category

IBC – Section 1604

- Buildings containing toxic, highly toxic, or explosive substances are permitted to be classified as Risk Category II structures if it can be demonstrated through a hazard assessment as part of an overall Risk Management Plan (RMP) that a release will not pose a threat to the public
- RMP is composed of 3 parts:
  - Hazard assessment
  - Prevention program
  - Emergency response plan

Performance-Based Design Strategies

Energy Storage

Battery Arrays

+ Limited to 50kWh, with 3-ft separation
+ Large-scale fire tests

Total Room Battery Capacity

+ Limited to 600 kWh maximum allowable quantity
+ Hazardous Mitigation Analysis (HMA)

Performance-Based Design Strategies

Energy Storage

Total Room Battery Capacity

- Fires will be contained within unoccupied ESS rooms for the minimum duration of the required fire resistance rating
- Fires and products of combustion will not prevent safe evacuation

Performance-Based Design Strategies

Penetrations in Fire-Rated Assemblies

Conveyors from one fire area to another

+ Shutter
+ Breakaway
+ Detection
+ Water Curtains

Performance-Based Design Strategies

Specialty Sprinkler Design

Inert Gas Systems

+ Floor space and pressure venting

Man-made Clean Agents

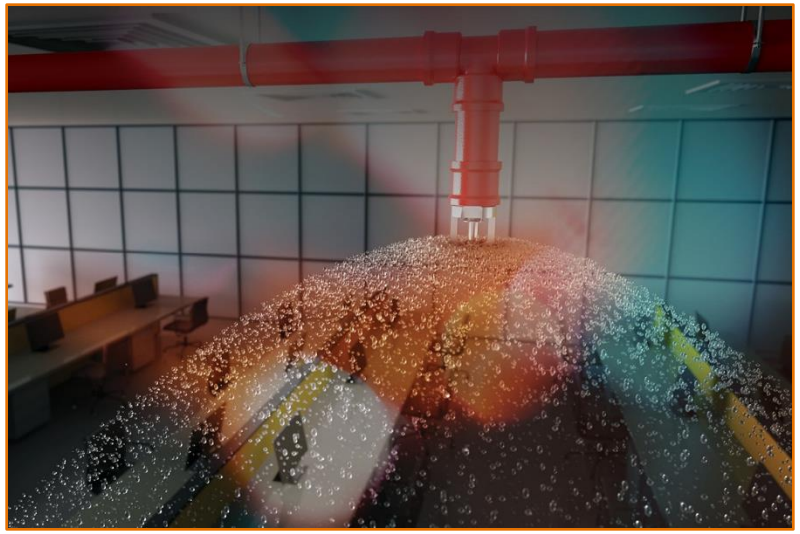
+ Future is questionable

Hybrid Water Mist Systems

+ Gas and water mist

High-Pressure Water Mist Systems

+ Complex

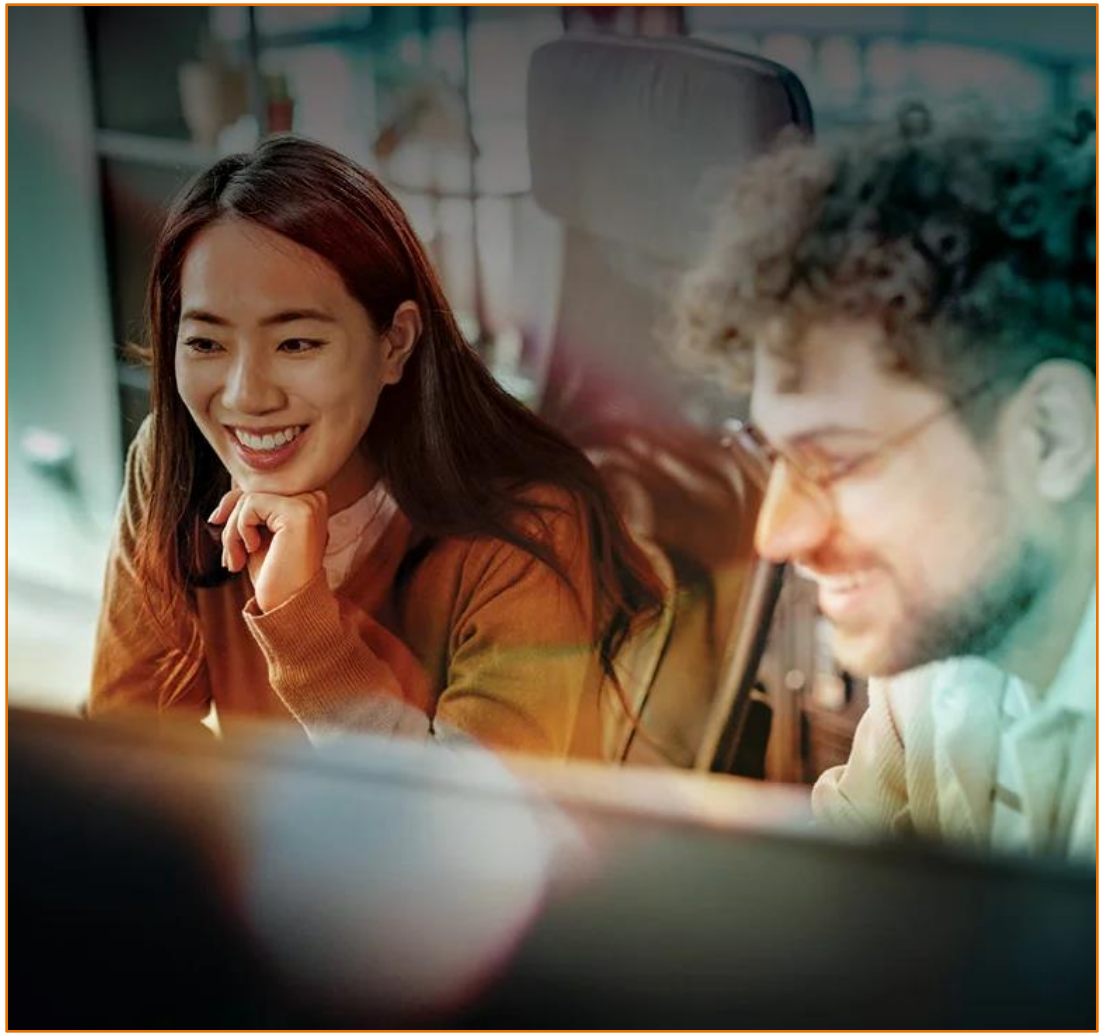


04 – Coordination Across Cross-Disciplinary Teams

Coordination Across Cross-Disciplinary Teams

Awareness + Alignment

+ Owner for communication
+ Limit update fatigue – targeted approach
+ Feedback loop
+ Informed decisions



05 – Key Takeaways

Key Takeaways

Remember…

1. Communicate Early + Often
2. Establish Pathways
   - Internally
   - Externally
3. Performance-based
   - Intent of code: protect people, properties and community

Questions?

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Thank You

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