Combustible Decorative Features and Unique Themed Environments

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After 22 years as a Fire Protection Engineer with Clark County (Nevada) Building Department, Mr. Evans founded DHE FPE LLC to provide specialized consulting services to the construction industry. In his position with Clark County, his primary focus was coordinating fire protection aspects for the mega-resorts on the Las Vegas Strip. Although this specialization requires a working knowledge of most fire protection aspects, Mr. Evans is primarily known for his expertise in plastics/foam plastics in building construction, unique interior features, smoke management systems and combustible exterior claddings. Mr. Evans is a Fellow of the Society of Fire Protection Engineers, member of NFPA and a registered Fire Protection Engineer.

Unique themed environments:

- May include artificial trees, large statues, giant signs/LED screens, hand painted canvas murals adhered to walls and even buildings within the main structure.
- The materials used are most apt to be regulated by Chapters 8 and 26 of the IBC as Interior finishes and plastics in building construction, but a number of additional requirements apply.
- These regulations along with applicable portions of the IFC are used to provide an understanding of not only those subjects, but the ability to extrapolate to unique applications.
- This class covers notable fire losses, present code requirements and applicable fire tests, as well as provides a way to think about unique applications to achieve a reasonable level of fire safety.

Artificial Plants

Mannequins vs. Large Statues

Pictures vs. Wall Coverings
When do signs become the wall?
McCarran Airport Baggage Claim

Umbrellas vs. Ceilings

Child’s Playhouse vs. Interior Structures

History of this Subject:
• Interdepartmental agreement between Clark County Building and Fire Departments (1998)
• Developed into Clark County Unique Building Interiors Design Guide (2003) (updated periodically)
  http://www.clarkcountynv.gov/building/HowToGuides/BPG201.pdf
• Article published fall of 2004 SFPE Magazine
• Republished ICC Building Safety August 2005
• Versions of presentation given a number of times

Primary Focus of this Class
• Specific Requirements of the 2018 IFC
• Specific Requirements of Chapters 8 and 26 of the 2018 IBC
  • Identify appropriate tests
  • Understand related terminology
  • Code intent and limitations
• The level of protection intended by those requirements
• Associated Hazards relative to:
  • Interior Finishes
  • Decorative Materials
  • Trim
  • Plastics
• Unique applications using the IBC for guidance

Learning Objectives: An increased understanding of:
• Fire losses associated with interior finishes and decorative features.
• Recognize hazards due to interior finishes and decorative features.
• IFC/IBC requirements to limit losses and provide a safe environment.
• Applicable fire tests, associated challenges, along with appropriate and inappropriate applications of those tests.
• Related fire dynamics
• Approaches to achieve reasonable fire safety when the fuel loading exceeds intended limitations.
• How to use the same thought process to achieve fire safety for other unique decorative features.
Notable Losses - Why do we care?

- Rhythm Club, MS 1940
  - 209 fatalities
- Cocoanut Grove, MA 1942
  - 492 fatalities
- Beverly Hills Supper Club, KY 1977
  - 165 fatalities
- Station Night Club, RI 2003
  - 100 fatalities
- Argentine Nightclub fire, 2004
  - 194 fatalities
- The Cosmopolitan, 2015
  - Exterior pool deck

April 23, 1940
The Rhythm Club
Natchez, Mississippi
(209 fatalities)

Spanish moss that had been draped over interior’s rafters as a decoration, quickly engulfed the structure. To ensure there were no bugs in the decorative moss, it had been sprayed with FLIT, a petroleum-based insecticide. Under the dry condition, flammable methane gas was generated from the moss.

The windows had been boarded up to prevent outsiders from viewing or listening to the music.
The back door was padlocked and twisted shut.

November 28, 1942
Cocoanut Grove Night Club
Boston, MA
(492 fatalities)
Cocoanut Grove Night Club

Area of Fire Origin

May 28, 1977
Beverly Hills Supper Club
Southgate, Kentucky
(165 fatalities)
February 20, 2003
The Station Nightclub
West Warwick, Rhode Island
(100 fatalities)
December 30, 2004
República Cromañón Nightclub
Buenos Aires, Argentina
(194 fatalities)

Around 3,000 people were in attendance.
Double the venue’s 1,500 capacity.

Materials used for decoration were mostly wood, Styrofoam, acoustic panels and a plastic net.

A pyrotechnic flare was determined to be the ignition source.

Four of the six doors were chained shut.
July 25, 2015  
The Cosmopolitan  
Las Vegas, Nevada  
(Exterior Pool Deck)

Bamboo Pool Deck  
Decorative palm trees

Videos posted on social media showed the inferno consuming the poolside tent-like cabanas, imitation palm trees, and just about everything else on the open-air deck of the Cosmopolitan of Las Vegas hotel sending thick black smoke billowing high above The Strip. Some of the hotel’s rooms sustained water damage from sprinklers.

The Director of Clark County’s department of building and fire prevention, said that an independent analysis shows the plastic fronds burned 10 times faster and hotter than an actual southern pine tree without needles. The artificial trunk was constructed of metal, polyurethane foam and fiberglass resin and burned five times more intensely.

Test results indicated that the tree’s materials didn’t meet flame and smoke resistance standards for indoor uses and wouldn’t be allowed inside buildings or as an exterior component on a building.

The building and fire codes adopted by the county don’t apply the same rules to outdoor decorative foliage. As such, “no policy changes are being recommended because it would be difficult to regulate, identify or standardize such adornments, and could cause an undue burden to the businesses.” The county also said current fire and building codes were sufficient enough to keep the fire from spreading beyond the pool’s deck where it started.

Instead, the county is now urging resort properties to remove or test any such decorations on their sites. The county took a cursory look at other buildings and didn’t identify the same materials being used elsewhere.
Kiss nightclub fire  
January 27, 2013  
Santa Maria, Rio Grande do Sul, Brazil, killing 240 people and injuring at least 630 others.

Outdoor pyrotechnics used indoors.  
Investigators said soundproofing foams on the ceiling caught fire and released poisonous gases that killed those attending a university party.

Bucharest, Romania  
Basement level Colectiv nightclub fire  
64 deaths – 146 injured  
Friday October 30, 2015

Between 300 to 400, mostly young people, were at the club, when a pyrotechnics show went awry. A spark from the band’s pyrotechnics ignited polyurethane foam plastic decor.

“People raced to the entrance but it was too narrow, they tried to climb and stumbled, climbing over each other trying to get out.”

And the losses continue

— December 5, 2009: 116 people died when a blaze broke out at the Lame Horse nightclub in Perm, Russia. It started when an indoor fireworks display sparked a plastic ceiling decorated with branches.
— January 1, 2009: An indoor fireworks display after New Year’s celebrations ignited a blaze in the Santral nightclub in Istanbul, Turkey, killing 56 people and injuring over 200. Victims died from burns, smoke inhalation, and from falling crushed.
— September 21, 2008: A fire killed 44 people at the Jam Night dance club in Shenzhen, China. A spark ignited a firework, which ignited a plastic ceiling, causing a crush.
— December 2008: A fire, blamed as a suicide, killed 169 people at a disco in the central Chinese city of Luoyang.
— October, 1998: A arson attack against an overcrowded youth disco in the Swedish city of Goteborg killed 63 people and left around 200 injured. Four people were later convicted for starting the fire.
— March, 1996: A fire at the Grenoble Club in Quebec City, Quebec killed 162 people. A large proportion of the victims were students partying at the end of the academic year.
— March, 1995: A fire at the Happy Land Social Club in the Bronx borough of New York City killed 87 people. A spark ignited a firework, which ignited a plastic ceiling, causing a crush.
— December 1994: A fire at the Lamma Island Club in Hong Kong killed 13 people and injured more than 200 injured.

Summary of Contributing Factors

• Combustible interior finish
• Combustible interior decorative features
• Ignition source – pyrotechnics
• Lack of fire sprinklers
• Egress paths
  • Locked,
  • Blocked,
  • Inadequate for occupant load (overcrowding)
• Otherwise noncompliant
• Lack of occupant awareness of alternate egress paths

Meet Henry

He just wanted to say hi

CODE REQUIREMENTS
Definitions

DECORATIVE MATERIALS. All materials applied over the building interior finish for decorative, acoustical or other effect including, but not limited to, curtains, draperies, fabrics, streamers and all other materials utilized for decorative effect including, but not limited to, bulletin boards, artwork, posters, photographs, paintings, batting, cloth, cotton, hay, stalks, straw, vines, leaves, trees, moss and similar items, foam plastics and materials containing foam plastics. Decorative materials do not include wall coverings, ceiling coverings, floor coverings, ordinary window shades, interior finish and materials 0.025 inch (0.64 mm) or less in thickness applied directly to and adhering tightly to a substrate.

Definitions

• Combustible vs. Non-combustible: ASTM E136—16
• FLASHOVER – See NFPA 265 or 286
• FLAME SPREAD: The propagation of flame over a surface.
• FLAME SPREAD INDEX: A comparative measure, expressed as a dimensionless number, derived from visual measurements of the spread of flame vertical height for a material tested in accordance with ASTM E 84 or UL 723.
• INTERIOR FINISH includes interior wall and ceiling finish and interior floor finish.
• INTERIOR FLOOR FINISH: The exposed floor surfaces of buildings including coverings applied over a finished floor or stair, including risers.

Fire-Resistant vs. Fire-retardant

• Fire-Resistant (primarily Chapter 7)
  • Applies to compartmentation
  • Structural frame
  • Walls
  • Floor/ceiling assemblies
  • Joints
  • penetrations
• Fire-retardant (Chapters 8 and 26)
  • Resistance to ignition
  • Less apt to propagate

Methods of “Fire-retarding” Combustible Materials

• Chemical
  • Plastics
• Impregnation
  • Natural fabrics
  • Dipping / soaking
• Coatings
  • Intumescent
  • Other topical applications
• Pressure Impregnation
  • Pressure treated wood products
Chapter 8: Interior Finishes

- 801 Scope
- 802 General
- 803 Wall and Ceiling Finishes
- 804 Interior Floor Finishes
- 805 Combustible Materials in Types I and II construction
- 806 Decorations and Trim

SECTION 803 WALL AND CEILING FINISHES

- 803.1.1 - NFPA 286
  - Includes pass/fail constraints
- 803.1.2 tested to ASTM E84 or UL 723
  - Class A: Flame spread 0-25
  - Class B: Flame spread 26-75
  - Class C: Flame spread 76-200
  - In all cases smoke developed 0-450.
- 803.2 Materials having a thickness less than 0.036 inch (0.9 mm) applied directly to the surface of walls or ceilings not required to be tested.
- 803.14 Stability. 200 °F for 30 minutes

Section 803.15 Application

- 803.15.1 Limited Combustible Voids
  - Substance contact with non-combustible substrate
  - Eliminate
  - Mitigate
- 803.15.2 Larger Combustible Voids
  - Eliminate
  - Mitigate
- 803.15.3 Heavy Timber
- 803.15.4 Materials
  - Exception 1 - non-combustible
  - Exceptions 2 & 3 - tested for the application

2018 IFC

- Decorative Materials
  - 806 & 807
  - Decorative Vegetation
  - Foam plastics
- Furnishings
  - 805 & 808

The Fire Code Primarily addresses fuel loading inside a building

2018 IBC

- Interior Finishes
  - Chapter 8
    - 806 addresses Decorative Materials
- Special Detailed Requirements
  - Chapter 4
- Type of Construction
  - Chapter 6
- Plastics
  - Chapter 26

Primarily addresses materials that make up the building
2018 IBC Table 803.13

803.5.1 Textiles

- As Interior Finishes Include:
  - woven, nonwoven, napped, tufted, looped, carpet, or similar materials
- Must be Class A and protected by automatic sprinklers, or ...
- NFPA 265 Test Method B
  - Fully lined protocol
  - Pass/Fail constraints
  - Defines Flashover

NFPA 265

- Test Method A
  - Screening Protocol
  - Less Material
  - Pass/Fail constraints more restrictive
- Test Method B
  - Fully lined protocol
  - Pass/Fail constraints less restrictive

SECTION 804 - INTERIOR FLOOR FINISH

- 804.1 General. Interior floor finish and floor covering materials shall comply with this section.
  - Exception: Floor finishes and coverings of a traditional type, such as wood, vinyl, linoleum or terrazzo, and resilient floor covering materials which are not comprised of fibers.
- Pill Test (DOC FF-1 / CPSC 16 CFR, Part 1630)
- NFPA 253 (Radiant flux test for specific exit paths)
Flooring Radiant Panel

Properties measured:
• Critical radiant heat flux
• Smoke (ISO only)
• Ignitability (FAA only)

Section 805 Combustible Materials in Type I and II Construction

• 805.1 Application
  • 805.1.1 Subfloor construction
    • Combustible voids
    • Fireblocking per 717 allowed
  • 805.1.2 Wood finish flooring
  • 805.1.3 Insulation boards

[F] SECTION 806 DECORATIONS AND TRIM

• Occupancies regulated
  • A, B, E, I, M, R-1 and dormitories in R-2
  • Suspended from walls or ceilings
    • Curtains
    • Draperies
    • Hangings
    • Other decorative materials
  • Testing
    • Non-combustible, or
    • NFPA 701 (Test 1 or 2)
    • NFPA 289, using the 20 kW ignition source
    • 806.4 approved testing agency required

Limitations

• Non-combustible
  • unlimited
  • Flame-resistant materials
    • 75% in Group A auditoriums w/ sprinklers
    • 50% in R-2 Dormitories w/ sprinklers
    • 10% in all other
      • (specific wall or ceiling area)

806.5 & 806.6

• [F] 806.5 Foam plastic. Foam plastic used as trim in any occupancy shall comply with Section 2604.2.

• [F] 806.6 Pyroxylin plastic. Imitation leather or other material consisting of or coated with a pyroxylin or similarly hazardous base shall not be used in Group A occupancies.

806.7 Trim

TRIM - Picture molds, chair rails, baseboards, handrails, door and window frames and similar decorative or protective materials used in fixed applications. Other than foam plastics.

- Crown molding?

• Limited to 10% of the specific wall or ceiling
• Class C flame spread index required
Select 2018 IBC
Chapter 4 Interiors Requirements

402 Covered Mall Buildings

- 402.6.2 Kiosks & similar structures
  - Temporary or permanent
  - Fire-retardant-treated wood
  - Foam plastics ≤ 500 kW per UL 1975
  - Aluminum composite materials – Class A
  - Sprinkler protected
  - 300 sq ft max
  - Separated by 20 ft

- 402.6.3 Children’s play structures.
  - Per Section 424
  - Separated by 20 ft

- 402.6.4 Plastic signs limited to:
  - 20% of tenant wall area facing mall
  - 36 inches max height if horizontal
  - 96 inches high by 36 inches wide if vertical
  - No closer than 18 inches to adjacent tenants

  - 402.6.4.4 Non-foam plastic signs:
    - Edges and back incased in metal and
    - 2606.4 Light-transmitting plastics, or
    - Class B along with Ignition temp ≥ 650 °F

  - 402.6.4.5 Foam plastic signs:
    - ≤ ½ inch thickness
    - ≥ 20 pound per cu ft density
    - ≤ 150 kW per UL 1975

Other Chapter 4 Interiors Requirements

- 404.8. Attra Interior Finish
  - Class B

- 410.2.6 Stage Scenery
  - NFPA 701
  - Foam plastics per 2603

- 411.7 Special Amusement Buildings
  - Class A

- 424 Children’s Play Structures
  - Non-combustible materials, or
  - Materials regulated

Chapter 6 Allowances

- Chapter 6 – Types of Construction
  - 603 – Combustible materials in Non-Combustible Buildings
    - Fire-retardant-treated wood
    - Exposed thermal and acoustical insulation – Class A
    - Foam plastics in accordance with Chapter 26
    - Floor covering materials in accordance with Sections 804 & 805
    - Millwork such as doors, door frames, window sashes and frames
    - Interior wall and ceiling finishes in accordance with Section 803
    - Trim in accordance with Section 806
    - Blocking such as for handrails, millwork, cabinets and window and door frames
    - Materials exposed within plenums complying with the Mechanical Code

Chapter 26

Although Chapter 26 governs the use of plastics for various aspects of building construction, the following overview is intended as guidance for the use of plastics inside buildings.
Chapter 26 Sections to discuss

• 2603 Foam Plastic “Insulation”
• 2604 Interior Finish and Trim
• 2605 Plastic Veneer
• 2606 Light-Transmitting Plastics
• 2611 Light-Transmitting Plastic Interior Signs

Foam Plastic “Insulation”

• Shortened Definition
  • Expanded for insulating or acoustical purposes
  • Density less than 20 pounds per cubic foot

2603 Foam Plastics

• 2603.1 Foam Plastic in buildings and structures
• 2603.2 Listed and labeled at the job site
• 2603.3 Surface-burning characteristics
  • Class B
• 2603.4 Thermal barrier
  • Required to separate foam from interior

2604 Plastics as interior finish and trim

• Meet Chapter 8
• Foam plastics in accordance with 2603.9
• Foam plastic trim
  • Density ≤ 20 pounds per cu ft
  • Thickness ≤ ⅛ inch
  • Width ≤ 8 inches
  • ≤ 10% the specific wall or ceiling
  • Class B or meets NFPA 286

2605 Plastic Veneer

• Interior finish must meet Chapter 8
• Exterior use limited

2603.4 - Thermal Barrier

• Required to separate foam from interior of building
• ½ inch gypsum wallboard or equivalent
• NFPA 275
  • Temp rise on unexposed surface limited to 250 °F after 15 minutes
  • Encapsulation must remain in place
• Several construction approaches recognized to mitigate thermal barrier
• Exposed foam on interior of buildings essentially not allowed
• EIFS not allowed inside buildings
• 2603.9 Special tests allow exposed foam

2605 Plastic Veneer

• Interior finish must meet Chapter 8
• Exterior use limited
2606 Light-Transmitting Plastics

- 2606.4 Specifications
  - Self-ignition temp > 650 °F
  - Smoke generation limited to:
    - 450 per E84 or 75 per ASTM D2843
    - Either CC1 or CC2 per ASTM D635
    - CC1 - 1 inch burning extent
    - CC2 - 2.5 inches per minute burning rate

Light-Diffusing System Defined

Construction consisting in whole or in part of lenses, panels, grids or baffles made with light-transmitting plastics positioned below independently mounted electrical light sources, skylights or light-transmitting plastic roof panels. Lenses, panels, grids and baffles that are part of an electrical fixture shall not be considered as a light-diffusing system.

2606.7 Light-Diffusing Systems

- 2606.7.2 Shall comply with chapter 8
  - Unless fall from mounting at ≤ 200 °F below ignition temperature
  - Remain in place at 175 °F for 15 minutes
- 2606.7.3 Size limitations
  - 10 feet long and
  - 30 square feet in area
- 2606.7.4 Sprinkler protection
  - Above and below
  - Unless not adversely affect sprinklers
  - Area unlimited

2611 Light-Transmitting Plastic Interior Signs

- Must comply with 2606
- Size limitations:
  - 24 square feet maximum
  - 100 square feet if CC1 and protected by sprinklers
  - Separation by 4 feet horizontal and 8 feet vertical constitutes separate signs
- Sides and back fully encased in metal
- For malls see 402.6.4

2607 Light-Transmitting Plastic Wall Panels
2608 Light-Transmitting Plastic Glazing
2609 Light-Transmitting Plastic Roof Panels
2610 Light-Transmitting Plastic Skylight Glazing

These materials limited to use on exterior walls and roofs

SECTION 2612 PLASTIC COMPOSITES
  - Exterior use where combustible construction is permitted
SECTION 2613 FIBER-REINFORCED POLYMER
  - Interior use must meet Chapter 8

Henry
SAYS – ENJOY LUNCH
Fire Dynamics

The physics of how fires start, spread and develop.

Fire Dynamics is the study of how chemistry, fire science, material science, fluid mechanics and heat transfer interact to influence fire behavior.

Conditions affecting Fire Dynamics

- Proximity to, and significance of, ignition sources and adjacent fuel packages
- Amount of heat energy the ignition source projects onto target
- Combustibility/flammability characteristics of target
  - Ignition temperature, heat release rate
- Mass to Surface area ratio
  - Thin combustible materials
  - Density
- Orientation of material (horizontal vs. vertical)
- Floors vs. ceilings
- Assemblies vs. single materials
- Type of substrate and method of attachment.
- Size of the fire compartment

Heat Release Rate (HRR)

A common term used in fire dynamics

The rate at which fire releases energy (also known as power). Measured in Watts (W) or joules per second. Also measured in Kilowatts (equal to 1,000 Watts) or Megawatts (equal 1,000,000 Watts).

- HRR is the driving force of fire development
- Measurement of “how big the fire is” - Quantity of heat energy being expended.

Examples of Peak Heat Release rate:

- Cigarette lighter: 50 - 100 W
- One candle: 80 W
- Small waste basket: 20 - 50 kW
- Cotton easy chair: 300 W
- Flashover in small room: 1 MW
- 100 sq ft cubic fully involved: 2 MW
- Polyurethane easy chair: 1.5 MW
- Polyurethane sofa: 3 MW
- Fully developed fire in compartment: 1 - 4 MW
- 18 wheeler tractor trailer: 100-150 MW

Common Fire Tests Used for:

Decorative materials and Interior Finishes

- Small Scale
  - ASTM D 645 (50 W)
  - NFPA 701 Test Methods 1 and 2 (1 kW)
  - UL 1775 (20 kW)
- Intermediate Scale
  - The Steiner tunnel test / ASTM E84 (88 kW)
- Large Scale
  - Room-corner tests (160 kW)
    - NFPA 285 (textiles)
    - NFPA 285 (non-textiles)
**Bench-scale Testing Vs. Larger Scale**

- "Bench-type" testing should initially be conducted to determine if adverse behavior of the specific material can be predicted under actual fire conditions.
- Failure to achieve ignition in small-scale tests is not substantial proof of non-combustibility.
- Many materials incapable of achieving self-supporting fire in bench test configurations prove to be very combustible when subjected to larger scale testing.

**NFPA 701 Test Method 1**

Applications:
- Curtains/drapes
- Decorative materials
- Textiles

**NFPA 701 Test Method 2**

Applications:
- Fabrics in excess of 700 g/m²
- Tents/tarps/awnings
- Decorative materials
- Textiles

**UL 1975**

Maximum 10 inches long and 6 inches high
Foam Plastic Decorative Object

Photo Courtesy Hughes Associates

Steiner Tunnel Test (ASTM E 84)
The most common fire test specified in US codes

Applications:
• Interior finish
• Building products
• Insulation
• Plenum materials

Photo Courtesy Hughes Associates

Applications:
• Interior finish
• Building products
• Insulation
• Plenum materials

Photo Courtesy Hughes Associates

Used to Determine:
Flame Spread and
Smoke Developed
Indices

Steiner Tunnel Test (88 kW)

25 feet long

Steiner Tunnel Test

Fire Box one foot by 1.5 foot

Photo Courtesy GBH International
Room Corner Test (40 – 150/160 kW)

Room Corner Test Standards:

- NFPA 265-15
  - Textile wall coverings
- NFPA 286-15
  - Wall & ceiling interior finish
  - Thermal barrier exemption
- UL 1715-97
  - Interior finish for foam plastics
  - Thermal barrier exemption

Side View – Room Corner Test

Wood Crib Version

Overview of Recognized Test Methods

- Proximity to, and significance of, ignition sources and adjacent fuel packages
- Amount of heat energy the ignition source projects onto target
- Combustibility/Flammability characteristics of target
  - Ignition temperature, heat release rate
- Mass to Surface area ratio
  - Thin combustible materials
  - Density
- Orientation of material (horizontal vs. vertical)
- Floors vs. ceilings
- Assemblies vs. single materials
- Type of substrate and method of attachment.
- Size of the fire compartment

Screening Protocol
Primary Concept

The main concept of this portion of the presentation is:

When decorative materials exceed the intent of the fire code they can be constructed out of the same materials allowed for the building.

Q: When do decorative materials exceed the intent of the fire code?

Fire Code

Decorative materials inside buildings are regulated by the fire code as fuel loading:

- Artificial plants
- Mannequins
- Table umbrellas
- Signs
- Pictures
- Draperies
- Murals

Building Code

The building code regulates what the building components are constructed out of:

- Floors
- Walls
- Columns
- Ceilings
- Interior finishes

Artificial Plants

McCarran Airport; Satellite B
**Consideration Of The Potential Fire Hazard**

- Proximity to fire sprinklers.
- Obstruction to sprinkler discharge.
- Flammability characteristics.
  - Ignition temperature, flame spread, heat release rate
- Type of substrate and method of attachment.
- Physical properties of the decorative item.
  - Size, thickness and product type
- Properties of topical applications.
  - Pigments, varnishes
Consideration Of The Potential Fire Hazard (Slide 2 of 2)

- Combustible concealed voids.
  - (compartmentation, sprinkler installation and plenums)
- Fire-retardant applications.
- Applicability of recognized fire tests.
- Temporary vs. Permanent.
- Proximity to, and significance of, ignition sources and adjacent fuel packages.
- Obstruction to occupant evacuation.

Organizing the approach for unique interior applications

- Trim
- Wall Applications
- Ceiling Applications
- Artificial Plants and Statues
- Decorative Structures within, on and adjacent to Buildings

Trim

- Limited in size and quantity
  - Baseboards
  - Chair rails
  - Crown molding
  - Door/window frames
  - Handrails
  - 10% of walls and ceiling
- When does trim become the wall or ceiling?
  - 6 to 8 inches? (IBC Section 2604.2.2 – 8 inches)
- Not further discussed in this presentation

Wall Applications

- Murals
- Tapestries
- Pictures
- Signs
- When does a picture become a wall covering?
  - 10 feet by 10 feet.

Interior Signage

Aladdin Desert Passage Mall

McCarran International Airport
Fabric Room Dividers

Ceiling Applications

- Umbrellas
- Awnings
- Canopies
- Non-occupiable/decorative balconies
- Interior eves/projections
- Lattice ceilings
- Roofs of interior structures

When do these features become a ceiling?

- 10 feet by 10 feet
Obstruction to sprinkler discharge

Thatched "Roofs" Under a Roof

Carousel Inside a Mall
Artificial Plants and Statues

- Artificial plants
- Statues
- Preserved plants
- Mannequins
- Models
- Small, non-occupiable decorative structures

When do these features exceed the intent of the fire code?
- If it barrier and bifurcation?
Decorative Structures Within Buildings

Break decorative structures into components

- Interior wall/ceiling finishes
- Decorative ceilings/roofs
- Nonbearing partitions
- Columns and bearing walls
- Mezzanines
- Occupiable floors/balconies
Decorative Features Summary

• When does fuel loading become building materials?
  • If anyone at anytime can pick it up and carry it inside the building, it’s likely fuel loading.
  • If the decorative item takes a crew of people to haul it into the building and assemble it, it may be more appropriate to construct the decorative feature out of the same materials allowed for the base building.

This Presentation Focused On

• The fire protection aspects of interior finishes and decorative features inside buildings
• Why these requirements exist
• Fire losses
• Applicable Code requirements
• Applicable fire tests, associated challenges, along with appropriate and inappropriate applications of those tests.
• Related fire dynamics
• How to use the same thought process to achieve fire safety for other unique decorative features.

The End

Any Questions?

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