American Fire Sprinkler Association

Presents

An Introduction to the IBC and IFC

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Roland Huggins is a graduate of the University of Maryland and is registered in Fire Protection Engineering. He is a member of the NFPA and SFPE. Huggins is a member of multiple NFPA technical committees, including NFPA 13 Technical Correlating Committee, NFPA 13 Discharge Criteria, NFPA 25 Inspection and Maintenance, and three NFPA 5000 (Building Code) committees, Technical Correlating Committee, Assembly Occupancies, and Industrial/Storage Occupancies. NFPA activities have included participating on the editing of the 1999 and 2002 editions of the Sprinkler Handbook. Other national activities involve the NFPA Research Foundation, UL Standard Technical Panels, NICET, and SFPE (performance based design guide). He has conducted many seminars and presentations as well as written numerous sprinkler-related articles.
Steve Leyton is President of Protection Design & Consulting in San Diego, CA. Now in his 25th year in the fire protection industry, Steve began his career in the contracting side of fire sprinkler design and construction. He founded Protection Design & Consulting in 1995, and has focused the firm's work on Architectural as well as Contractor clients. His professional affiliations include membership in NFPA, AFSA, California Fire Prevention Officers Northern and Southern Sections, as well as the San Diego Fire Protection Association. In the code development community, he represents AFSA as a principal member of the NFPA 14 and an alternate member of the NFPA 5000 Technical Committees, and is Co-Chair of the ICC Ad-Hoc Committee On Residential Fire Sprinklers. Over the course of his career, Steve has worked on all manner of residential, commercial, industrial and high-rise projects in both the United States and Mexico.

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Agenda

• Background
• How Codes Work
• Traditional vs Design Build
  – Differences and Documents/contracts
• Other Issues
  – Performance based design
  – Value engineering
• Format compared to other model codes
• Trade-offs
• Design issues
Background

Why one needs to be involved and AWARE of building codes

• IF systems are to be installed

• Level of service to clients
  – Consulting assistance
  – Design build

• Impact on system design
Four reasons WHY sprinklers are installed

- **Industrial-HPR**
  - Property protection
  - Insurance driven
- **BUILDING CODE** requirement
  - Recognized life safety aspect
- **Trade-offs**
  - Offset cost by reducing other requirements
- **Recognize value**
  - Dept of Energy (DOE)
Required Sprinkler Protection

• Location driven
  - Below grade
  - High-rise plus 30+ occupants

• Occupancy driven (Ch 9)
  - Other combined factors
    • Group M: > 12,000 sf
    • Group A: 5,000 sf or 300+ occupants
Background

- Basic Premise - Multiple safeguards
  - Reliance for protection and safety does not depend on any single safeguard which may be ineffective due to:
    - Inappropriate human actions
    - Building failure
    - System failure
Background

• Balanced protection
  - Current approach works well
    • Heavier reliance on active protection
    • No multiple life loss fires fully sprinklered
  - Push to resurrect mainly passive
    • Comparisons to Europe
  - Passive alone does not work
Flash-Over

- Ventilation controlled fire
- Room temperature 1700 F
  - Positive pressure differential
  - Pushes gases through small holes
- Immense production of heat/smoke
  - Pushed through-out building
  - Buoyancy/Wind/Temperature difference
One Meridian Plaza, Philadelphia PA

Burned 8 floors

Stopped by 10 sprinklers
How Codes Work
Code Process

- Link with IFC
  - Site/Facility
  - System: IBC 901.2
  - Maintenance and testing per IFC
- Adoption Process
  - Local amendments
- Referenced Standards
  - Amendment for latest
- Code supercede standards
Two typical references

- General 903.3.1
  - Any type system
- Specific section (system Type)
  - Per 903.3.1.1 (13)
  - Per 903.3.1.2 (13R)
  - Per 903.3.1.3 (13D)
Other Issues
Performance Based Design

• Currently only applicable to building design
  – Smoke control
  – Building egress
  – Fire resistive construction

• Can be used to evaluate some installation criteria
  – See “Ceiling Pocket” report at www.sprinklernet.org
  – Small room allowance and 8 inch lintels

• Not applicable to sprinkler system design
  – No accurate fire models for suppression
Performance Based Design

• Bid package must reflect criteria
  – AHJ checks per NFPA 13 NOT specification package
• Documentation and maintenance requirements part of continued use of building
  – Applies throughout life of bldg
Performance Based Design

- Sprinkler spacing, head temp
- Steel column protection vs fire proofing
- Size of the fire (stop the growth of the fire)
- Smoke control design requirements
  - Size of fans
  - Temperature rating of fan
- Atriums and high ceilings
Value Engineering

- Impact on other construction features
- IBC 708.1 requires draftstopping
- IBC 708.4 Ex 6
  - With a NPFA 13 system not required.
Hybrid 13R System

- IBC:708.4 Ex.6 Installed in building Per NFPA 13R except to omit draftstopping in attics requires that sprinklers be installed in combustible concealed spaces.
  - Includes between floors
  - Lose main cost savings of 13R
    - Still less than NFPA 13
What Goes Where

- IBC Chapters 1 - 10
  - 11 - 34
  - Ch 35 Referenced Standards

- Other models
Construction Trade-offs
Base Construction

- Height increase (typical 20 ft plus 1 or 2 stories) (504.2)
- Area increase (506.3)
  - 200% for buildings two or more stories
  - 300% for buildings single stories
Base Construction

- Unlimited Area Buildings (507)
  - One and two stories Business and Mercantile plus 60 ft yards

- Maximum allowable area of unprotected openings in exterior walls (704.8.1)
Rated Construction

- Corridors
- Hazardous area protection
  - (separation / protection)
- Occupancies separation
  - FIRE DAMPER / COST
Rated Glass Partitions

- **Interior:** Initially only NFPA 101
  - Just atriums
  - Must wet entire surface
- **Exterior walls**
- **ICC (and prior 3 model codes)**
  - National Evaluation Report 516
  - ICBO -ES report 5709
  - 2-hr rating with WS model sprinklers
Means of Egress (ch. 10)

- Travel Distance
- Dead End corridors
- Common path of travel
- Separation between exits
Fire Dept Access and Fire Hydrant Spacing

- Increased distance for fire hydrant spacing (IFC: 508.5.1 Ex 2)
  - For both 13 & 13R

- Reduction in access road (IFC 503.1.1)
Sprinkler Standards

- Trade-offs restricted by type of sprinkler systems: 13 or 13R
  - 1994 UBC 904.1.3: No Exceptions or reductions for a NFPA 13R system.
  - 2000 IBC 903.1.2: Unless specifically allowed no exceptions or reductions for NFPA 13R systems
  - 2003: Nothing in Ch 9
Modified Features

- Allowed trade-off depends on:
  - Building feature
  - Why sprinklers are provided
  - Type of system: 13 or 13R

- IBC Table 601, note c: Sprinklers may substitute for 1 hr. rated construction when:
  - Installed per 903.3.1.1
  - Not required by other provisions of the code OR
  - Used for an area increase
Modifying Multiple Features

- When sprinklers are not required by other provisions of the code...

- Applying a trade-up with sprinklers makes it a REQUIRED system

- Applying an allowance for sprinklers to one feature does NOT exclude modifying other features unless explicitly stated
Standpipes

• Modifying Standpipes - Class II
Design Criteria
NFPA 13R

- Where used
  - Residential occupancies
  - Portions can be non-residential

- Defining Four Stories

- Mixed Occupancies
Multiple Buildings

• With a common wall

• Inadequate distance between
Omission of Protection

- By Location (903.2)
  - Telecommunication
  - Participant sports area
  - Parking

- General - With detection (903.3)
  - Generator and transformer rooms
  - Discharge issue due contents
  - Non-combustible construction and contents
Seismic Protection

- Historically Local building code simply said Yes or No
  - Left to contractor to know
- All systems protected unless proven otherwise
  - Seismic Use group (Type of facility)
  - Type of system
  - Site classification
  - Acceleration values
- Design team evaluation
High Rise

- Definition
  - Can conflict with NFPA standards

- Sprinkler design factors

- Standpipes

- Seismic - Water supply
Other factors

• Construction limits
  - NFPA 13R Balconies PROTECTED

• System Supervision
  - Per NFPA 72
  - Items per 903.4
Design Issues Not addressed
Ceiling Issues

Issue:
Distance below ceiling

5'-0"

10'-0"
Vents and Draft Curtains

• (13: 12.1.1) Sprinkler protection criteria is based on the assumption that roof vents and drafts curtains are NOT being used.
  
  - Curtains: additional sprinklers open
  - Vents:
    • Concern on delayed operation
    • Sprinkler distance below ceiling
CONCLUSION