Fire Safety Engineering: The Performance-Based Approach

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Exova Warringtonfire

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Agenda

• About us
• Code compliance
• Performance-based design
• Case study
• Examples
About Me

• Master of Engineering (Fire Safety & Mechanical)
• Chartered Fire Engineer
• Member of NFPA 5000 Technical Code Correlating Committee
• Specialist in Performance-Based Design

Exova
About Exova Warringtonfire

- Exova (Bodycote)
- Fire research & testing
- Independent
- One stop shop
- Local yet global

Exova
Code Goals & Objectives

1. Occupant safety
2. Safety of fire brigade
3. Avoid spread to other buildings
4. Avoid damage to adjacent building
Code Compliance Options

Building Code (NFPA 5000 or IBC)

Goals & Objectives
Functional & Performance Requirements

Prescriptive Design
Performance-based Design

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Performance-Based Design

Management Procedures

Building & Systems

Occupant Behaviour

A holistic approach to Fire and Life Safety

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Systematic Approach

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Case Study – New Theme Park

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Extended Travel Distance

- **Sprinklers?**
  - Required: Yes
  - Proposed: Partial Protection

- **Smoke Exhaust?**
  - Required: No
  - Proposed: Yes

- **Travel Distance**
  - Required: < 76 m
  - Proposed: < 150 m
Evacuation Time

\[ \text{RSET} = \text{Ta} + \text{Tr} + \text{Tt} \]

- Ignition
- Fire Detected
- Occupants Start to Evacuate
- Evacuation Complete
- Alarm Time (Ta)
- Response Time (Tr)
- Travel Time (Tt)
Evacuation Modelling

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Time to Reach Untenability

- Geometry?
- Fuel load?
- Ventilation Condition?
- Sprinklers?
- Smoke control?
- Compartmentation?

ASET

Conditions Unsafe for Occupants

Ignition
Tenability Criteria

Temperature

Visibility

Toxicity

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Fire & Smoke Modelling

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“Timeline Analysis”

ASET > RSET x Safety Factor

Ignition

Required Safe Egress Time

Safety Factor

Available Safe Egress Time

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Case Study – Benefits

• Superior fire & life safety
• Practical design
• Cost effective
• Easy to build
• Sustainable
• Innovative design
Recap

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Questions?

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