

About this Presentation

Provides an overview of the performance-based design review process, the role of the AHJ, and tools available to the code official. It will include discussions related to:

- The roles, responsibilities and qualifications of design team members
- Review process including the use of peer review
- An example of how engineering methods and models are used
- Managing changes to the design
- Maintaining the design and documentation

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What is Performance-Based Design (PBD)?

Performance-based design is an engineering approach to fire protection design or alternate methods in the IBC based on established fire safety objectives and functional statements, analysis of fire scenarios, and assessment of designs based on the objectives and functional statements. Performance-based design differs from traditional prescriptive design in that specific methods for achieving compliance with the design intent are established by the design team, in partnership with the code official. A fire/life safety solution is developed that is tailored to the specific building, fire and occupant characteristics contained within the building being assessed.

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Why PBD?

- Evaluate designs of fire protection measures to achieve stated objectives
- Support alternatives to prescriptive-based code requirements
- Evaluate the building fire safety as a whole
- Prescriptive codes can stifle innovation.



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Advantages of Performance Based Design

- Greater design flexibility and address unique building features
- More cost effective
- Provides an environment that encourages new ideas
- Prescriptive codes protect against fires that occurred in the past.

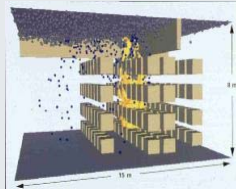


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Advantages of Performance Based Design, cont'd

- Designs based on engineering, not prescribed schedules, layouts, etc.
- Expedites implementation of research results
- Better understanding of building performance (what is safe in codes?)

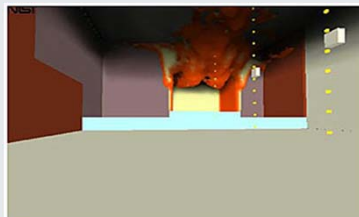


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Disadvantages of Performance Based Design

- Requires more expertise
- Resistive to change
- More time sensitive
- AHJ acceptance



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History

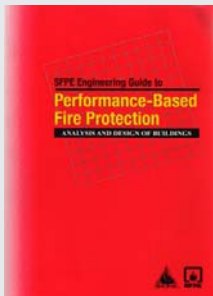
- 1970s – GSA Develops Goal Oriented Approach
- 1985 – British PBD Regulations
- 1992 – NZ Building Code
- 1995 – Australian Regulations & Guidelines
- 1995 – Nordic Committee Develops *Performance Requirements for Fire Safety & Technical Guide for Verification by Calculation*
- 2000 – NFPA 101 Performance Options
- 2000 – Japanese PB Standard
- 2001 – ICC Performance Code

From *Performance-Based Fire Safety Design*, Hurley & Rosenbaum (2015)

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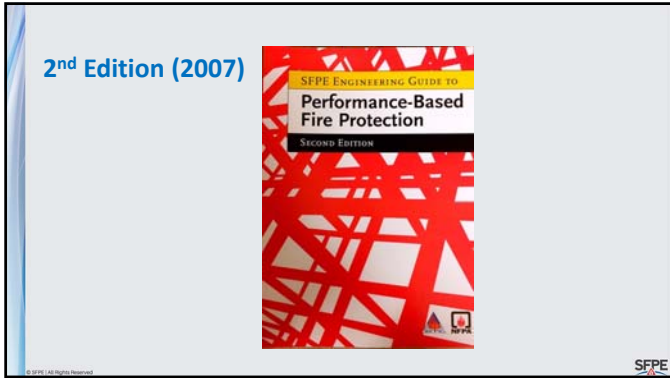
Original SFPE Guide (2000)

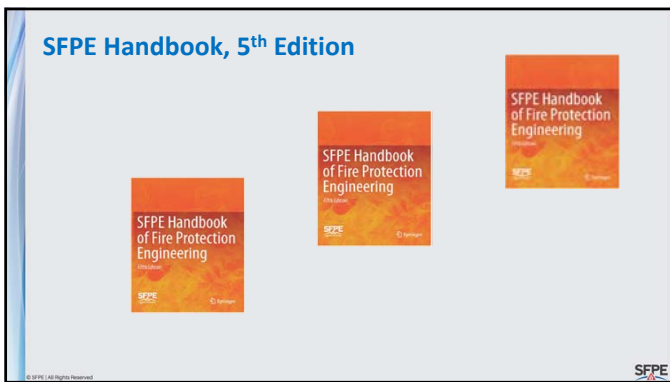


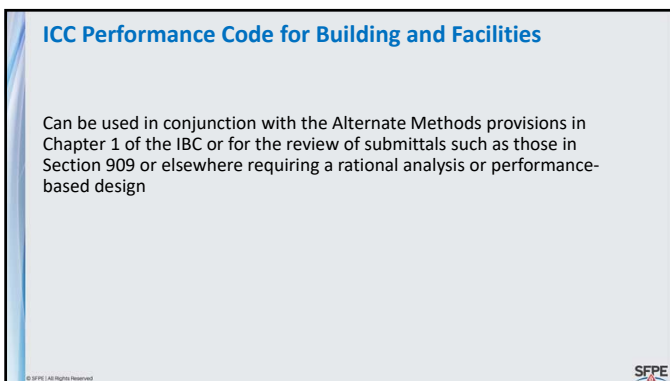
The image shows the cover of the book "SFPE Engineering Guide to Performance-Based Fire Protection: Analysis and Design of Buildings". The cover is red with white and yellow text. It features a stylized building graphic at the top and a fire icon at the bottom.

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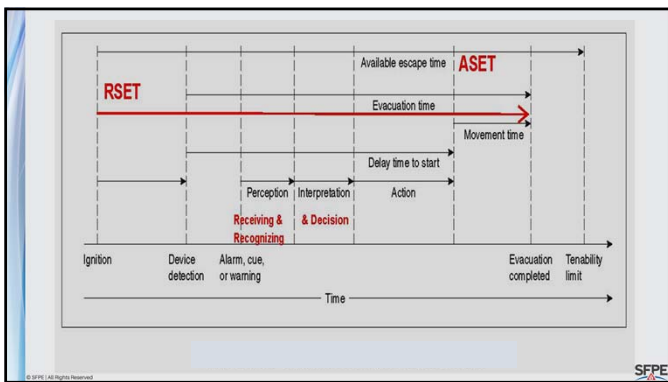


Basic Premise (Life Safety Analysis)

ASET > RSET

- ASET (available safe egress time): time from ignition until the room/space becomes untenable
- RSET (required safe egress time): time needed by occupants to evacuate from the space

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Stakeholders (Design Team)

<ul style="list-style-type: none"> • Building owner • Building facility manager • Design team • Authorities Having Jurisdiction • Construction manager • General contractor • Sub-contractors • Tenants • Insurance Interests • Emergency responders • Peer reviewer 	<p>Responsibilities:</p> <ul style="list-style-type: none"> • Good Communication • Understand Objectives • Reach a Basic Agreement <p>Schedule of:</p> <ul style="list-style-type: none"> — Meetings — Reviews — Deliverables — Inspection Process
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Qualifications

Registered design professionals shall possess the knowledge, skills and abilities necessary to demonstrate compliance with this code.

ICC Performance Code for Buildings and Facilities

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Qualifications -- Fire Protection Design Professionals (FPE, FSE, FE, etc.)

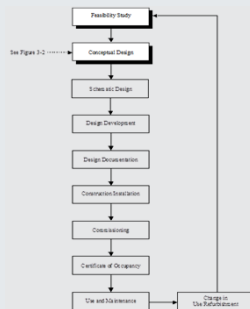
- Fire dynamics
- Fire modeling
- Active FP systems
- Passive FP systems
- Fire testing
- Fire department operations
- Human behavior



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Basic Building Design and Construction Process (from SFPE PBD Guide)



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Review Process

Design Submittal.

- *Applicable construction documents shall be submitted to the code official for review. The documents shall be submitted in accordance with the jurisdiction's procedures and in sufficient detail to obtain appropriate permits.*

Review.

- *Construction documents submitted in accordance with this code shall be reviewed for code compliance with the appropriate code provisions.*

ICC Performance Code for Buildings and Facilities



Peer Review

The owner or the owner's authorized agent shall be responsible for retaining and furnishing the services of a registered design professional or recognized expert, who will perform as a peer reviewer, where required and approved by the code official.

From ICC Performance Code for Buildings and Facilities



Conducting a Peer Review for a PBD

SFPE GUIDELINES FOR PEER REVIEW IN THE FIRE PROTECTION DESIGN PROCESS (2009)

- Can be found at: www.SFPE.org
- Address:
 - When to use a peer reviewer
 - Choice of reviewer
 - Scope of the review
 - Agreements needed
 - Documentation of the peer review



Choice of a Peer Reviewer

- The importance of a peer reviewer's independence and technical expertise cannot be overemphasized.
- Be objective and have no personal or corporate conflict of interest in the project.
- Disclose any conflict of interest or technical bias.
- Must have necessary knowledge and fire protection engineering



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Example of a PBD

- Will insert an example here

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Managing Changes to the Design

Analysis of change

The registered design professional shall evaluate the existing building, facilities, premises, processes, contents and the applicable documentation of the proposed change as it affects portions of the building, facility, premises, processes and contents that were previously designed for compliance under a performance-based code. Prior to any change that was not documented in a previously approved design, the registered design professional shall examine the applicable design documents, bounding conditions, operation and maintenance manuals, and deed restrictions.

From ICC Performance Code for Buildings and Facilities

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Managing Change

Maintenance

Maintenance of the performance-based design shall be ensured throughout the life of the building.

Changes

The owner or the owner's authorized agent shall be responsible to ensure that any change to the facility, process, or system does not increase the hazard level beyond that originally designed without approval and that changes shall be documented in accordance with the code.

From ICC Performance Code for Buildings and Facilities



Documentation

The registered design professional shall prepare appropriate documentation for the project that clearly provides the design approach and rationale for design submittal, construction and future use of the building, facility or process.

Verification of compliance

Upon completion of the project, documentation shall be prepared that verifies performance and prescriptive code provisions have been met. Where required by the code official, the registered design professional shall file a report that verifies bounding conditions are met.

Extent of documentation

Approved construction documents, the operations and maintenance manual, inspection and testing records, and certificates of occupancy with conditions shall be included in the project documentation of the code official's records.



Reports & Manuals

The design report shall document the steps taken in the design analysis, clearly identifying the criteria, parameters, inputs, assumptions, sensitivities and limitations involved in the analysis. The design report shall clearly identify bounding conditions, assumptions and sensitivities that clarify the expected uses and limitations of the performance analysis. This report shall verify that the design approach is in compliance with the applicable codes and acceptable methods and shall be submitted for concurrence by the code official prior to the construction documents being completed. The report shall document the design features to be incorporated based on the analysis.



Design Report shall address but not be limited to the following:

- *Goals and objectives.*
- *Performance criteria.*
- *Hazard scenarios.*
- *Design fire loads and hazards.*
- *Final design.*
- *Evaluation.*
- *Bounding conditions and critical design assumptions.*
- *Critical design features.*
- *System design and operational requirements.*
- *Operational and maintenance requirements.*
- *Commissioning testing requirements and acceptance criteria.*
- *Frequency of certificate renewal.*
- *Supporting documents and references.*
- *Preliminary site and floor plans.*


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Thank you for your time.

Questions?

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**Thank You For
Attending**

