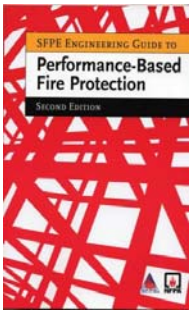
UNIVERSITY OF MARYLAND
Department of Fire Protection Engineering

Performance-Based Approach to Fire Safety Design

Performance Based Approach

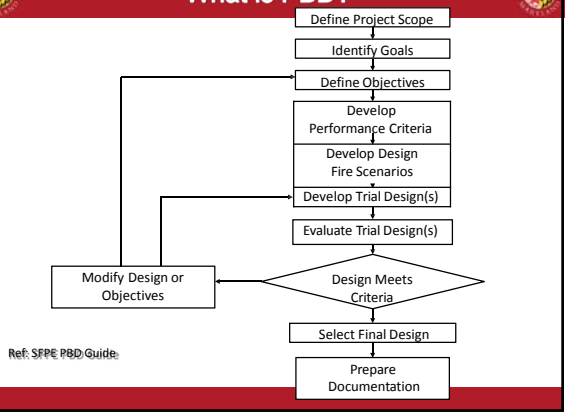
- Introduce Concept
- Discuss Elements
  - Goals
  - Assessments
  - Designs
- Example Applications
- Choosing Appropriate Design



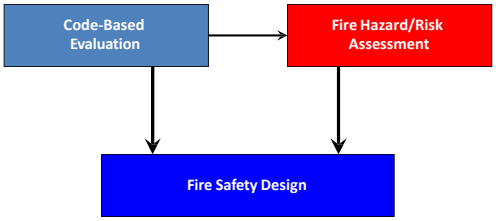
What is Performance Based Design (PBD)?

- Evaluation of Hazard or Risk based on defined goals
- Scenario specific
  - Fires
  - Building
  - Occupants
- Hazard-Consequences
- Risk-Consequences X Probability

What is PBD?



What is PBD?

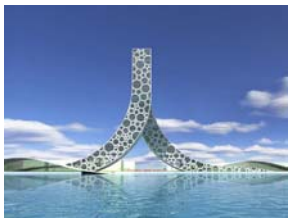


How is it different from code?

- Based on Fire Risk/Hazard Assessment Evaluation
- Evaluates specific building or structure

Why use PBD?

- Prescriptive code not feasible
- Based on system performance
- Addresses project specific needs



Develop Performance Goals

Life Safety:
- Protect occupants not intimate with fire for time needed to evacuate

Building Structure:
- Minimize damage to major structural elements

Building Appearance:
- Minimize impact of strategies on architectural features and openness of galleries

Facility Operations:
- Minimize undue loss of operations due to fire
- Prevent damage from fire to critical equipment

Example of Life Safety Performance

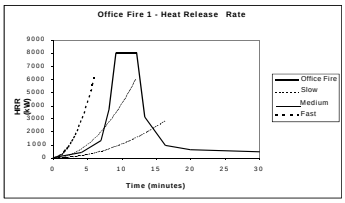
- Performance Criteria: Maintain visibility of >10 m

- CO / COHb
- Temperature
- Structural Integrity

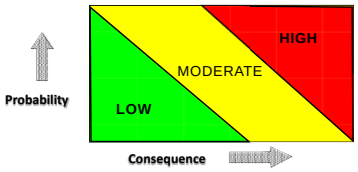
Egress Time + Safety Factor < Time to Hazardous Conditions

Develop Fire Scenarios

- Quantify fire into engineering terms
  - Example - typical office fire
  - 8,000 kW, fast-growth rate fire, 15-minutes
- Range of fire scenarios for different areas



Performance Risk Assessment



RISK = HAZARD x PROBABILITY

Perform Fire Risk Assessment

Frequency → / Consequence ↓	Beyond extremely unlikely	Extremely unlikely	Unlikely	Anticipated
	$f < 10^{-6}$	$10^{-6} \le f < 10^{-5}$	$10^{-5} \le f < 10^{-3}$	$f > 10^{-3}$
Extreme		7	4	1
High	10	8	5	2
Moderate		9	6	3
Low	11		12	

"High" risk
"Moderate" risk
"Low" risk
"Negligible" risk

- Apply to each fire scenario
- Determine relative fire risk
- Evaluate for Trial Designs

Select Final Design

Options That Meet Goals

Vs.

Options That Meet Most of the Goals

- Cost
- Aesthetics
- Feasibility

Summary

- Performance-Based Design
  - Different than prescriptive approach
  - Use Fire Risk/Hazard Assessment Evaluation
  - Numerous factors influence ultimate design