The Challenges for Sustainable Fire Safety

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Presentation Outlines

Introduction
Why Fire Safety
Building Regulations & Codes (UBBL)
Performance-based Codes
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Introduction
Fire Safety

**Fire safety** is the set of practices intended to reduce the destruction caused by fire. Fire safety measures include those that are intended to prevent ignition of an uncontrolled fire, and those that are used to limit the development and effects of a fire after it starts.

Fire safety measures include those that are planned during the construction of a building or implemented in structures that are already standing, and those that are taught to occupants of the building.

Threats to fire safety are commonly referred to as fire hazards. A fire hazard may include a situation that increases the likelihood of a fire or may impede escape in the event a fire occurs.
Why Fire Safety
Why fire safety?

- Life safety
- Community impact
- Environment impact
- Business impact

**ECONOMIC IMPACT OF WAREHOUSE FIRES**

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£1 billion cost of warehouse fires to UK Plc

The British economy has lost £1 billion in GDP and 5,000 full-time jobs through preventable fires in commercial warehouses over the last five years.
Why fire safety?

Safety of Occupant
Safety of Properties
Safety of Firefighters
Safety of Adjacent Premises
Business Continuity
Why fire safety?

To achieve this five principles, a building must have certain fire safety elements;

- an adequate means of escape for occupants,
- a structure that can withstand the fire for a period of time to allow occupant to get out of the building and for firefighters to extinguish the fire,
- appropriate compartmentation to contain the fire,
- the ability to detect and extinguish the fire at the earliest stage, and
- adequate access for intervention by the fire brigade.
Why fire safety?

Safety measures are based on years of experience.
What we do now, the effect will be much later.
The worst enemy of safety is complacency.
Cost of Unsafe Act

Lost of life – occupants as well as firefighters
Lost of property
Lost of business
Lost of work
Lost in term of economy
Building Regulations & Codes (UBBL)
What is Building Regulations?

“Building Regulations set standards for the design and construction of buildings to ensure the safety and health for people in or about those buildings.”

-GOV.UK-
Prescriptive-based Building Codes

“The minimum requirement to safeguard the public health, safety and general welfare through structural strength, means of egress facilities, stability, sanitation, adequate light and ventilation, energy conservation, and safety to life and property from fire and other hazards attributed to the built environment.”

International Code Council
Building Regulations

In general, these building regulation achieve their intent of providing safety through the use of specific requirements based on generalized construction types and occupancy classifications.
History of Building Regulations

Ancient – Codes of Hammurabi (circa 3000 BC)
  ◦ 229. If a builder builds a house for someone, and does not construct it properly, and the house which he built falls in and kills its owner, then that builder shall be put to death.
  ◦ 230. If it kills the son of the owner, the son of that builder shall be put to death.

Big Fire Event i.e. Rome Fire (64 AD), London Fire (1666 AD), Chicago Fire (1871 AD)

19th Century – Modern Building i.e. North America
Building Codes – Comments

“The Deemed to Satisfy (DTS) provisions are very conservative. Things are changing – there is a need to be more efficient” Philip Chun, Australian Building Code Consultant.

“The presumption that there is only one way of providing the level of safety makes the prescriptive code rigid and inflexible” Hadjisophocleous and Benichou (1999) – Performance Criteria Used in Fire Safety Design, Automation in Construction, Canada
Unfortunately, many of the existing prescriptions are based on empirical fire statistics and historical data, without substantial scientific research data or practical evaluation to support them. In addition, the process of code development has been essentially reactive to events rather than proactive in anticipating events.
Building Codes – Comments

Given that many codes and standards are generic by occupancy and based primarily on past loss history, this minimum may well exceed what is needed for some buildings, yet fall far short of what is needed for others.

For Standard type of buildings it does provide consistent design perimeters for designers in achieving “deem to satisfied” design based on data provided in terms of maximum travel distance, compartmentation areas, size of compartmentation beyond which sprinkler protection is required.
Issues

- Rigid and Not flexible
- Objective of design often not specified
- Lack of understanding of fire safety fundamentals, fire behaviour
- Contains grey areas due to complexity of modern building design
- Lack of clarity subject to individual interpretation of outcome
- Some “Deem-to –satisfied” By-law is outdated e.g. fire resistant doors
- Even for prescriptive code, all active and passive fire protection systems shall be performance-based orientated
- Fire resistant doorset and portable fire extinguishers Malaysian Standards are drafted in accordance to performance-based fundamentals with flexibilities in design
Building Fire Safety Solutions + Fire Engineering

Performance Requirements

- Deemed to Satisfy Solution
  - Prescriptive

- Appropriate Solution
  - Fire Engineering Performance Based
Uniform Building By-Law (UBBL) 1984

- 1984 – buildings were small, shorts and easy to anticipate its design

- Recipe Book - prescribes materials, design and construction methods frequently without stating goals and objectives

- Unable to keep up with changes in design and innovation
Uniform Building By-Law (UBBL) 1984

Part I
Preliminary

Part II
Submission of Plans for Approval

Part III
Space, Light and Ventilation

Part IV
Temporary Works in Connection with Building Operations
Uniform Building By-Law (UBBL) 1984

Part V
Structural Requirements

Part VI
Constructional Requirements

Part VII
Fire Requirements

Part VIII
Fire Alarms, Fire Detection, Fire Extinguishment and Fire Fighting Access

Part IX
Miscellaneous
Deemed-to-Satisfy (DtS)
Level of Safety

- Alternate fire escape staircases for egress
- Tamper glass for building façade or atrium facade
- Proper separation of fire escape staircases
- Fire Appliance (truck) access road
- Accessibility of breeching inlet
- Ironmongery should be tested together with fire resistant doorset as a system
- Compartmentation wall with fire resistant doorset for underground car park lift lobby
Level of Safety

- Is it sufficient?
  - Yes for normal standard buildings
  - No if interested parties still tries to asked for waiver from Fire and Rescue Department not to install critical life safety fire protection systems though our UBBL is already a minimum requirement
- Is it not enough?
  - For those mega size buildings
Example 1

5th Schedule – Compartments Dimension

2,000 m² Paper Storage

4,000 m² Steel Storage
Example 2

5th Schedule – Compartments Dimension

Do we need more fire wall or FRS?

7,000 m² carpark

Is 4hr rating too much? Again it all depends on where the fire occur and the density of the carpark

18,000 m² carpark
Example 3

Means of Egress
Which one is safer?
Fire size, high of ceiling and smoke layer will be the deciding factors instead of just the egress speed or the egress distance
Performance-based Codes
Building Design Evolution
New Technologies

- **Fire Protection Systems**
  - State of the Art systems – more efficient systems i.e. sprinkler, fire detection etc.
  - Do we need high fire rating or fire compartment if fire is kept small? (Fundamentals of Performance-based design and cant do this in prescriptive code)

- **Materials**
  - Lightweight Construction i.e. Cross Laminated Timber, Drywall
  - Increase the quality, reduce the construction period, increase productivity but smoke density or the toxicity of adhesive as a result of heat needs to be established first for life safety
Alternative Solution

- Building Codes in many countries are shifting from prescriptive to more performance-based
- It has very broad application across various sectors – built environment, infrastructure and industrial
- Uses fire science, fire engineering principles, human science to protect people, property and the environment from fire
Building Performance Objectives

1. Occupant safety
2. Safety of fire brigade
3. Avoid spread to other buildings
4. Avoid damage to adjacent building
The challenges for sustainable fire safety

- Building are getting taller, bigger and complex

  This basic design premise results in large, open building spaces, which span multiple floor levels classified as atriums, and desired use of materials such as glass and unprotected steel for assemblies that are required to maintain a fire resistance rating.

- Green building i.e. open concept for natural lighting, natural ventilation, modern building materials many of which is highly combustible

  Many green building designs include atrium spaces to enhance light transfer and natural ventilation throughout the building area yet is not protected due to the height of the roof

  Wall hanging plants if not properly maintained becomes fire hazards
Challenges!

- Fire safety culture is not properly embraced. Fire safety is important but not urgent!
- Lack of expert, specialist, skilled person if performance-based to be used extensively
Is Building Regulations Compliance a Burden?

- If life safety is the prime objective (Fire Services Act 341 – Building owners or management is responsible for occupant safety through self-declaration of Fire Certificate under Fire Regulation)
- If property protection is also the prime objective for business continuation

- The answer is NO
Conclusions
Conclusion

UBBL defined minimum requirement by-law and is the fundamental to meet built-environment requirements!

- Mandatory requirement

- Compare to direct losses and consequences losses, loss of lives, loss of job, loss of business income, loss of business goodwill, loss of market

- Provide appropriate fire safety standard is a win-win scenario for building owners, occupants, Fire and Rescue Department Malaysia, insurance underwriters and National GDP
Conclusion

- UBBL needs to be regularly updated to include new materials, construction methods and technologies and eliminate unnecessary requirements

- Recently updated 2012

- Performance based code and performance-based building regulatory system can be a solution. It is implemented solely not to reduce cost but adds flexibility to existing prescriptive requirements.

- Accord building with appropriate protection in accordance with the fire hazards and fire risks
Conclusion

- Construction industry stakeholders should embrace fire safety fundamentals for life safety and should not try to reduce the minimum fire requirement as cost saving exercise.

- If everyone plays their part diligently, it will be a win-win situation for building owners, Fire and Rescue Department Malaysia, Professional Engineers, Professional Architects, Insurance Underwriters and all occupants of the building (could be you and me with our families)
Thank You!