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FIRE & RISK

The importance of research for provision of sustainable fire safety engineering

SFPE
Engineering A Fire Safe World ®

23rd of May 2023

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Presentation

What is sustainability?

Sustainability vs Fire Safety

Fire Safety Engineering hurdles

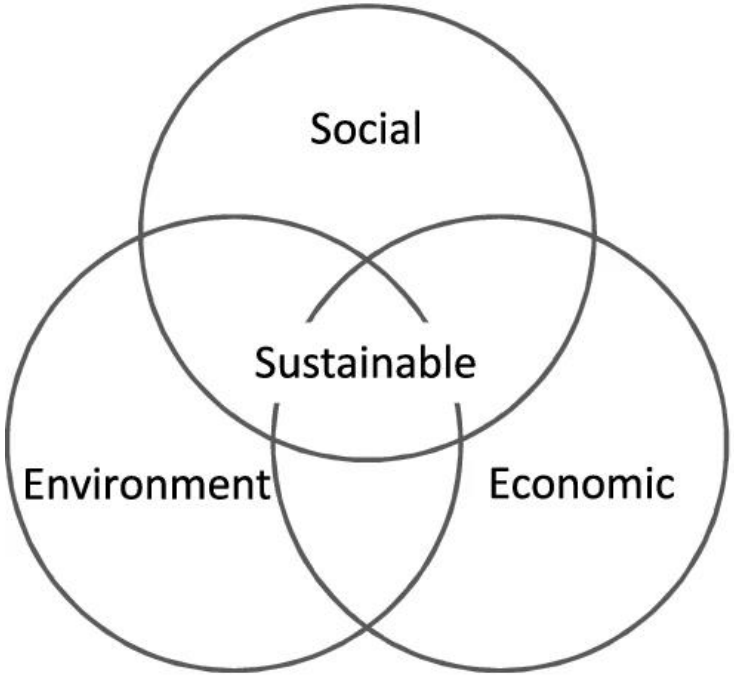
Needed Research

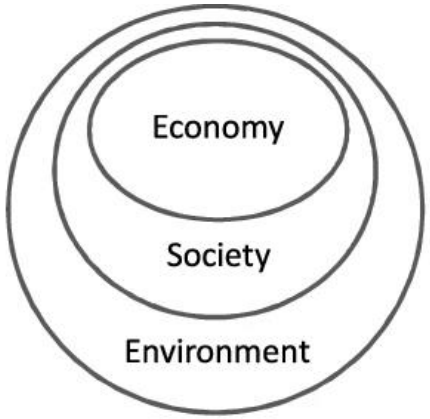
The role of the Fire Safety Engineer

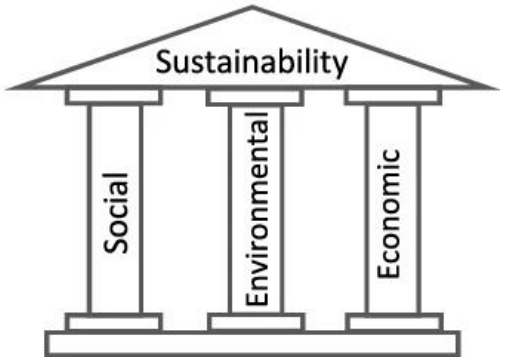
Conclusions

Sustainability

"A sustainable society meets our present needs without compromising the ability of future generations to meet their needs" (Brundtland Report, 1987)







Sustainability / Architecture

*"**Green architecture, eco-architecture and environmentally conscious architecture,** is a way of conceiving architectural design in a sustainable way, seeking to optimize natural resources and building systems, to minimize the environmental impact of buildings on the environment and its inhabitants."*

"It is about increasing environmental sustainability through better energy efficiency, reduction/reuse of building materials, incorporation of alternative energy sources, etc."

U.S. GREEN BUILDING COUNCIL LEED USGBC LEED LEARDERSHIP IN ENERGY & ENVIRONMENTAL DESIGN

BCA GREEN MARK

greenstar

CODE FOR A SUSTAINABLE BUILT ENVIRONMENT BREEAM BRE GLOBAL

Sustainability Strategies for Buildings

- Global demand to more **sustainable buildings / building technologies**
- Reduce energy from fossil fuel sources
- Reduce construction materials
- Reduce urban transportation impacts from fossil fuels

Overall Aim

- **Societal objectives** (to create modern, ‘green’ buildings which do not endanger our climate);
- We do this by **Designing our buildings** so that they express these societal objectives (materials, systems and design features);
- **BUT** we also want our buildings to be FIRE SAFE, we need **Control mechanisms** that are put in place to ensure that (regulations, standards and guidelines).

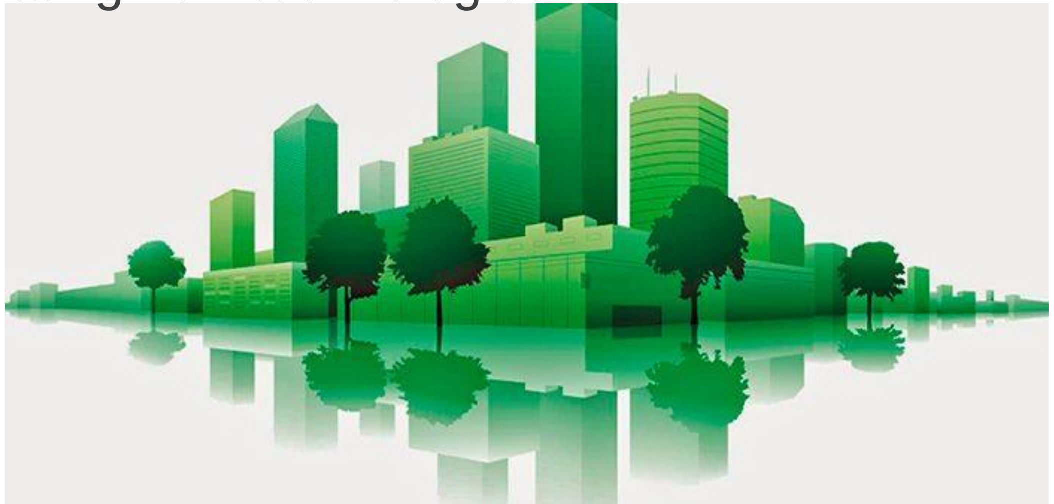
Sustainability Progress

- 10/15 years ago → Specific building projects applied “sustainability” criteria
- Now → The majority of new structures are (or need to be) “sustainable buildings”, it is becoming “mainstream”
- Globally (and specifically in Europe); renovation wave (existing building stock) + sustainability demands

→ This creates a powerful mix of “unknowns”

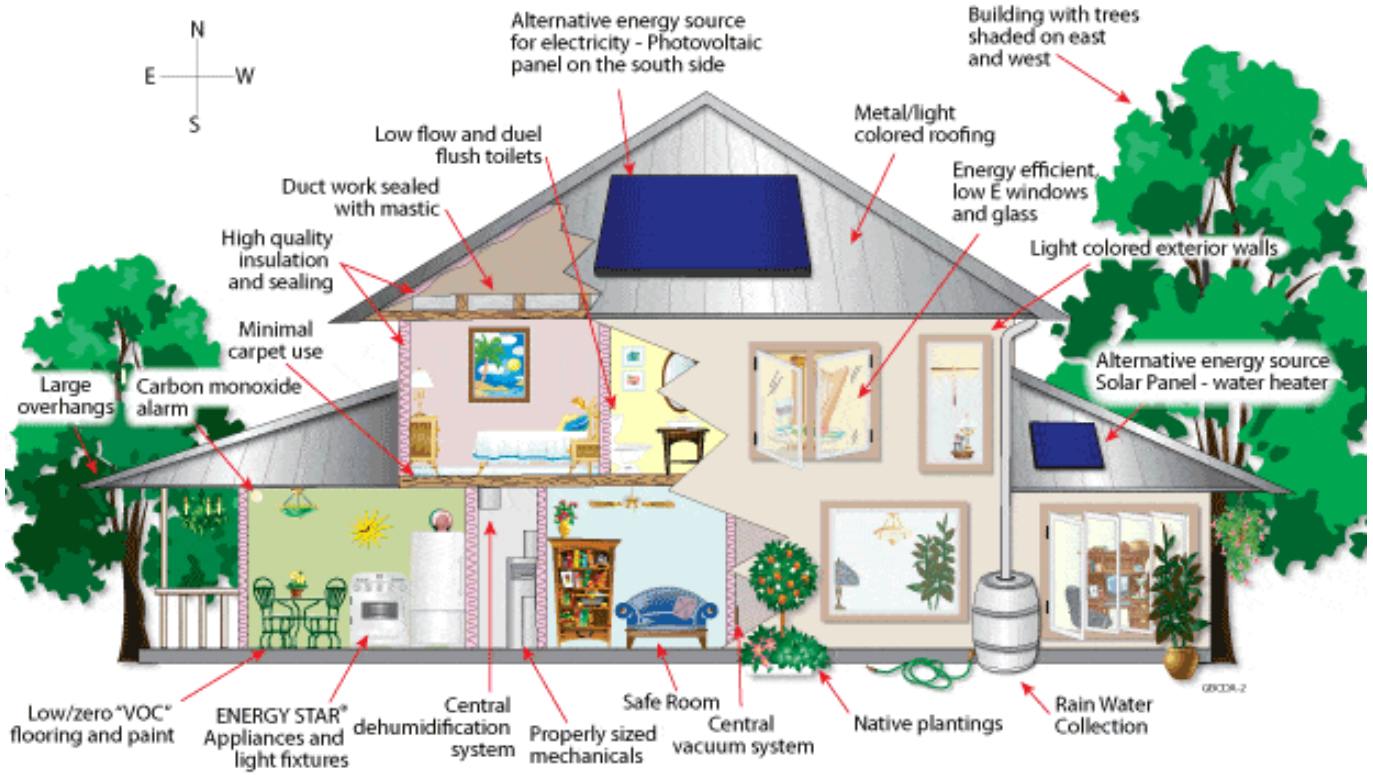
→ New and Existing building where we are applying/incorporating new technologies

→ We are lacking information/knowledge for both scenarios



Are Sustainability and Fire Safety Competing Objectives?

The extent to which the fire safety requirements of a building is impacted by sustainability technologies, and whether potential hazards may be created by sustainable building attributes, has only recently begun to be studied.



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What happened?

- Introduction of new sustainability goals & new sustainability technologies
- In a relatively short period of time,
- Without a full assessment of how they interact with the regulatory goals of buildings, and
- Without widely agreed holistic solutions,

→ **A situation with the potential to create increased hazards to occupants.**

→ **Are we there now?**

→ **Are we controlling/understanding the “new” hazards?**

→ **Can we still consider our buildings to be fire safe?**

Pace of Innovation, Development of New Technologies & Fire Safety Research

- What is our current situation from a fire safety perspective?

- We are NOT keeping up with development….

What is affecting the fire safety for a sustainable building?

Maybe we should ask ourselves: **What is NOT affecting the fire safety?**

Exterior Materials and Systems

- Façade and Wall Systems
- Timber Facades
- Green Walls and Roofs
- Etc.

Façade Features

- Out-of-Plane Geometry
- Solar Radiance Concentration
- Etc.

Alternate Energy Sources

- Photovoltaic Panel Systems
- Energy Storage Systems
- Building Integrated
- Photovoltaics (BIPV)
- Etc.

Structural Materials and Systems

- Lightweight / Engineering Lumber Systems
- Carbon Fiber Composites
- Ultra-High-Performance Concrete (UHPC)
- Etc.

Common upcoming (or already here) problems that we are struggling with as Fire Safety Engineers

Energy – New technologies

Alternative energy sources are good for sustainability, but photovoltaic panels can cause an ignition that develops into a significant fire.

Common upcoming (or already here) problems that we are struggling with as Fire Safety Engineers

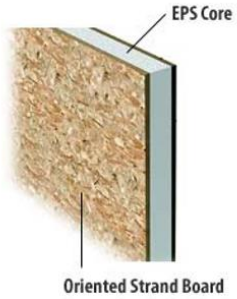
Wood + New technologies

Wood is "sustainable" but it is also combustible so if not addressed properly it can present a significant fire risk.

2″x 4″ or
2″x 6″

Cross Laminated
Timber (CLT)

Engineered
Wood I-Joist



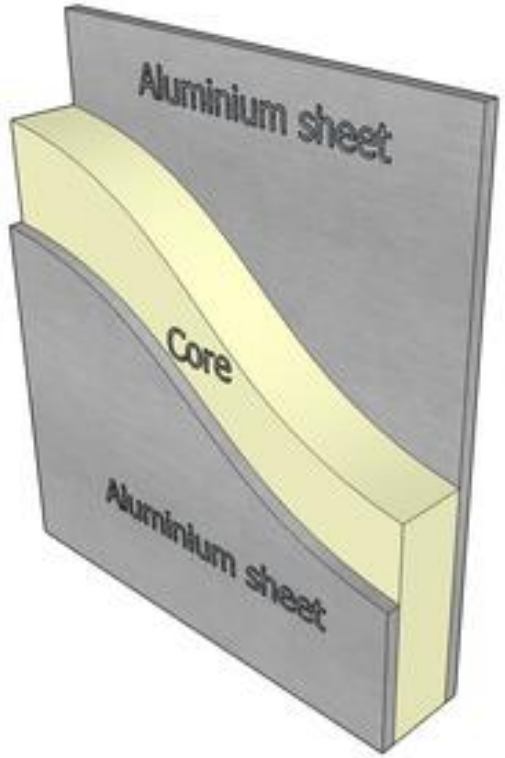
Structural
Insulated Panel

Engineered Wood

Common upcoming (or already here) problems that we are struggling with as Fire Safety Engineers

Facades – New materials

Insulation is good for sustainability, but a flammable insulation material can create very serious fires.



What do we need? → Research and Development

- Integration of ‘green’ (sustainable) attributes of buildings into fire incident reporting systems.
- More robust and appropriate test methods, which yield engineering data, for assessment of material, component and systems performance.
- Integration of fire performance considerations into sustainable materials, technologies
- Robust risk and performance assessment methods and tools, which are founded on broad expert stakeholder knowledge and experience, available data, and expert judgment where data are lacking.

→ **Coordinated effort (Globally/Europe)**

→ **Appropriate research bodies (Knowledge/Competence)**

→ **Buy in from Stakeholders (Resources)**

The role of the Fire Safety Engineer

Fire safety engineers can play a pivotal role in the **design and development of sustainable technologies** (e.g., ESS, building systems, …)

Fire safety engineers should undertake **fire hazard and risk assessments** as core components of **fire safety engineering designs for the built environment** (e.g., buildings, vehicles, transportation systems, power infrastructure, …)

Fire safety engineers are essential for appropriate **fire safety management & fire risk management** of the built environment

Overall Conclusions

- Sustainability is a concept that is here to stay – it is necessary for protecting resources, the environment and the population
- Fire safety is required as well–and has to be integrated with sustainability objectives
- Ignoring the need to engage across the spectrum means unintended, but addressable impacts, may go unaddressed
- **We need: new guidance material, updated legislation and fire safety engineering tools**

→ RESEARCH (a lot more of research)

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Thank you

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