

# Learning Objectives

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At the end of the this course, participants will be able to:

- 1) Participants understand the importance of stakeholder involvement in the development of Fire Safety Strategies for buildings
- 2) Participants will gain knowledge about the importance of implementing the Fire Strategy through design, construction, handover and facilities management
- 3) Participants will have an understanding of design specifications and how they relate to fire strategies and what happens when the specification is not checked by a fire safety professional or misunderstood by the contractor/site team
- 4) Participants will have an understanding of fire tests as they relate to materials of construction and design specifications
- 5) Participants will see real project examples of the course objectives

# **Fire Safety -- Strategy, Design, Specification, Construction and Facilities Management**

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**04<sup>th</sup> Dec 2013**

**Safety Design in Buildings, Oman**

**[www.arup.com](http://www.arup.com)**



# Summary

- **Fire Strategy to Facilities Management**
  - Design
  - Construction
  - Handover
  - FM Fire Safety Plan
- **Examples of what can go wrong**
- **Case study**
- **Conclusions**

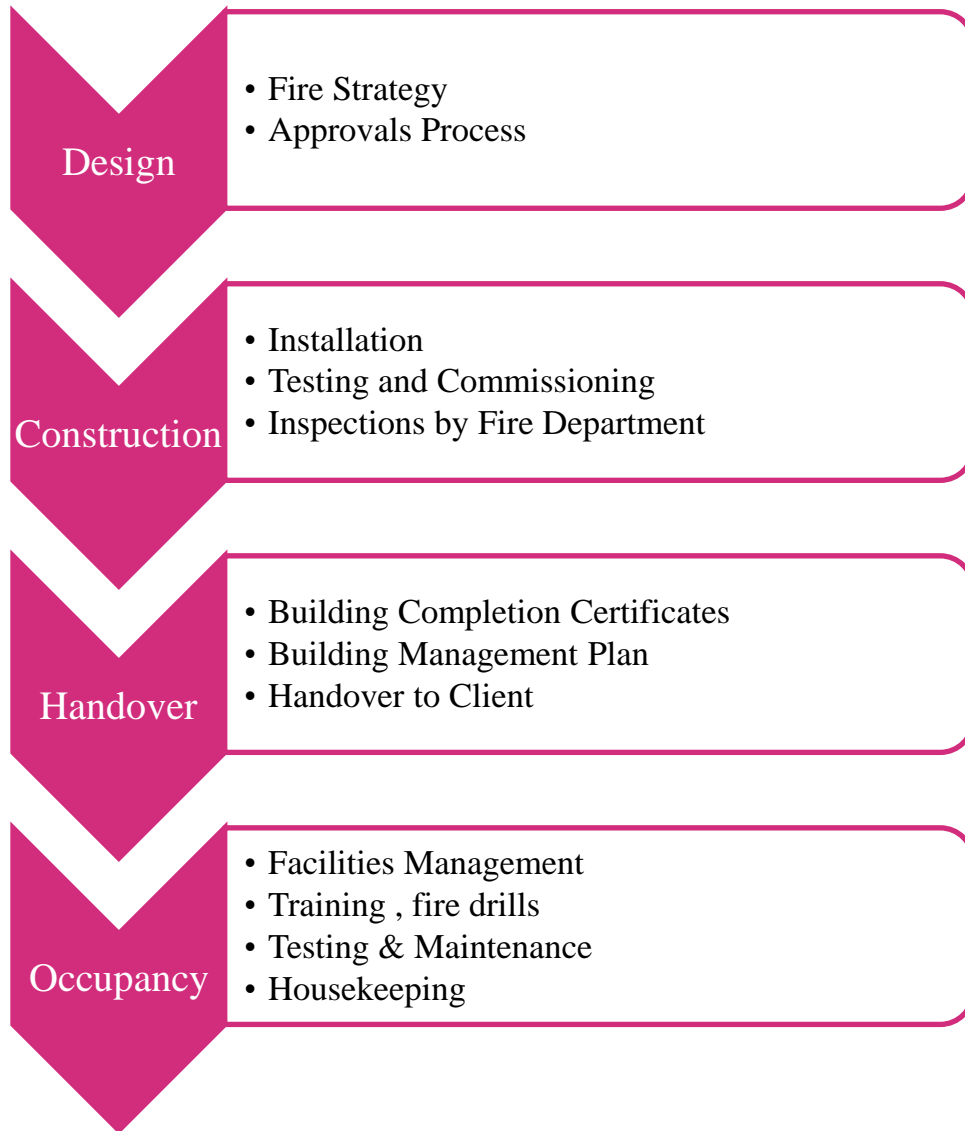


# Fire Safe Buildings?

- **Buildings come in all shapes and sizes but a fire is a fire**
- **All stakeholders should understand the fire strategy**
- **Check compliance with fire strategy during design, specification, construction, testing & commissioning, handover**
- **Prepare a fire safety plan, train and test with fire drills**
- **Regular maintenance and testing of systems**
- **A proactive approach is needed**



# Fire Strategy to Facilities Management





# Design Phase



# Design Phase - Communication

- **Talk with the client, operator, end users as early as possible**
- **Develop the fire strategy with them**
- **They know how the building will be used and therefore what will work and what won't**
- **They will enforce the fire strategy if they helped develop it**



# Design phase - Keep it Simple

## ■ Reliability, Maintenance & Testing

- “Do lots and lots of fire safety systems make the building safer?”
- Sprinklers, detection, smoke control – only reliable if tested and maintained (replaced) for the entire 30-50 years of the building life
- ***Less is often more .....keep it simple***
  - ***Protect the evacuating occupants, Fire Fighters and the asset as appropriate***
  - ***Cause and effect is simpler***
  - ***Testing and commissioning is less***
  - ***Maintenance is less***
  - ***Also – more sustainable, less space required etc etc***



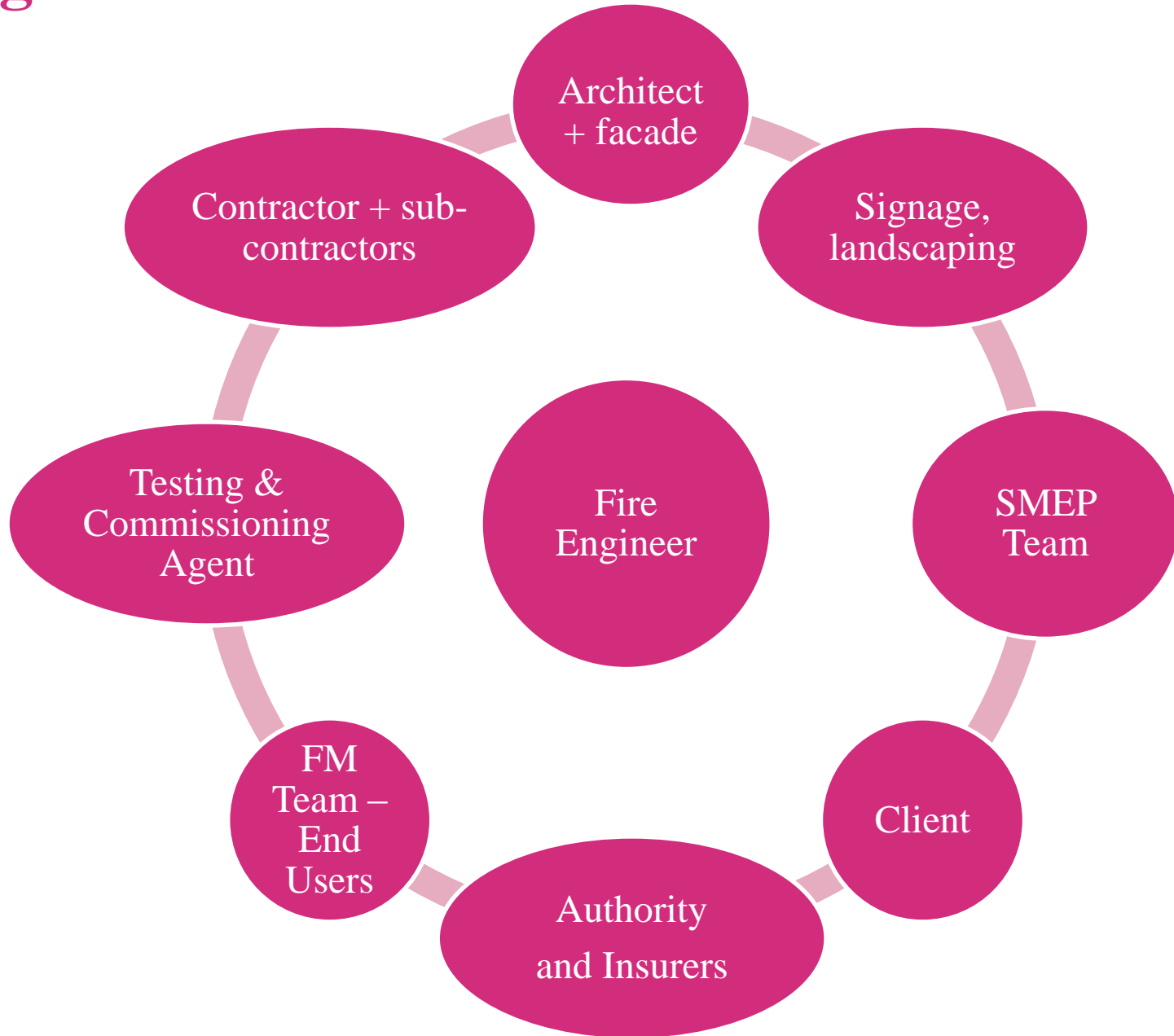


# Design Phase – Share Information

- **Producing a fire strategy report is 5% of the fire engineer's role**
- **Communication and liaison with stake holders and members of the team etc is 95%**



# Design Phase – Share Information



# Design Phase – Specifications

- **Materials of construction**
- **British versus US standards**
- **Understanding fire safety definitions**
- **Understanding fire tests**
  
- **Fire as a result of combustible materials of construction is a problem.....that is still an issue today**

# Station Night Club Fire

- The Station nightclub fire was the fourth deadliest nightclub fire in U.S. history, killing 100 people. The fire began at 11:07 PM EST, on Thursday, February 20, 2003, at The Station, Rhode Island
- The fire was caused by pyrotechnics, **which ignited flammable sound insulation foam in the walls and ceilings** surrounding the stage. A fast-moving **fire engulfed the club in 5½ minutes.**

<http://www.youtube.com/watch?v=OOzfq9Egxeo>

# Monte Carlo fire, Las Vegas

- **Combustible cladding materials in strips across the facade**



KABC-7

# Al Tayer Tower, Sharjah, UAE

Fire started at around 2:30am, burned for 5 hours



Press cuttings:

“Sharjah - Contractors to prove exterior aluminium cladding will not catch fire”

“A **hardline approach** to the widespread application of **non fire-rated** cladding in the wake of two major tower fires in recent months. “

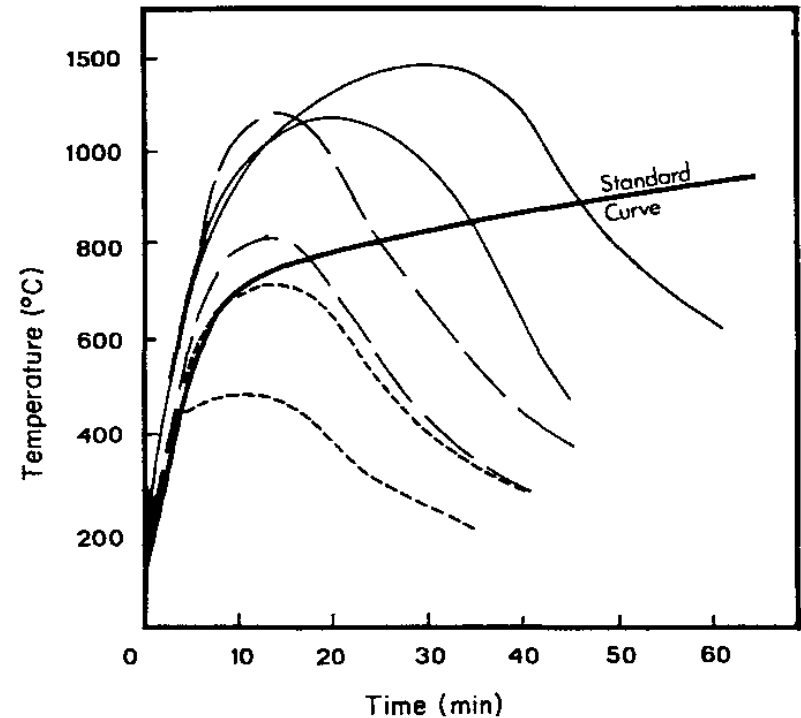
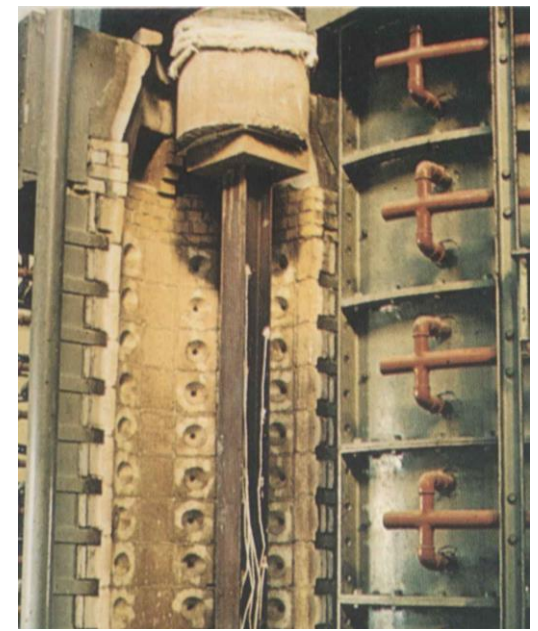
“Panels to be **fireproof**”

“Panels to **fire resistant** and withstand high temperatures”



# Why?

- Confusion over definitions and fire testing
- Non combustible
- Limited combustible
- Fire Retardant (wood)
- Fire Resistant



# Boom time construction – procurement times



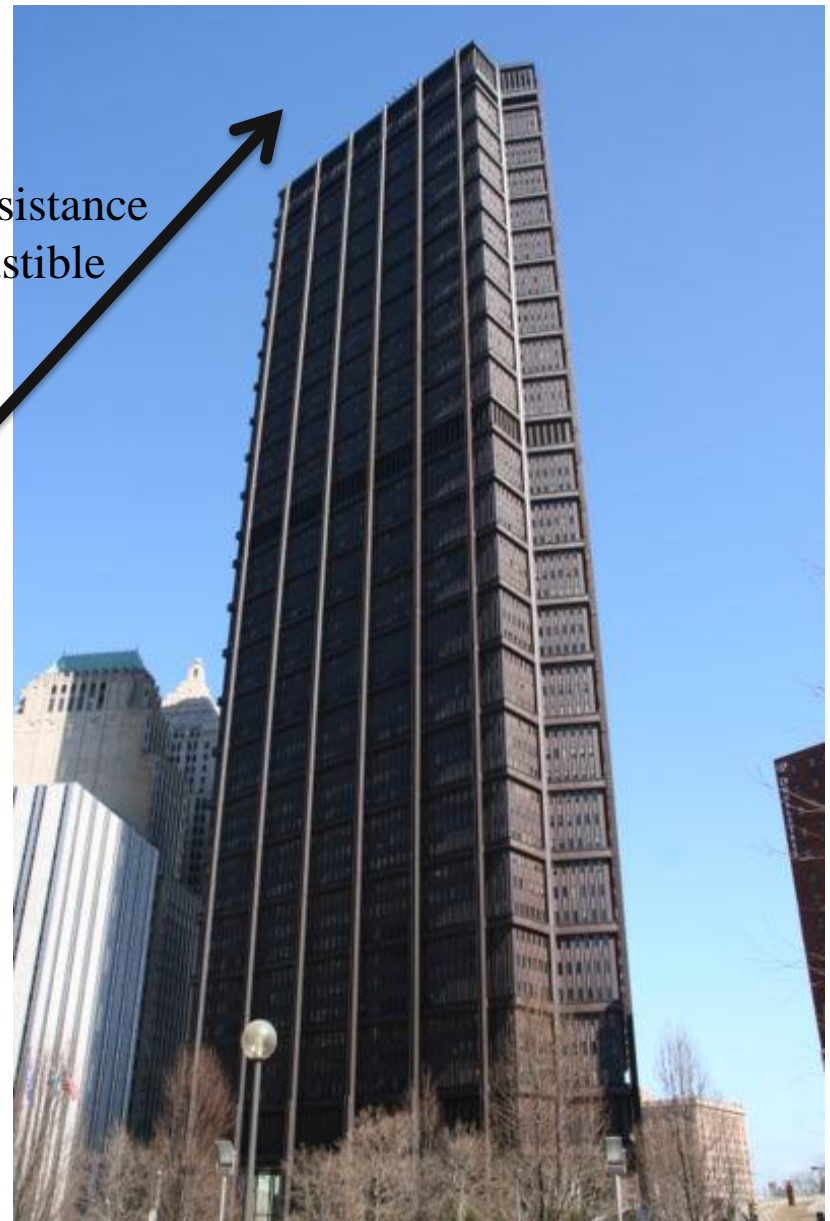
# Boom v bust - price





Type I  
Large/tall  
High fire resistance  
Non-combustible

Risk

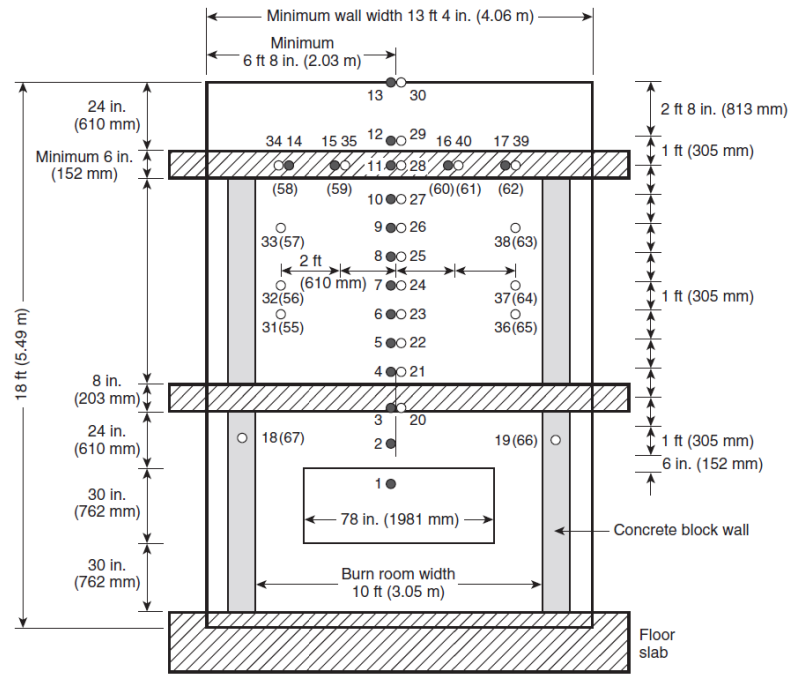
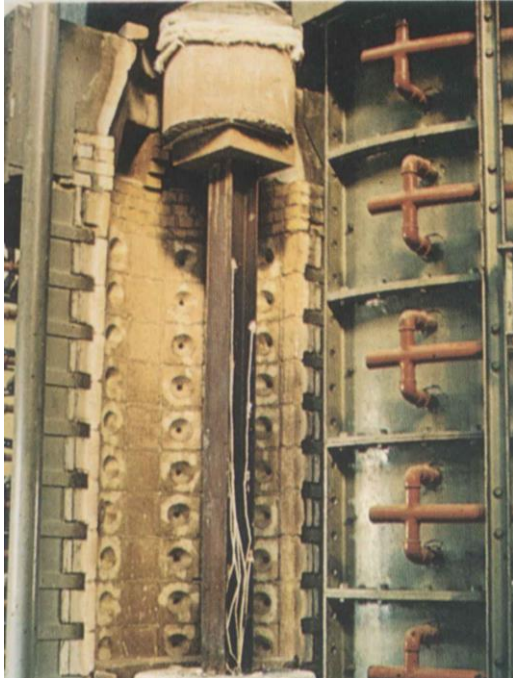


Type V  
Small/low rise  
No fire resistance  
Combustible materials ok

# Fire Tests

- **They are not intended to represent reality**
- **They are intended to be an industry benchmark and provide a comparison between the fire performance of different materials**
- **You have to specify the correct test for the application as not all tests are equally severe**
- **US, BS or EU are permitted in the Gulf**

# Fire Tests





# Fire Tests

Fire performance	Fire test	British Standard Test for Similar Products (not equivalent)
Fire resistance	ASTM E119	BS 476 – Parts 20 to 24
Flame spread	ASTM E84	BS 476 Parts 6 and 7
Smoke production	ASTM E84	No BS
Potential heat	NFPA 259	
Fire propagation of exterior walls	NFPA 285	BS 8414-Part 1 and 2
Non combustible	ASTM E136	BS 476- 4:1970 Non-combustibility test for materials or  BS 476-11:1 82 Method for assessing the heat emission from building products
Limited combustible	See NFPA 5000 definition	BS 476 Parts 11

# Certification

- **All products that have been fire tested to achieve a certain fire performance should also be certified to be sure of the quality and consistency of the product**
- **Always ask for the certification as well as evidence of fire testing**



# Construction Phase

# Construction Phase

- **Fire strategy drawings in addition to the fire strategy report are key**
- **Original design team may have been replaced by local consultants**
- **Fire Engineer is often no longer involved in project**
- **What can happen?**



**Stop it.....**



- **Spot the errors !!**

# Stop it.....



- **Spot the errors !!**





# Interior Designers vs Sprinklers



# Materials – interior linings, facades, etc..

- **Specification is misunderstood or not correct**
- **Material has been fire tested but is it the correct test?**
- **Does it meet the fire strategy?**
- **Is the material certified by an independent body**
- **Does the cheaper alternative or the locally available material provide the same performance?**
- **Is BS 476 Part 7 the same as ASTM E84?**
- **Is BS 476 Part 7 or ASTM E84 appropriate?**

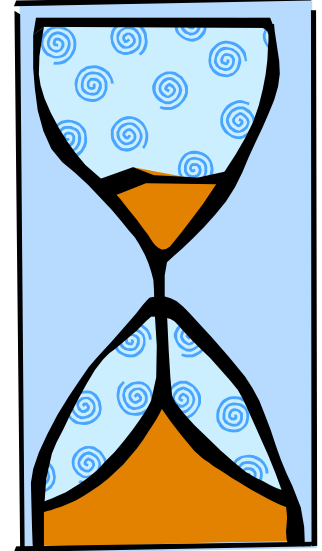


**Handover**



# Handover

- **Again fire engineer is often not involved**
- **Engineer of record reviews testing and commissioning by contractor + signs off project**
- **Civil Defence Inspection -**
  - Relatively short time on site
  - Has many other buildings to inspect
- **PRESSURE TO DELIVER ON TIME**
- **Facilities Manager develops fire safety plan**



# Fire Safety Plan

- **Training**
- **Emergency Management and Staff Structure**
- **Staff Duties**
- **Routine Fire Precautions**
- **Extensions and Alterations**
- **Fire Incident Routine**
- **Emergency Staff Response**
- **Evacuation Scenarios and Zoning**
- **Maintenance and Testing**



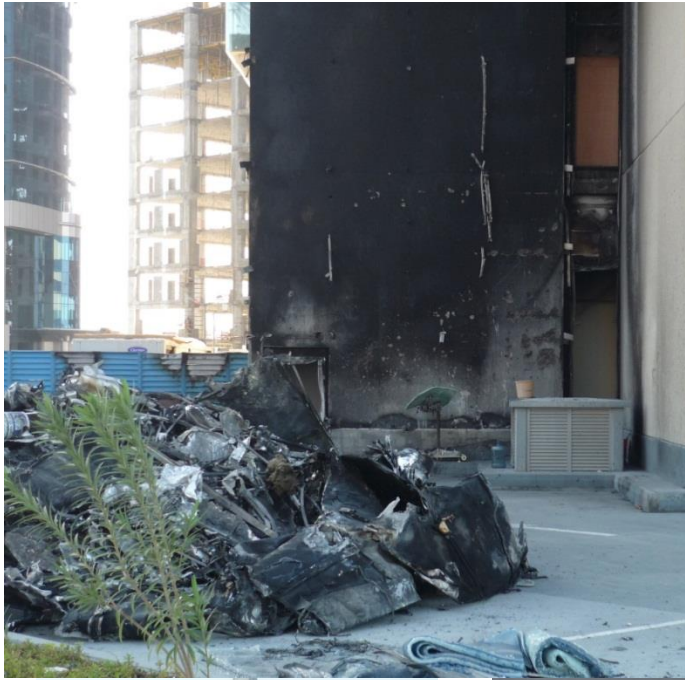
# **Case Study 1 – High Rise with Combustible Facade**



# Typical Facades in Gulf



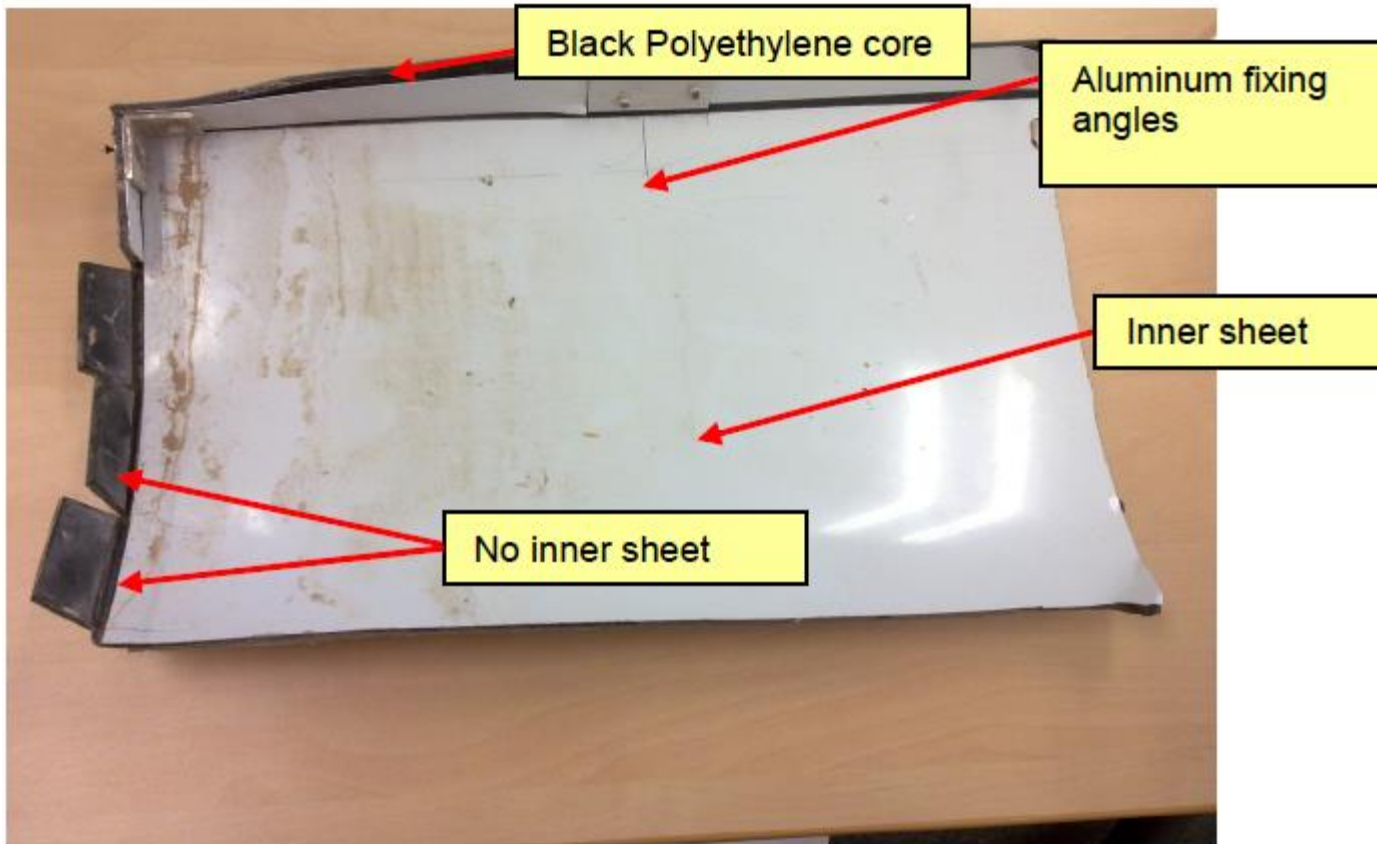
# Case Study





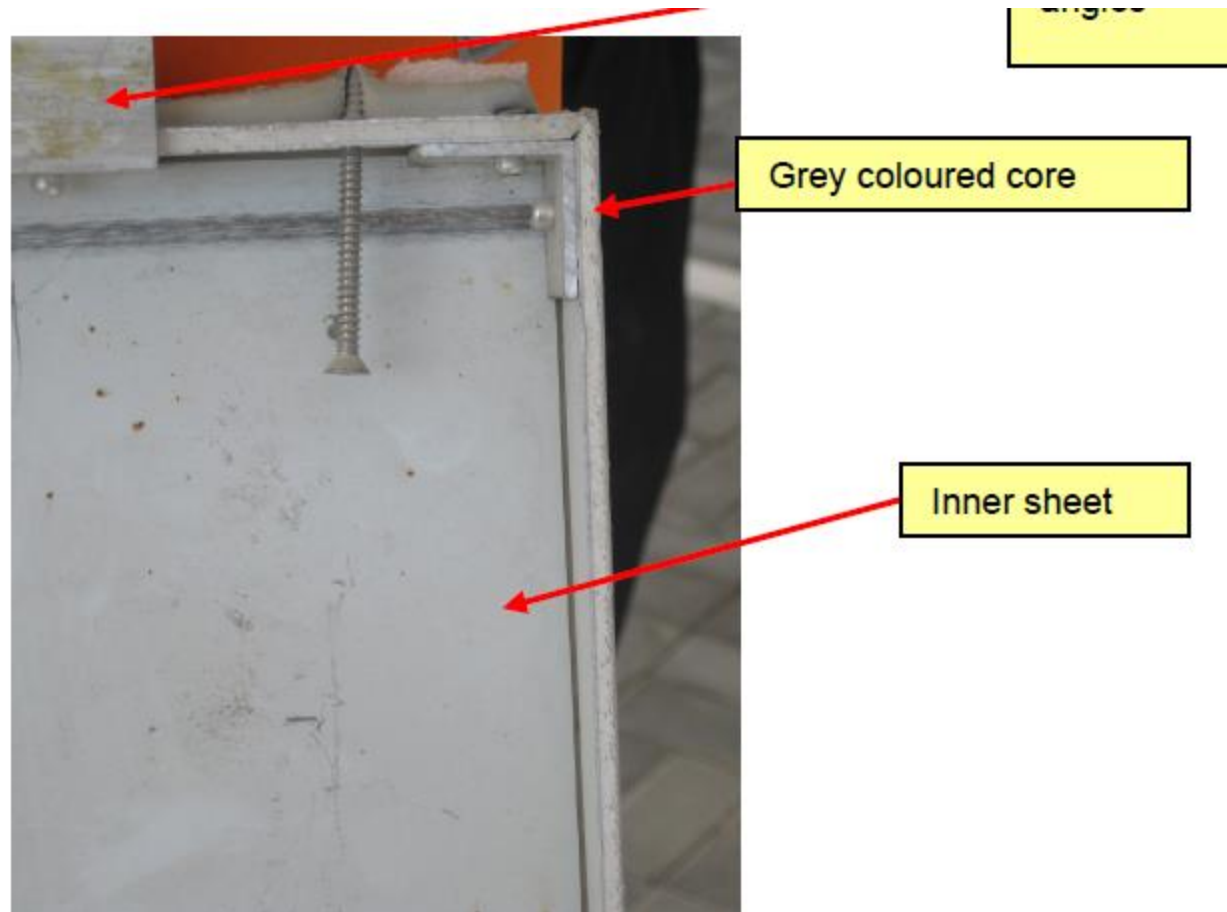
# ACP – Combustible Plastic Core

- Does not comply with NFPA 5000
- Would not pass NFPA 285 fire test
- Would probably pass BS 476 -7 or ASTM E84



# ACP – Limited Combustible Mineral Core

If mineral content is high enough then it will pass NFPA 285



# Conclusions

- **Writing a fire strategy report and producing drawings is not enough**
- **The fire engineer should be alongside the design/site team and interacting at each stage on a regular basis**
- **A thorough review of specifications and material submittals by a fire safety professional would seem sensible**
- **For some buildings, it is important that the fire engineer interfaces with all stakeholders through to building completion and beyond**



Questions?

This concludes The American Institute of Architects  
Continuing Education Systems Course

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