

# DESIGN CONFIDENCE

GLOBAL REACH LOCAL EXPERIENCE

DUBAI

SYDNEY

BUILDING REGULATIONS CONSULTING & ENGINEERING



DESIGN CONFIDENCE

# Application of Performance Based Design Methods To Façade Fire Safety Design

**Aaron Mc Daid**



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DESIGN CONFIDENCE



1970

**PAST**



Now

**PRESENT**



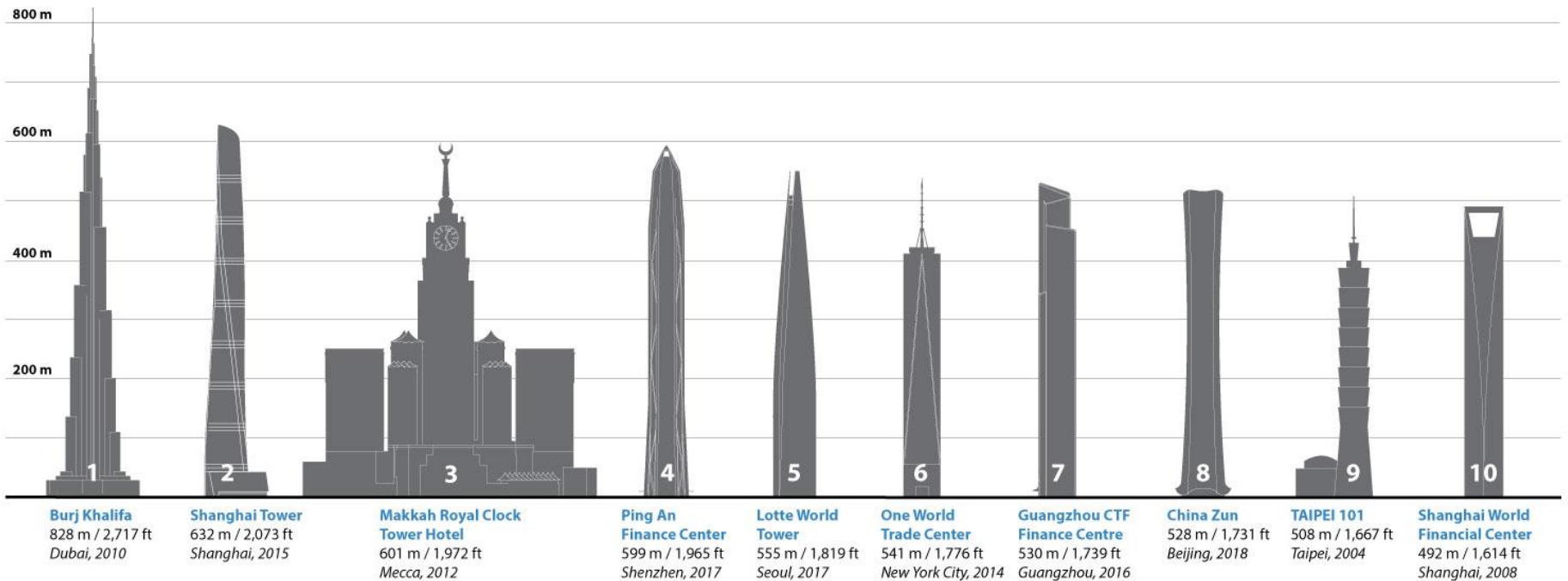
**PAST**

**PRESENT**



# BUILDING DEFINITIONS

## Tallest Building to the Tip



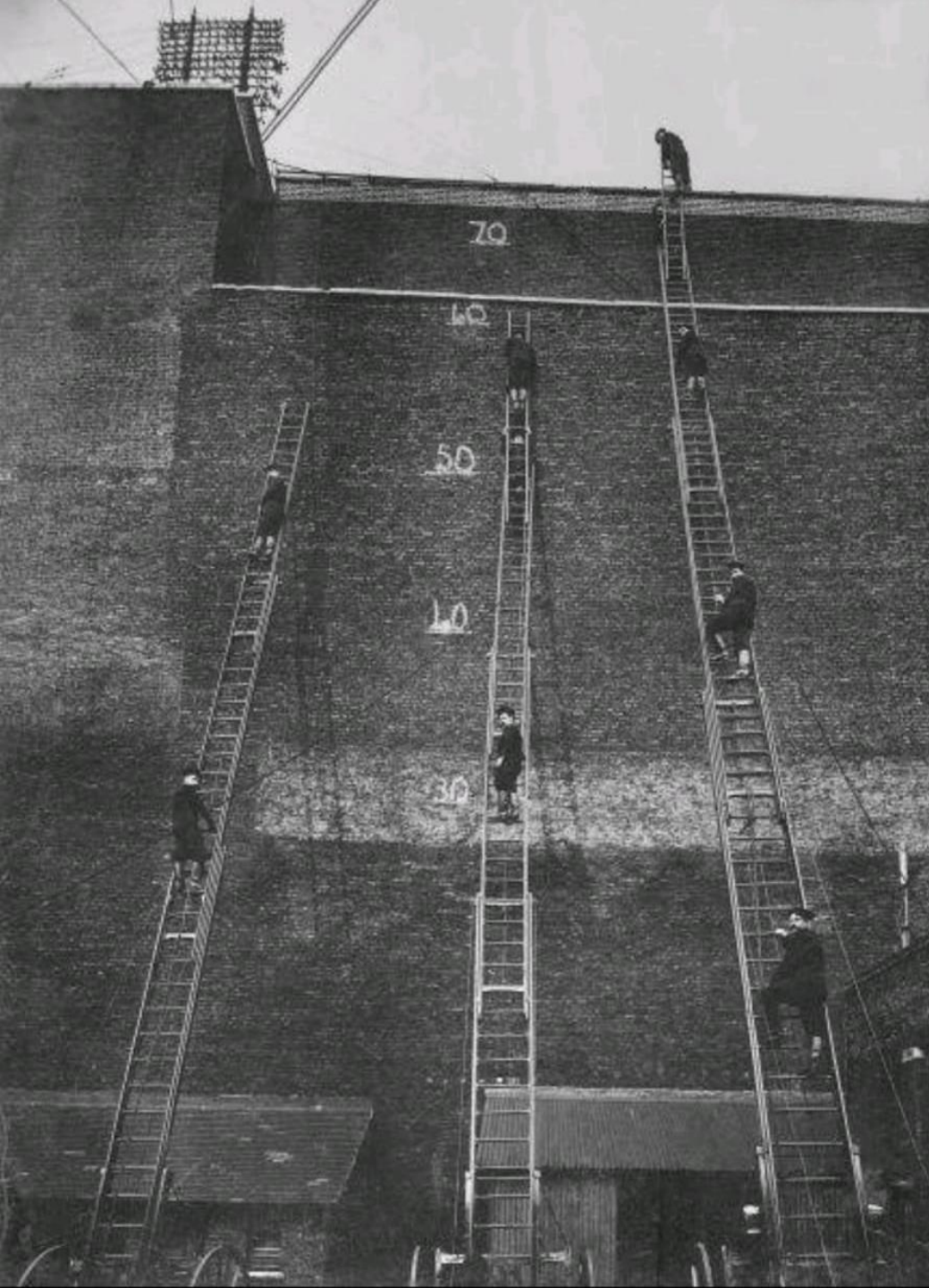
# BUILDING DEFINITION

History....

**High Rise Building  
(London Fire Brigade)**

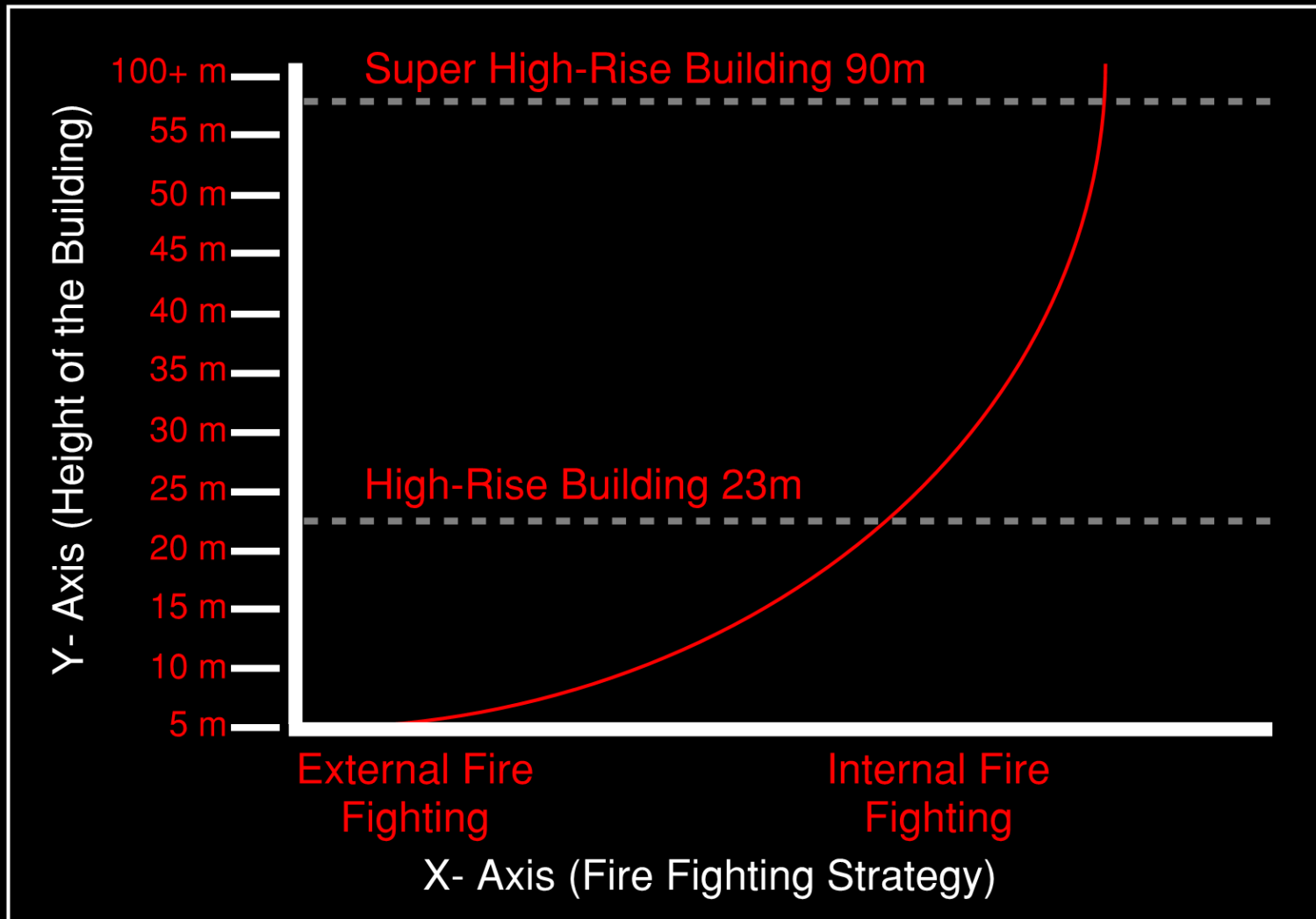
**Derived from a 50 foot  
wheeled escape ladders**

**Approved Document B  
18m High Rise = 60 foot**



# BUILDING DEFINITION

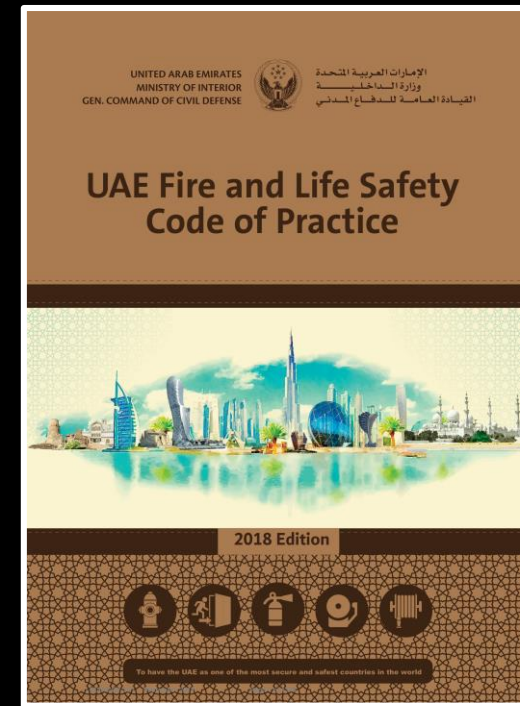
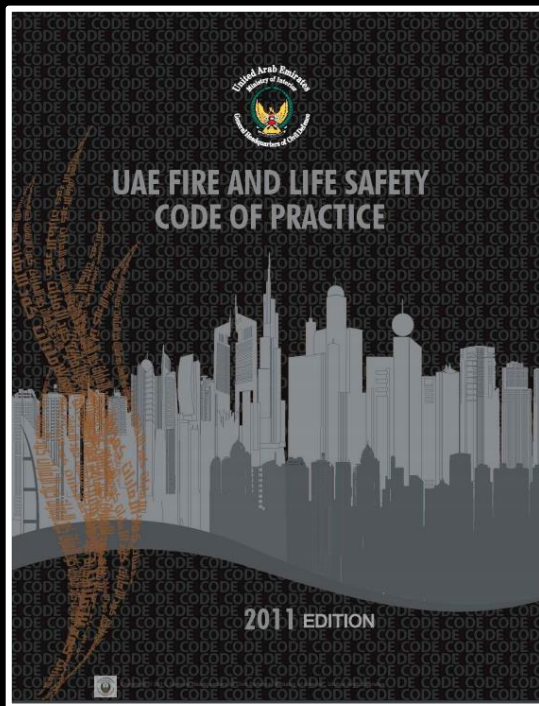
## FIRE FIGHTING STRATEGY





# BUILDING DEFINITIONS

## NEW UAE FIRE CODE



# BUILDING DEFINITIONS

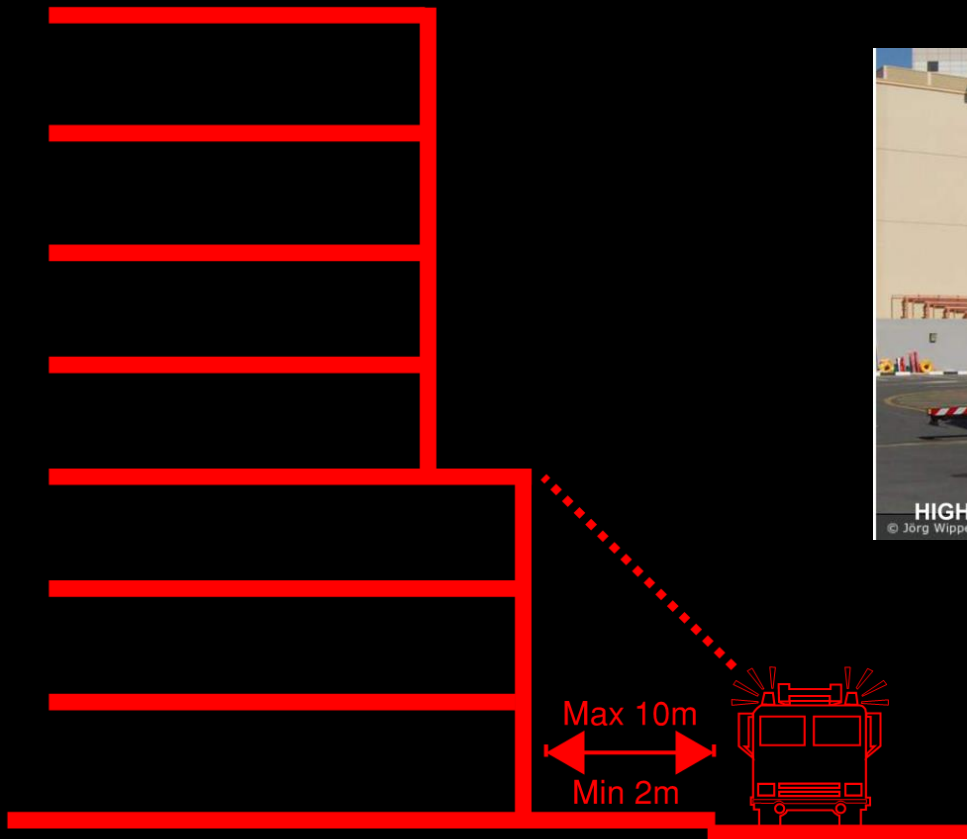
## FIRE FIGHTING STRATEGY

BUILDINGS CLASSIFICATION	UAE FIRE CODE	TYPICAL FIRE FIGHTING STRATEGY
<b>Low-Rise Building</b>	Buildings < 15.9m	Relaxed Vehicle Access Relaxed Smoke Control
<b>Mid-Rise Building</b>	Buildings 16m to 22.9m	Relaxed Vehicle Access Relaxed Smoke Control
<b>High-Rise</b>	Building 23-89m	Smoke Control Fire Lift
<b>Super High-Rise</b>	Building > 90m	Smoke Control Fire Fighting Lift Fire Fighting Lobby Increased Vehicle Access

# BUILDING DEFINITIONS

## NEW UAE FIRE CODE

### HIGH RISE FIRE FIGHTING VS LOW RISE



# BUILDING FIRE STRATEGY

## HIGH-RISE FEATURES

Extended evacuation time

Internal Fire fighting (Height beyond reach of fire ladders)

Water Supply Challenges

Pronounced stack effects

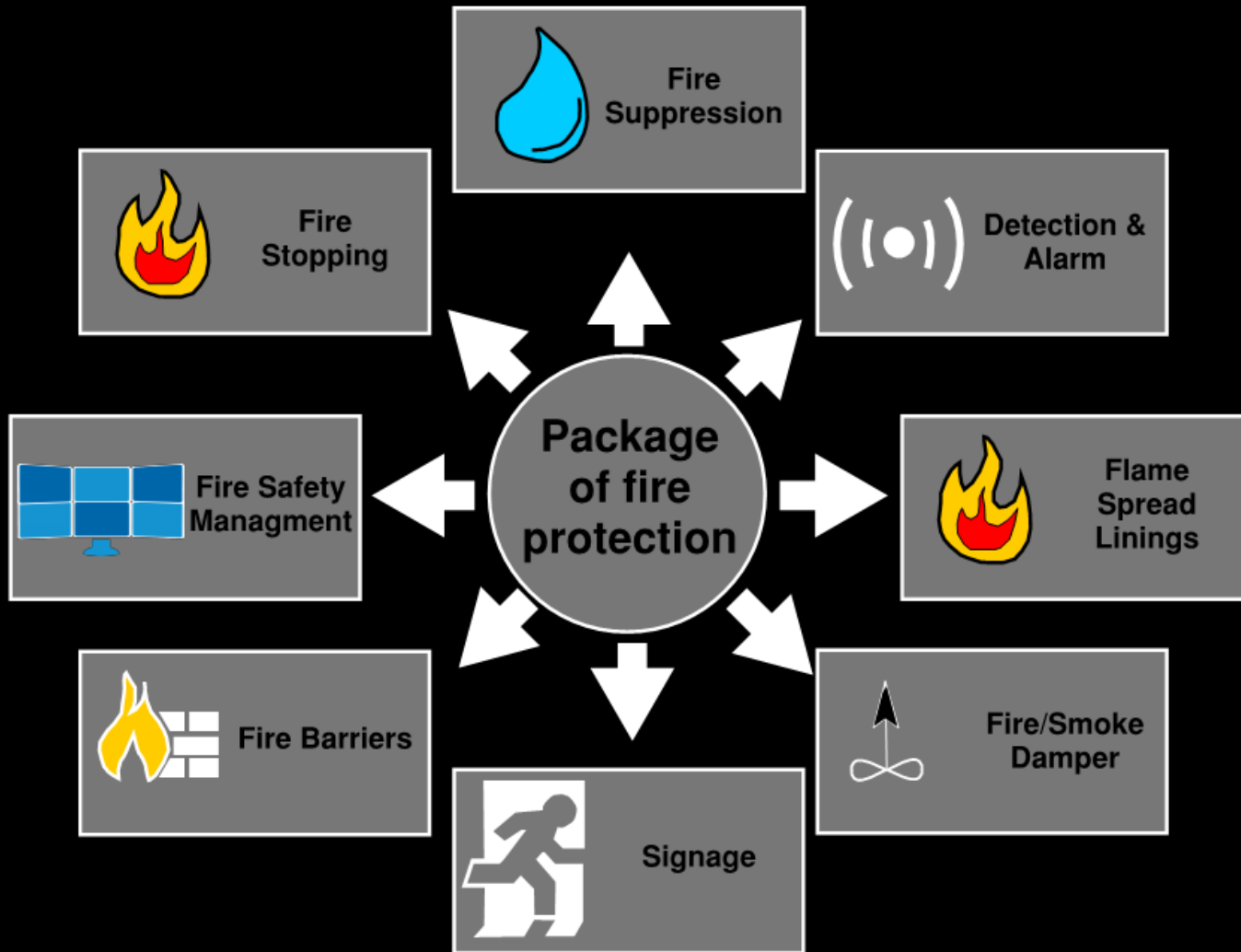
Can be Mixed Occupancies

Typically Iconic structures



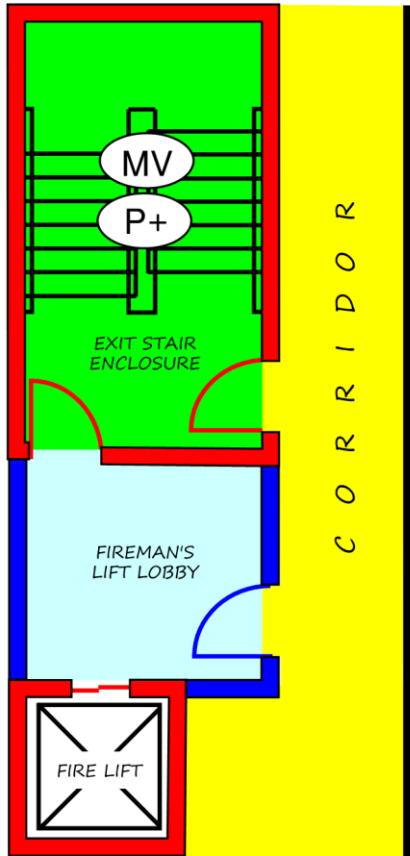
# BUILDING FIRE STRATEGY

## Package of Fire Protection – High Rise

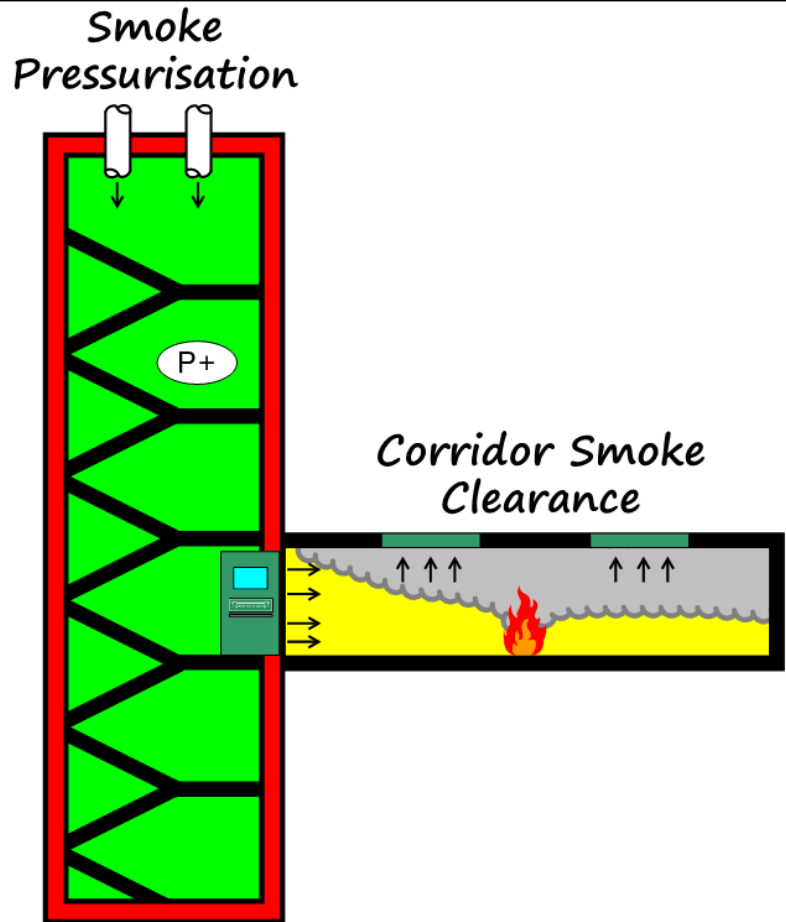


# BUILDING FIRE STRATEGY

## HIGH RISE FIRE FIGHTING



Typical Fire fighting core arrangement



Illustrative Smoke Control Section Drawing

# FACADE FIRE STRATEGY



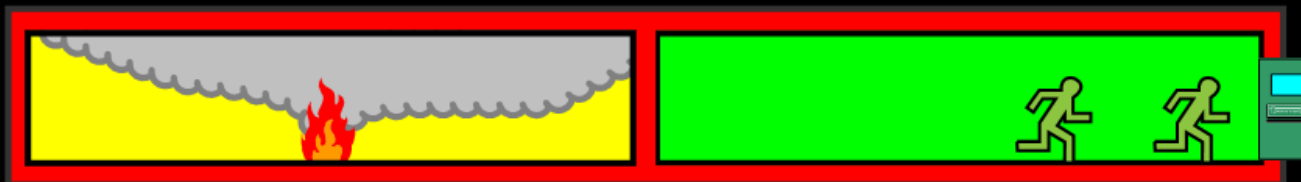
# FACADE FIRE STRATEGY

## DEFINING A SUCCESSFUL STRATEGY - FACADE

- Single fire incident at any one time
- Acts of arson not considered (Multiple Ignition Sources)
- **CONTAIN THE FIRE IN THE ROOM OF ORIGIN**
- Provide two routes to escape (For Most Circumstances)
- Limit the travel distance to a safe area

*Compartment  
of fire origin*

*Other Part of  
the building*

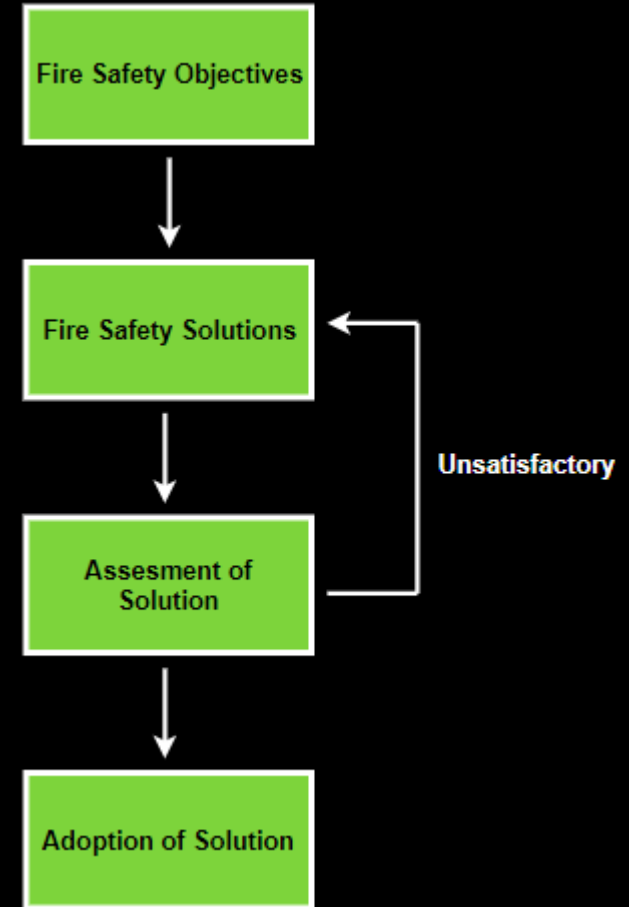




# FAÇADE FIRE STRATEGY

## WORKFLOW FOR STRATEGY

1. **PREVENT EXTERNAL FIRE SPREAD TO OTHER BUILDINGS**
2. **PREVENT INTERNAL FIRE SPREAD INSIDE THE BUILDING**
3. **PREVENT EXTERNAL FIRE SPREAD FROM OUTSIDE THE BUILDING**



# DEFINING A SUCCESSFUL STRATEGY

## Fire Scenarios – Deterministic Approach

### FIRE OCCURRING INSIDE THE BUILDING

- Sprinkler Controlled Fire Scenario?
- **Flashover Fire Scenario ?**

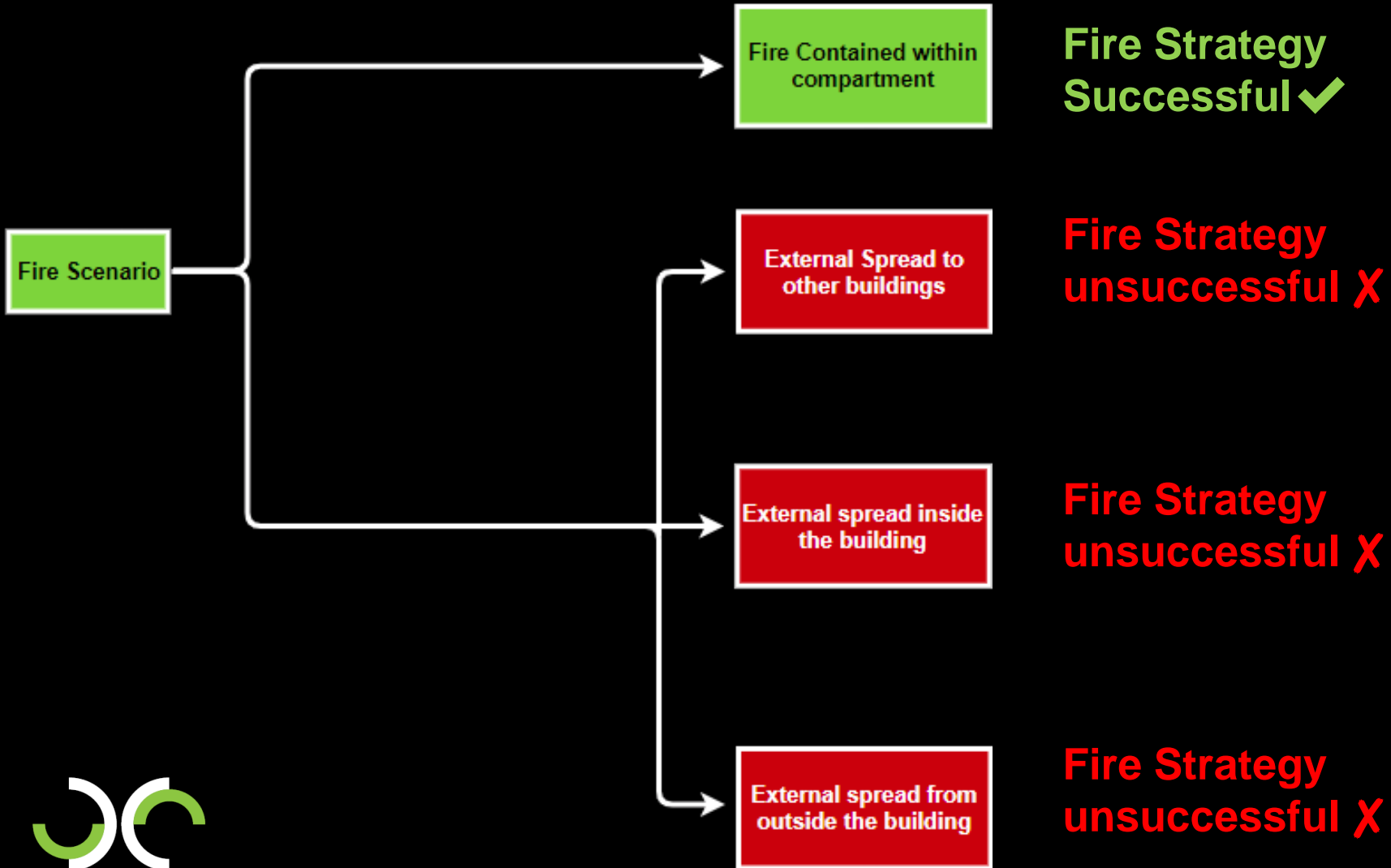
### FIRE OCCURRING OUTSIDE THE BUILDING

- Rubbish Fire Scenario (Management?)
- **Vehicle Fire (Car Fire) ?**



# DEFINING A SUCCESSFUL STRATEGY

## ACCEPTANCE CRITERIA



# FAÇADE FIRE STRATEGY

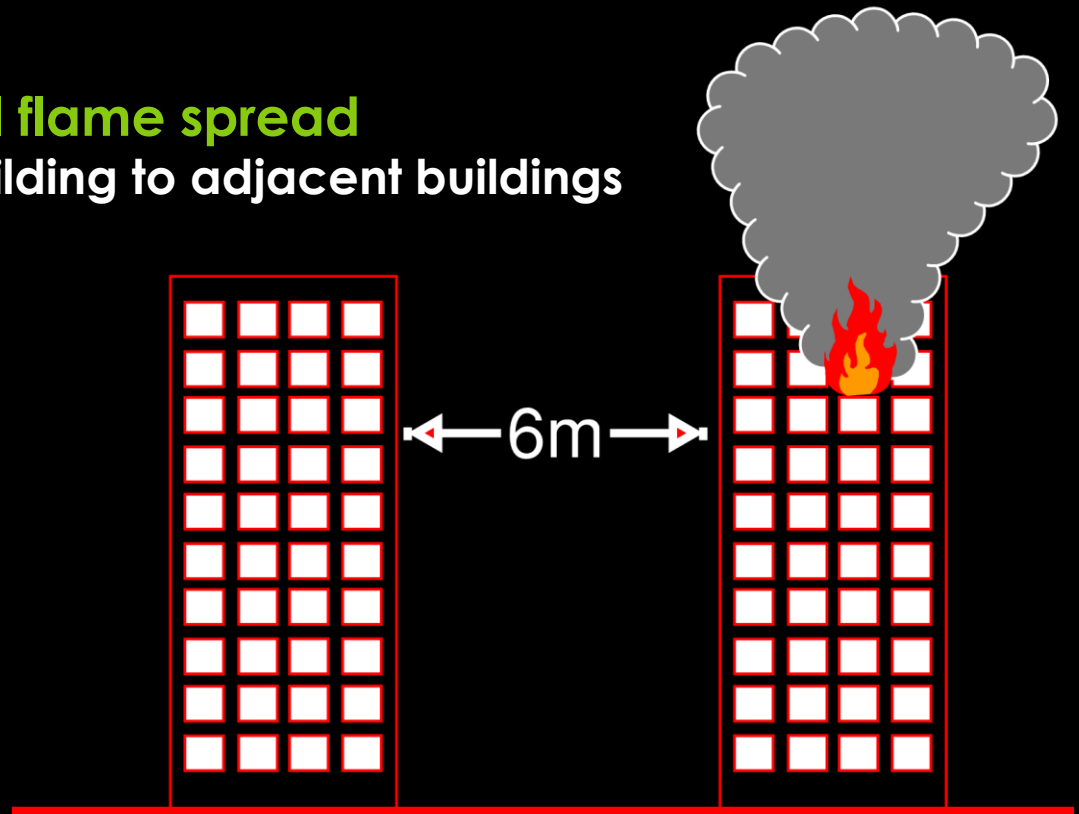
## PREVENT EXTERNAL FIRE SPREAD TO OTHER BUILDINGS

### Limit fire spread to neighbouring buildings

- Direct impingement
- Radiation

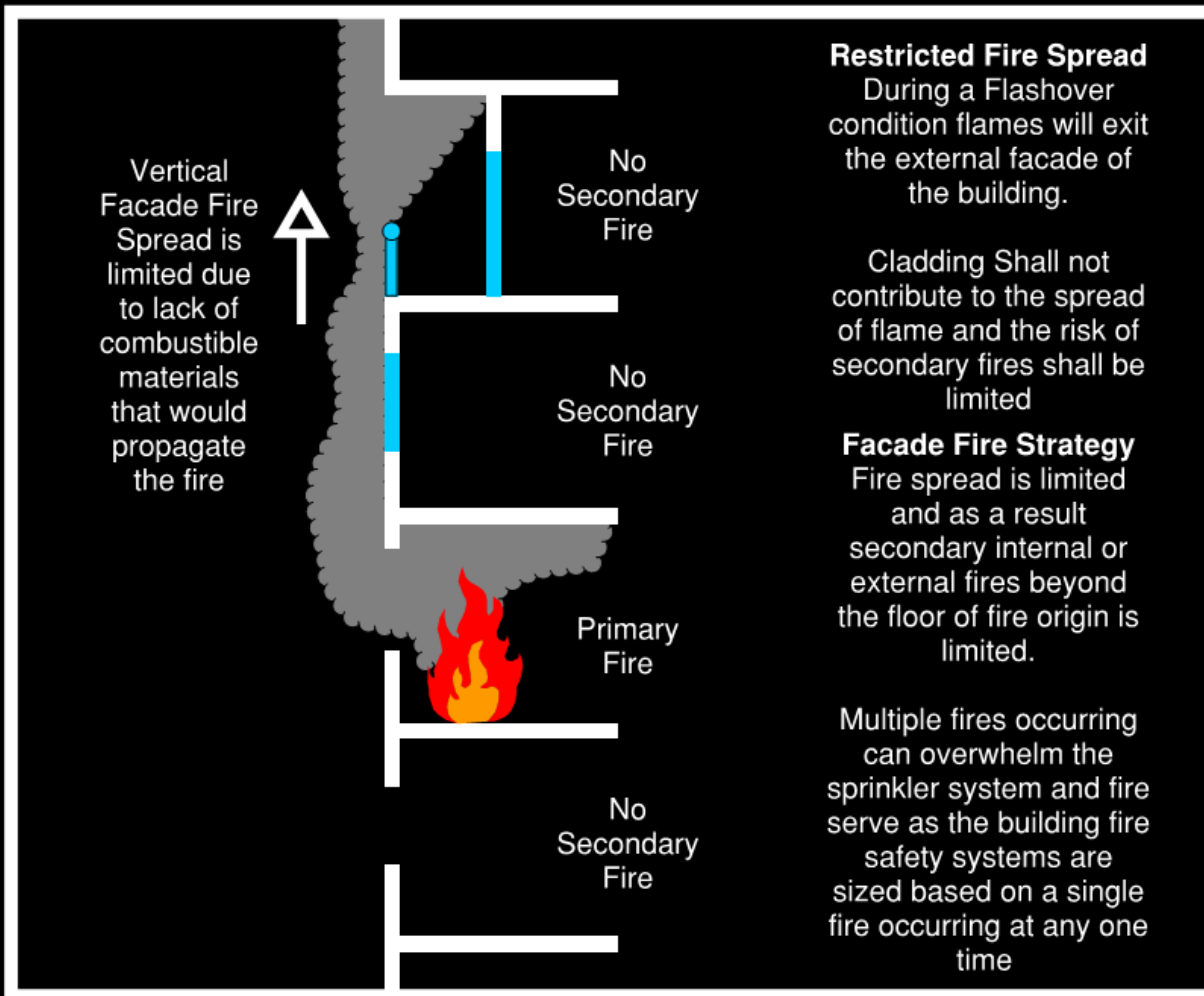
### Factors influencing external flame spread

- Proximity of incident building to adjacent buildings
- 'Radiative' surface
- Fire Intensity



# DEFINING A SUCCESSFUL STRATEGY

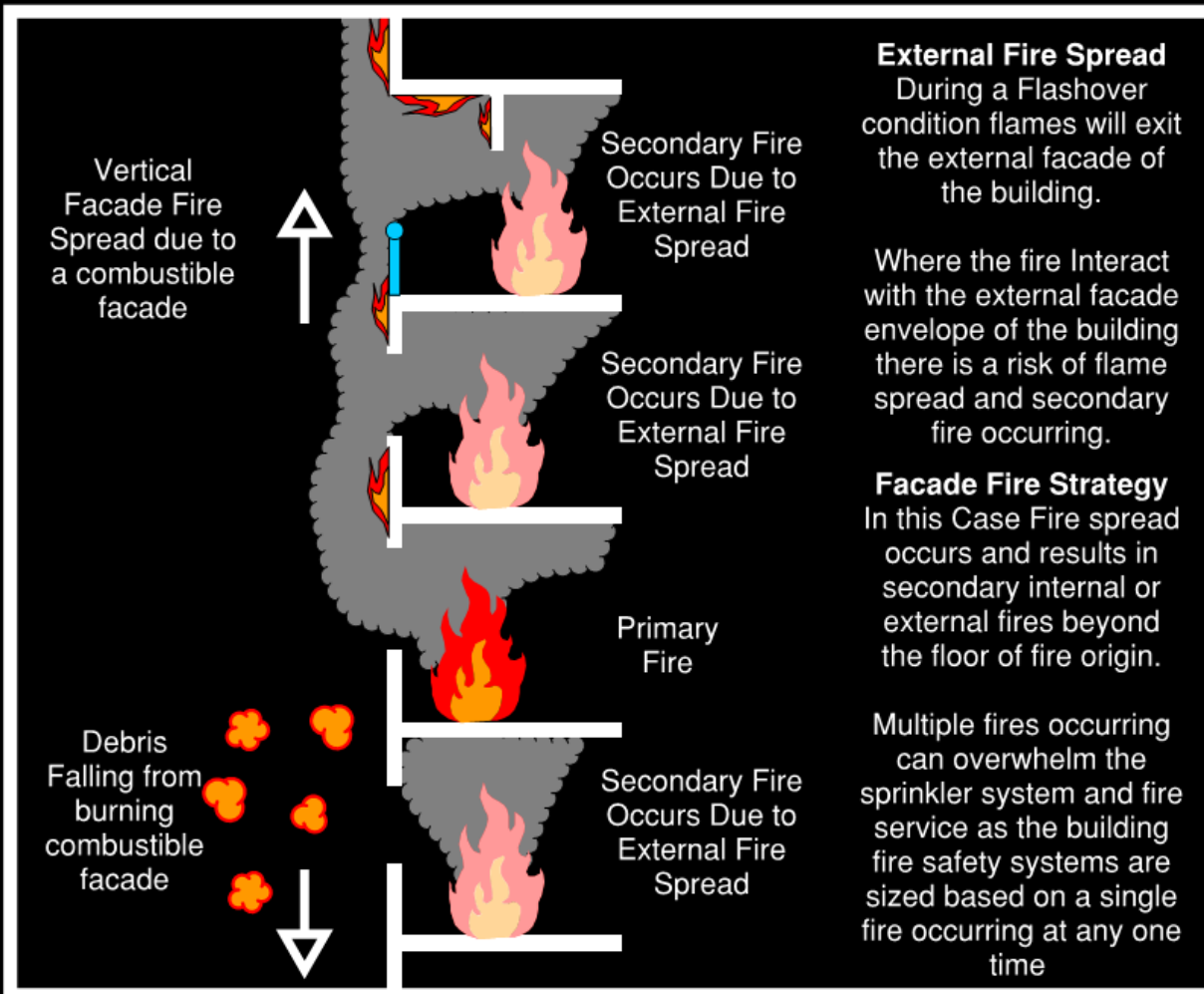
**PREVENT** EXTERNAL SPREAD FROM INSIDE THE BUILDING



**Successful Facade Fire Strategy**  
(Fire Does NOT Spread outside the floor of fire origin)

# DEFINING A SUCCESSFUL STRATEGY

## PREVENT EXTERNAL SPREAD FROM INSIDE THE BUILDING



**Un-successful Facade Fire Strategy**  
(Fire Spread Occurs outside the floor of fire origin)

# DEFINING A SUCCESSFUL STRATEGY

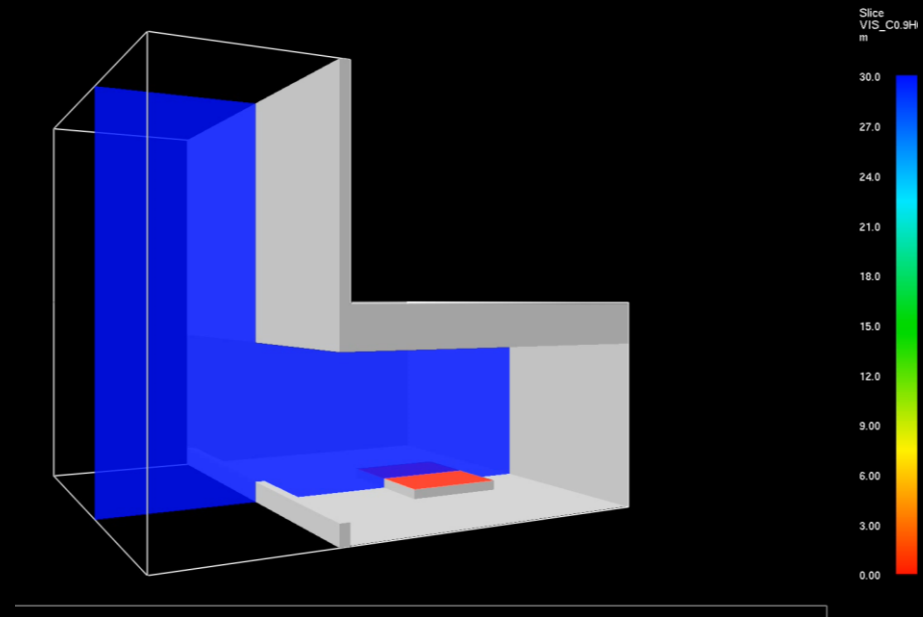
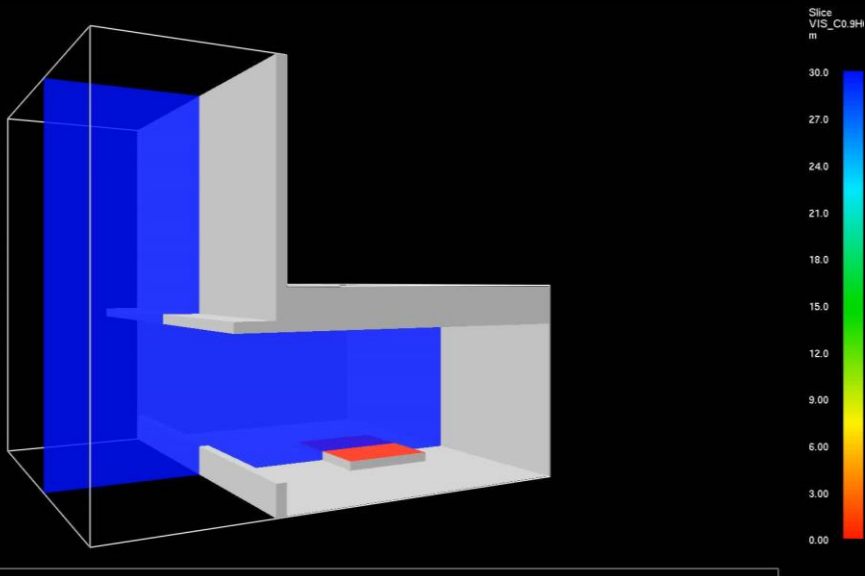
**PREVENT** EXTERNAL FIRE SPREAD OUTSIDE THE BUILDING



- **SPRINKLER PROTECTION**
- **SPANDREL OR APRON PROTECTION**
- **FAÇADE MATERIAL SELECTION**

# DEFINING A SUCCESSFUL STRATEGY

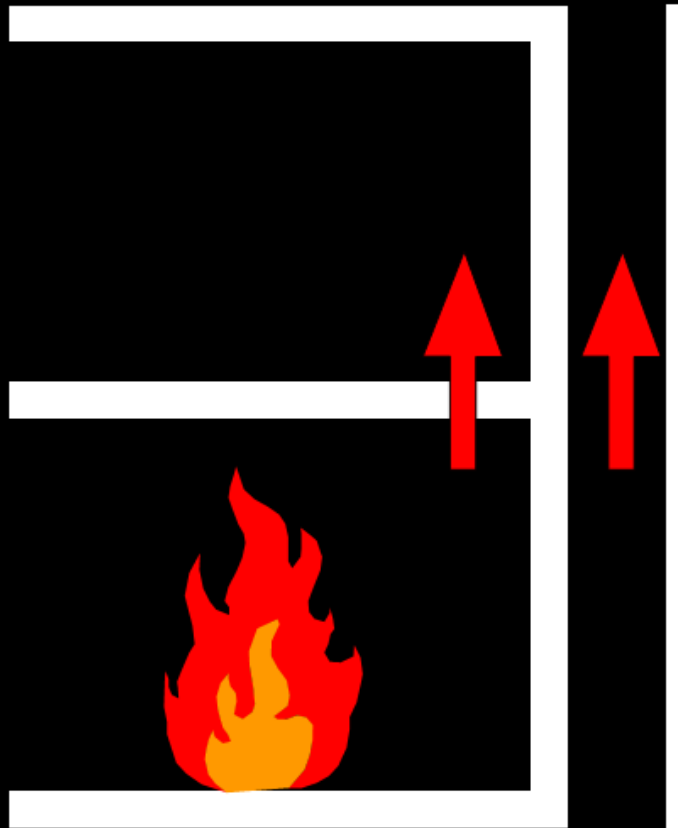
**PREVENT** EXTERNAL FIRE SPREAD OUTSIDE THE BUILDING





# DEFINING A SUCCESSFUL STRATEGY

**PREVENT** INTERNAL SPREAD INSIDE THE BUILDING



- CAVITY BARRIERS
- PENETRATION FIRE STOPPING
- HORIZONTAL FIRE BARRIERS

INSPECTION AND VERIFICATION

# CONCLUSION

## WHAT FACTORS IMPACTS SUCCESS

### MISUNDERSTANDING OF REQUIREMENTS

- USE OF COMBUSTIBLE PANELS

### COMPETENCY OF DESIGNERS \ CONTRACTOR

- LACK OF FAÇADE FIRE STRATEGY

### INSTALLATION QUALITY AND WORKMANSHIP

- FAILURE TO FOLLOW SYSTEM DESIGN

### LIFESPAN OF MATERIAL

- WEAR AND TEAR OF MATERIALS AND SYSTEM

### CHANGE CONTROL OF MATERIALS IN CONSTRUCTION

- MATERIAL SUBMITTALS, SYSTEM COMPLIANCE

### PRODUCT MARKING

- ACIDENTAL USE OF INCORRECT MATERIALS





**SAFETY  
DESIGN  
IN  
BUILDINGS**

**Thank you**