

The background of the slide is a low-angle, upward-looking photograph of a modern skyscraper's glass and steel facade. The building's lines converge towards the top center, creating a strong sense of height and verticality. The sky is a clear, vibrant blue with scattered white clouds. The overall aesthetic is clean, professional, and modern.

Considerations for specifying the elevator use for evacuation in tall buildings.

MR TOMI SIIPIÄ

Content

Background

Alternatives

Solutions

- Evacuation strategies
- Codes and norms
- Technical solutions
- Human aspects

Conclusions





Background



Reasons for evacuation

Power
blackouts

Fires

Terrorist acts

Natural
disasters

Man-made
disasters

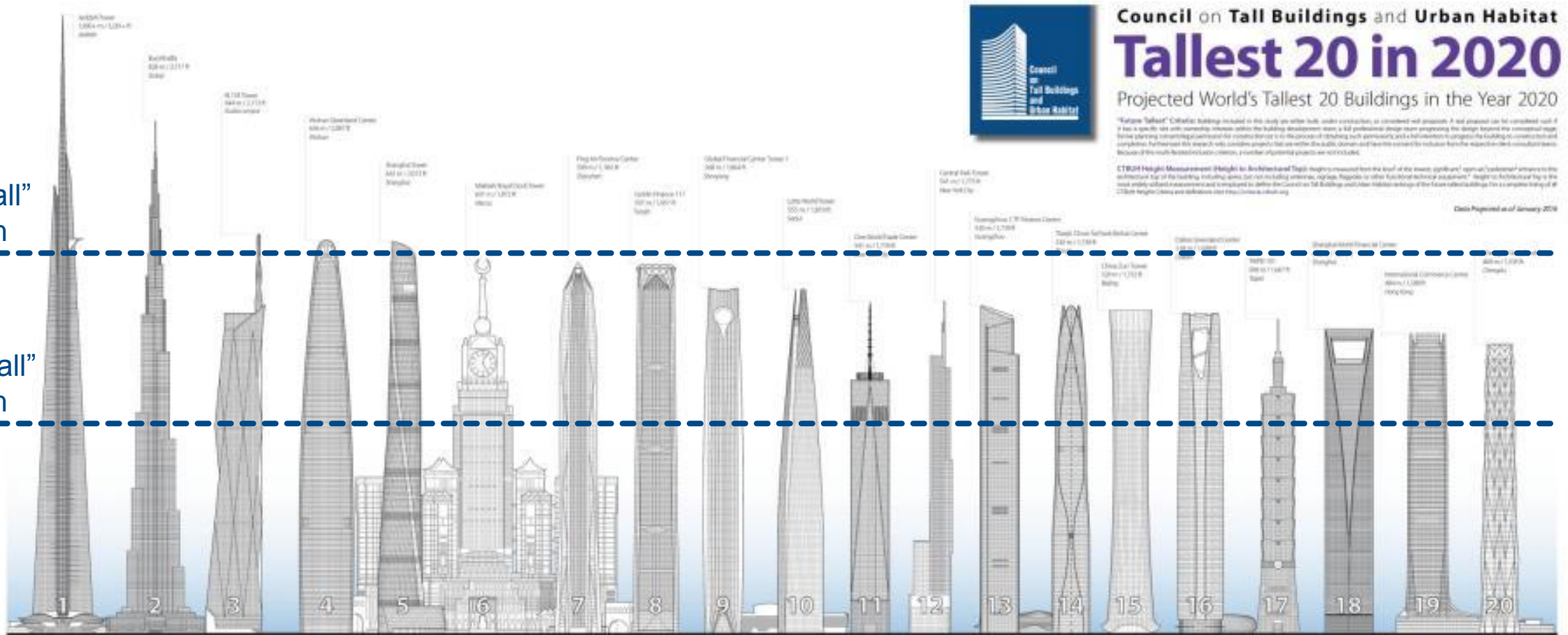
Reasons for managing traffic and access

All megatall buildings use elevators for evacuation



"Megatall"
+ 600 m

"Supertall"
+ 300 m



Alternatives



When and why elevators should be used for evacuation

- All buildings over 300 m high
- In buildings over 20–30 floors high, elevators are the fastest means of evacuation
- Elevators provide a method of evacuation for disabled people who cannot use stairs



Benefits of and barriers to evacuation elevators

Benefits

- Creates trust – easier to attract tenants to tall buildings
- Improved evacuation capabilities
- People can make their own choice – elevator or stairs

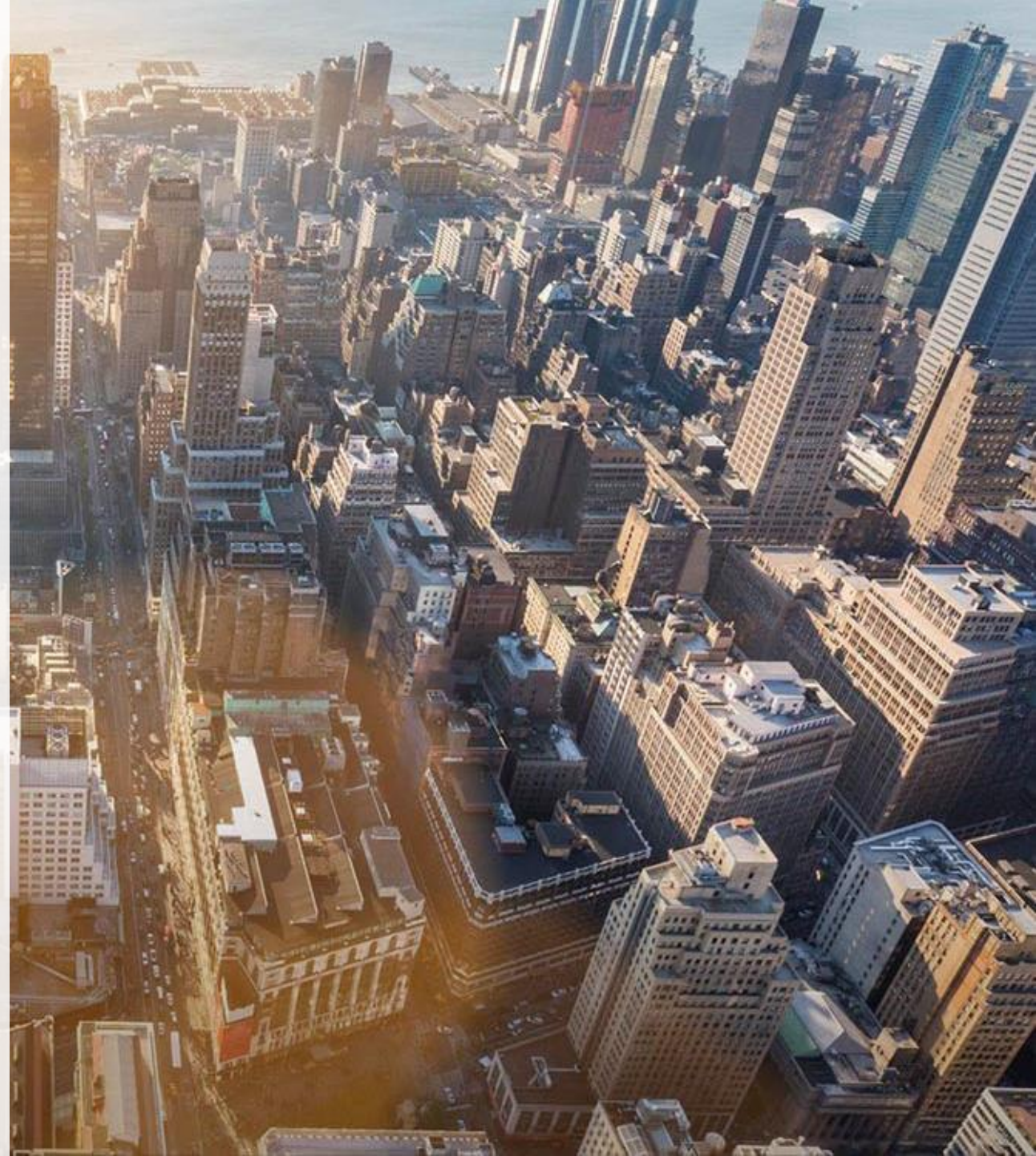
Barriers

- Money, Capex, and incentives
- Alternative means exists (stairs)
- Local codes and regulations





Solutions



Elevator use in evacuation of tall buildings

Building evacuation strategies

Codes and norms

Elevator use in
evacuations?

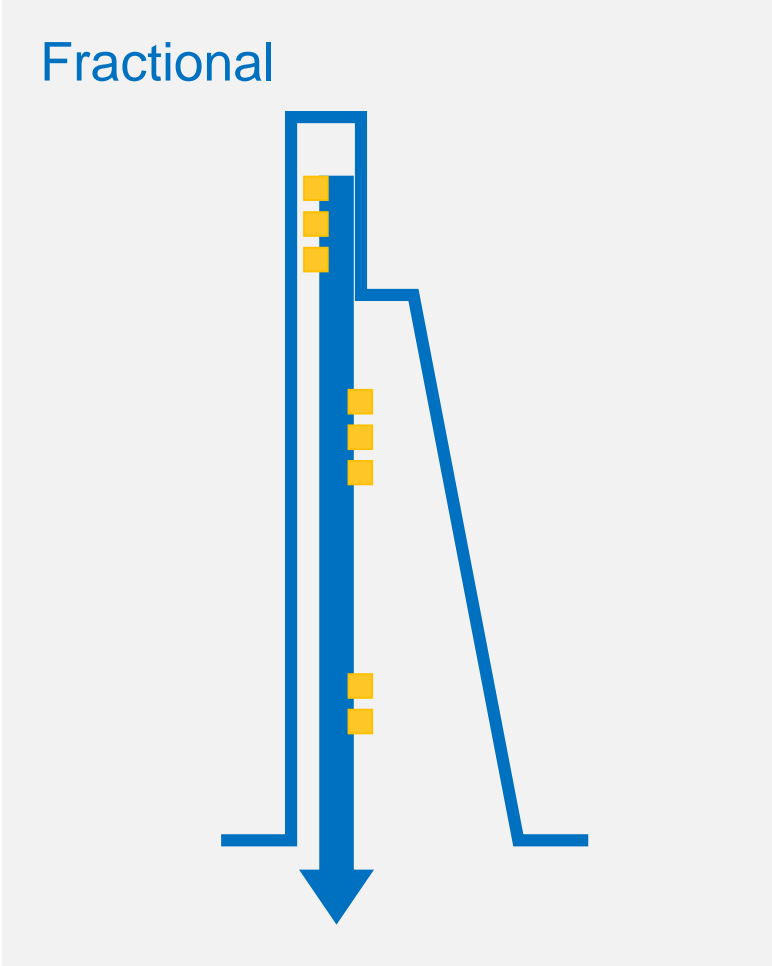
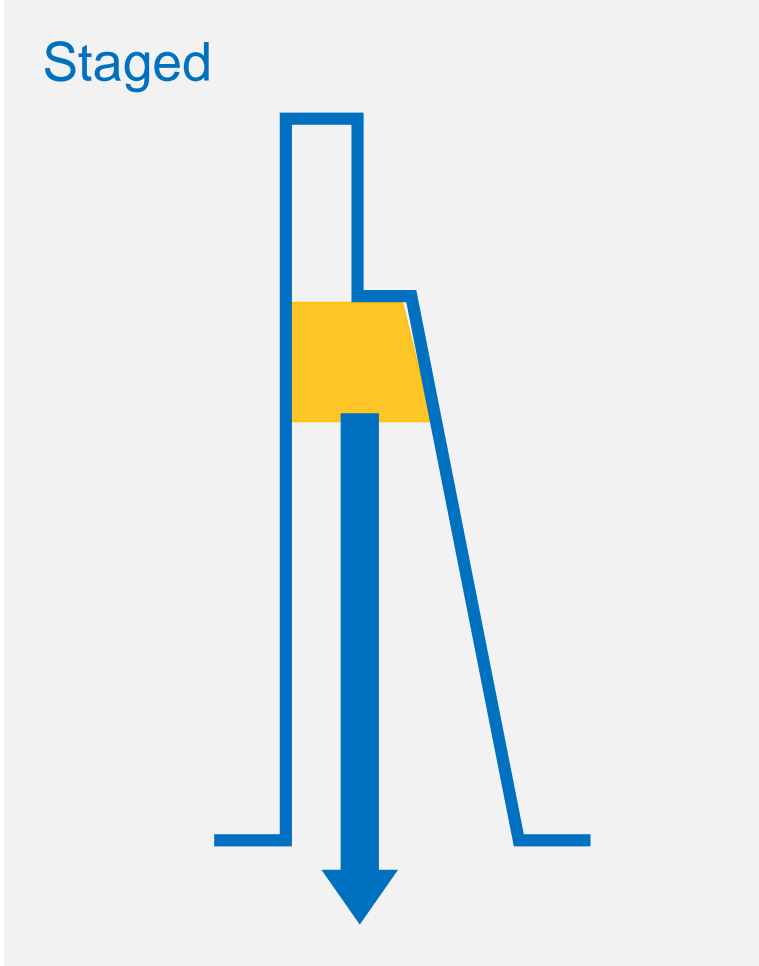
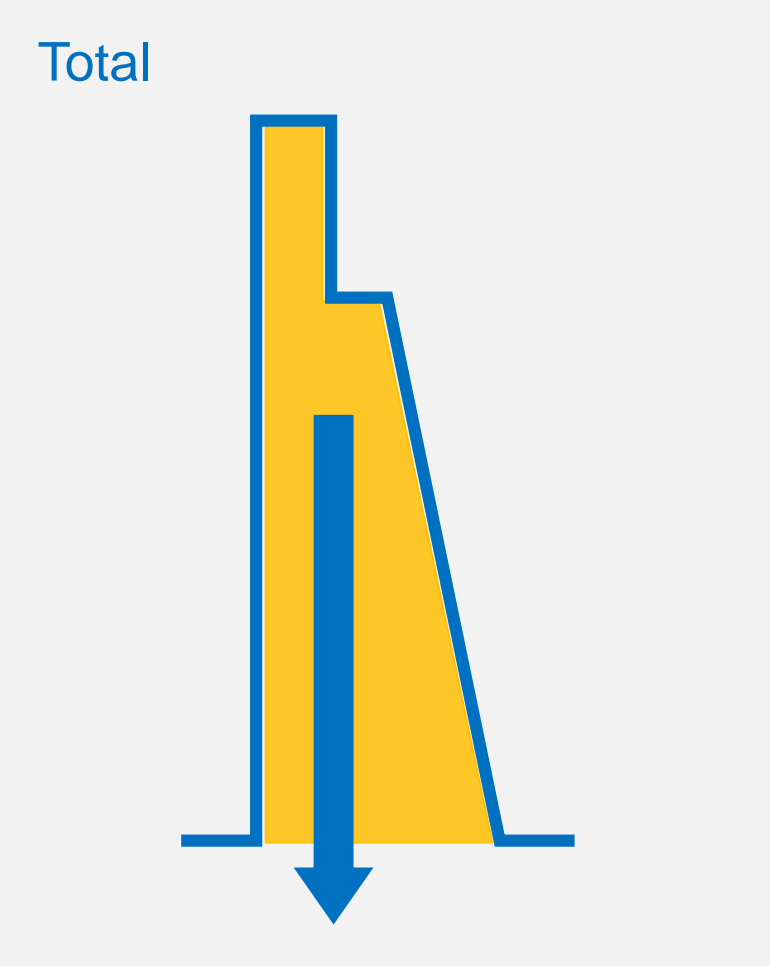
Technical Solutions

Human aspects

Building evacuation strategies using elevators



DIFFERENT DESIGNS FOR DIFFERENT CAPACITY NEEDS



Source: CTBUH emergency evacuation elevator systems guideline

Codes and norms – EN

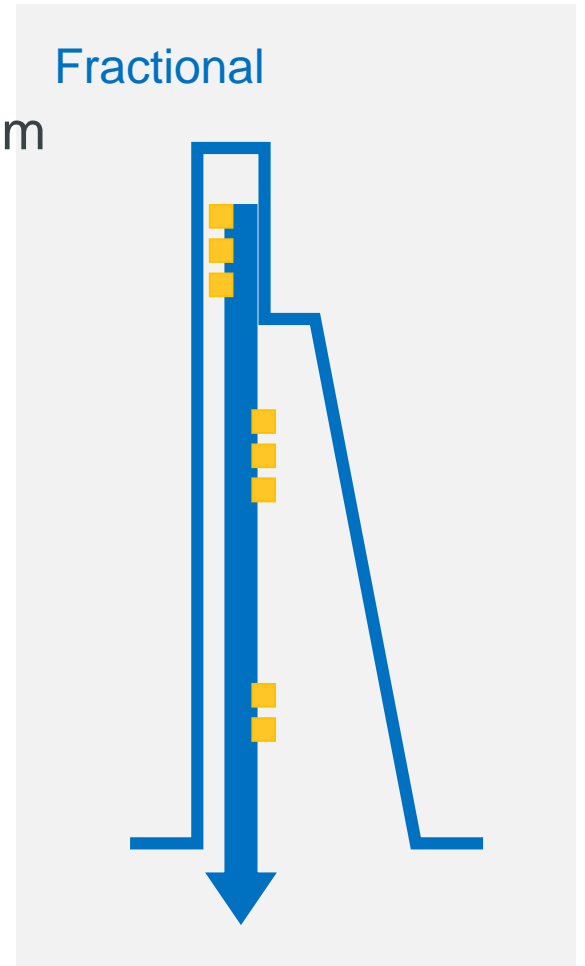
EVACUATION OF DISABLED PERSONS AND USING FIRE FIGHTERS LIFTS

- Disabled people with impaired mobility are defined in the CEN/TS 81-76
- Automatic return of elevators to main evacuation entrance floor (MEEF) from fire signal – elevators taken out of service
- Person in charge can switch the elevator to evacuation use and assist
- Protected firefighters lift (EN81-72, EN81-73) for firemen use
- **Landing calls not served**
- **Total evacuation missing**

EN81-72:2015 Firefighters Lift

EN81-73:2016 Behaviour of Lifts in the Event of Fire

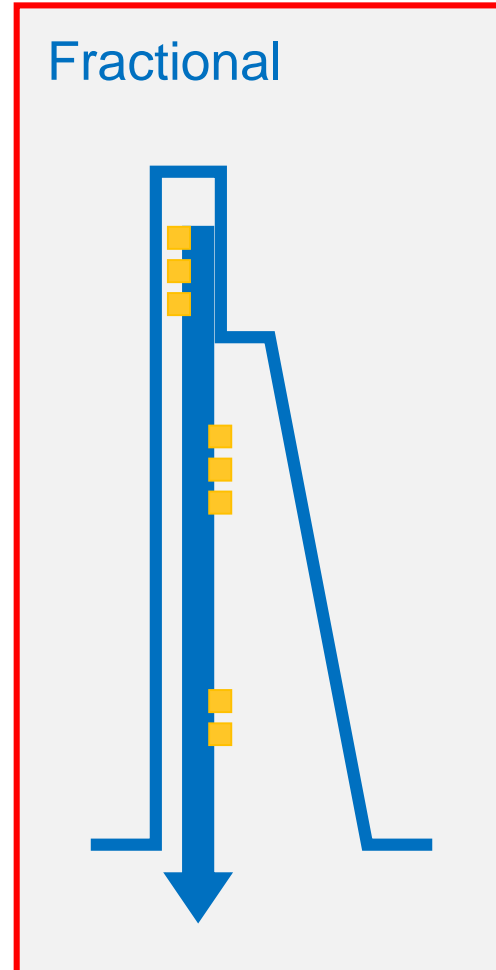
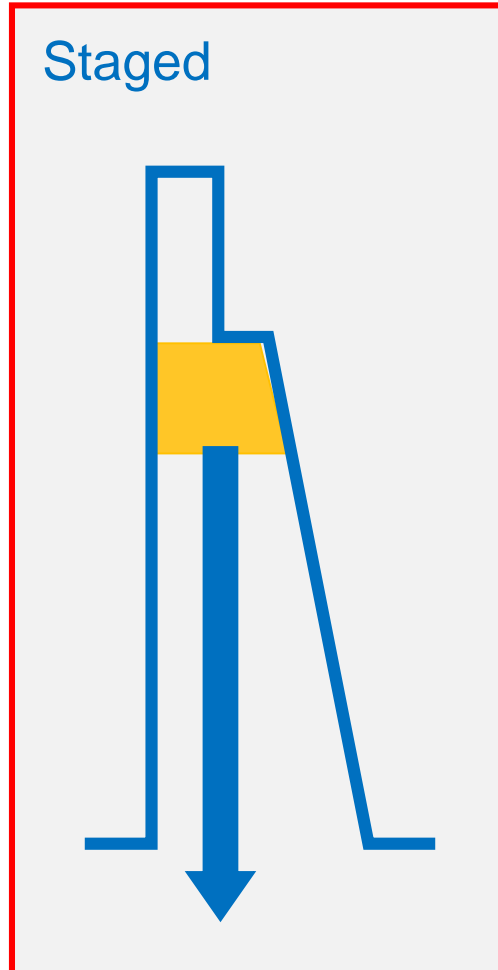
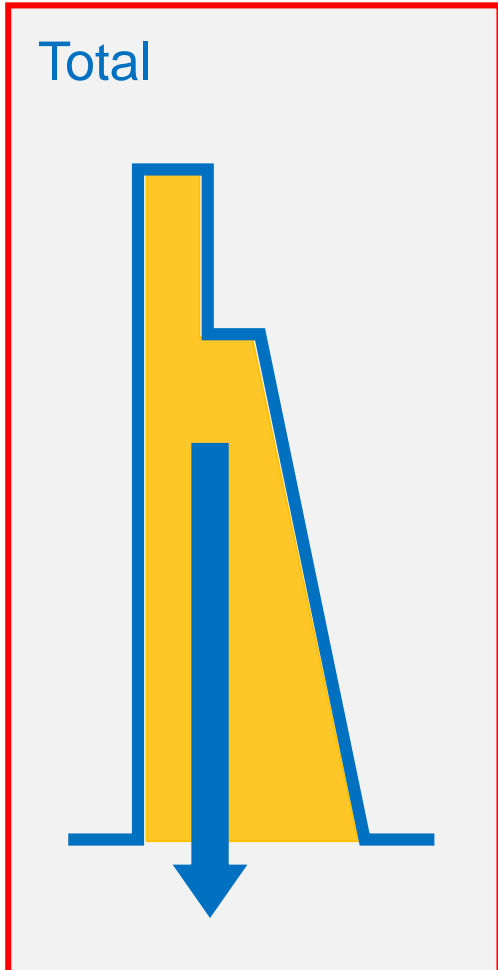
NPR-CEN81/TS 81-76:2011 Evacuation of disabled persons using lifts



Codes and norms – ISO TS 18870:2014



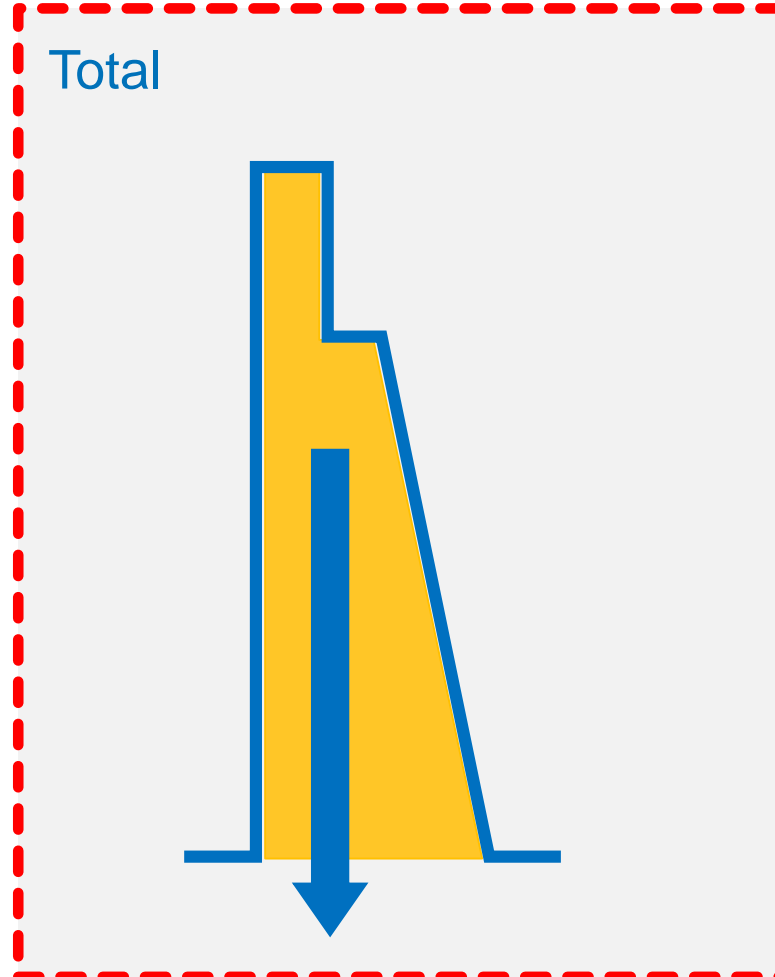
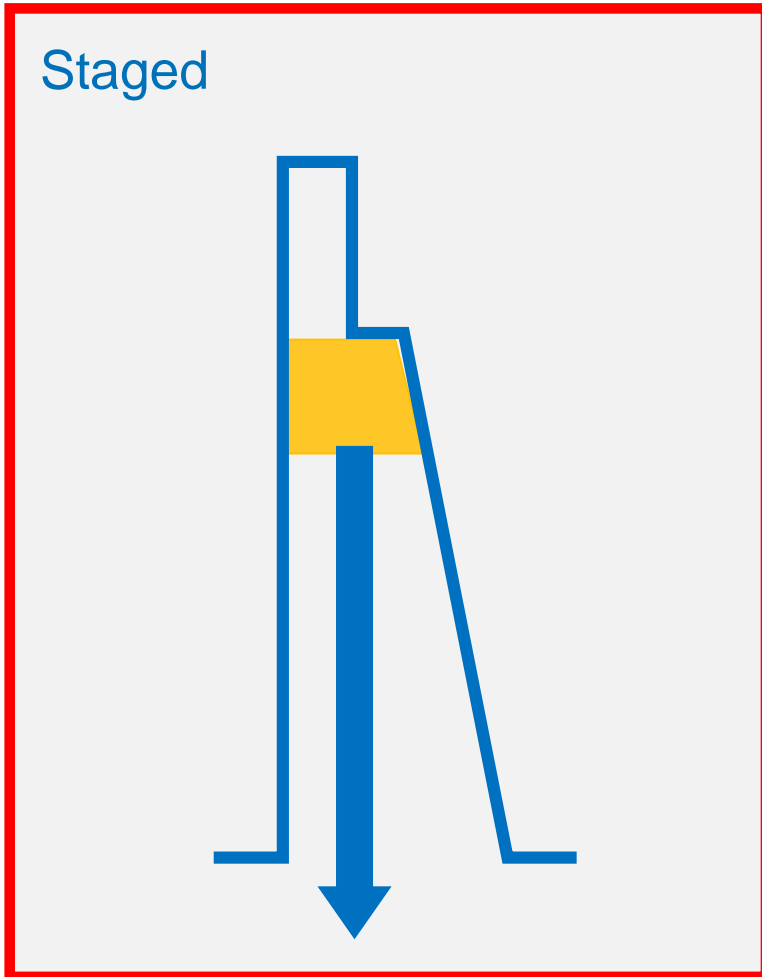
REQUIREMENTS FOR LIFTS USED TO ASSIST IN BUILDING EVACUATION



- Technical Specification for automatic evacuation
- The building designer determines the types of emergencies that are automatically detected, and how to direct elevators to or away from the critical area
- The role of the building management system (BMS) or FCC is defined:
 - MEEF can be altered
 - Elevators can be removed or evacuation suspended
- Elevator position is shown and audible signals are given on the landings adjacent to the relevant elevator

Codes and norms – ASME A17.2003

OCCUPANT EVACUATION OPERATION (OEO)



Staged: fire scenarios

- Automatic evacuation from fire signal or manually
- Fire floor and the two floors above and below the fire floor are evacuated

Total evacuation

- Started from Fire Command Centre (FCC) after fire zone evacuation

Total evacuation not started immediately after OEO.

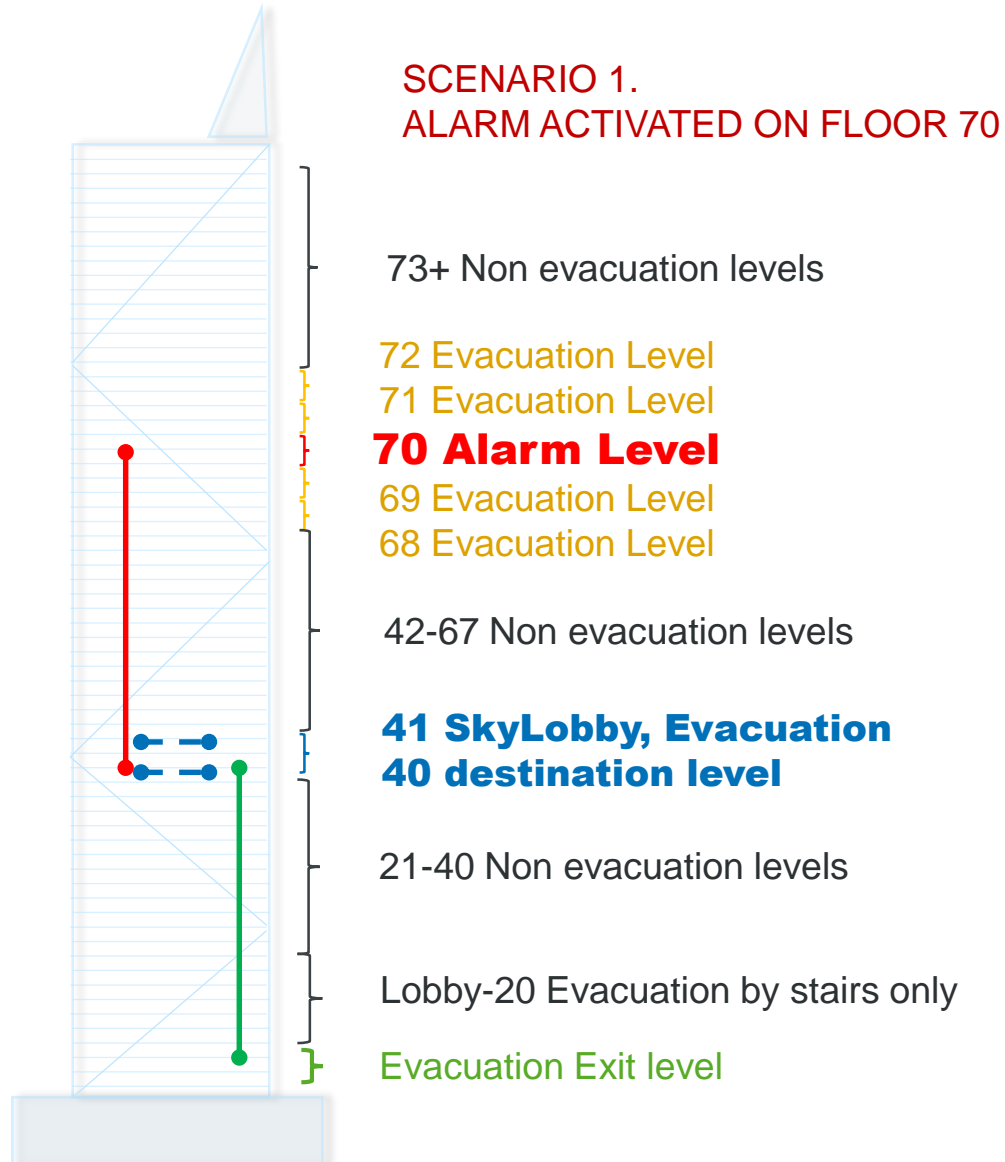
Code Considerations

- EN/ISO and ASME/IBC codes have differences in functionalities
- IBC and ASME currently more established, EN/ISO developing and require global view.
- Codes define basis - Building specific adoption need attention in desing phase.



Basis for Design - Practical Evacuation Strategy

EMERGENCY SCENARIOS AND OPERATIONAL DESCRIPTION



Staged evacuation scenarios

- Several evacuation scenarios
- Determined elevators to each potential evacuation floors
- Safe destination refuge floors or evacuation exits

Evaluation of Complexities

- Potential escalation of the emergency situation
- Simultaneous evacuation and fire fighting operation
- Real time control of operation at FCC

Transport Capacity Planning and Detailed Functional Descriptions.

Staged evacuation - case example

OCCUPANT EVACUATION OPERATION WITH DOUBLE DECK ELEVATORS



Elevator and Exit stair configuration

- 2 exit staircases (1500mm), Protected lift lobby with access to staircases.
- 6 DD elevator group (2*18persons, 7m/s), 2 elevators unavailable for evacuation

Scenario

- Fire alarm on floor 70. As a result 5-floor sandwich evacuated with combination of lifts and stairs
- Occupants are evacuated to the point of safety, which is Skylobby on floors 40-41 (~130m distance)
- Population of 194 persons/floor -> 970 in total, representing full occupant load for these floors

Simulation results

- | | |
|--------|---|
| 25:30s | Using Stairs only |
| 25min | Using Elevators only |
| 17min | Using combination of Elevators and stairs |

Pure evacuation transfer time 37% less with combination of elevators and stairs compared to stairs only.

Elevator use in evacuation of tall buildings

Building evacuation strategies

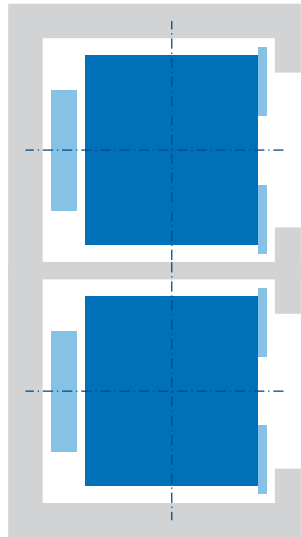
Codes and Norms

Elevator use in
evacuations?

Technical Solutions

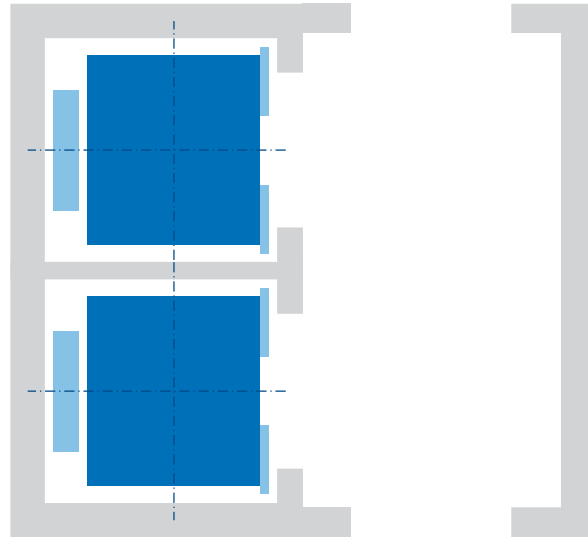
Human aspects

Technical approaches to managing evacuation



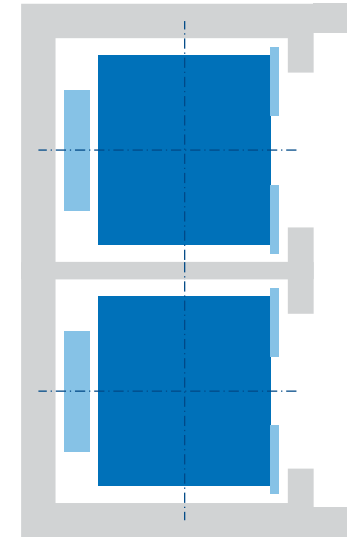
Standard elevator

1. Elevator car in standard hoistway
2. Unenclosed elevator lobby



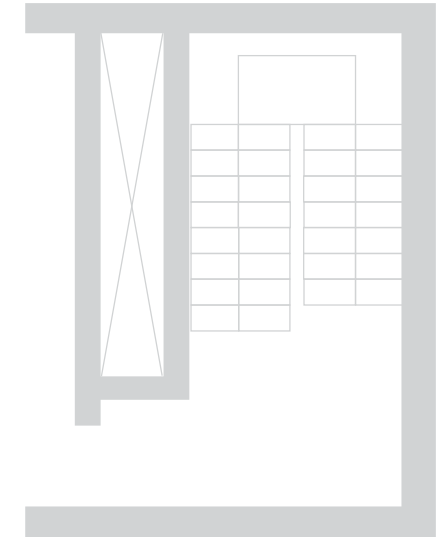
Enhanced elevator

1. Hoistway improved with sensors; heat and water resistance of electrical components
2. Lobby provided with smoke-control doors



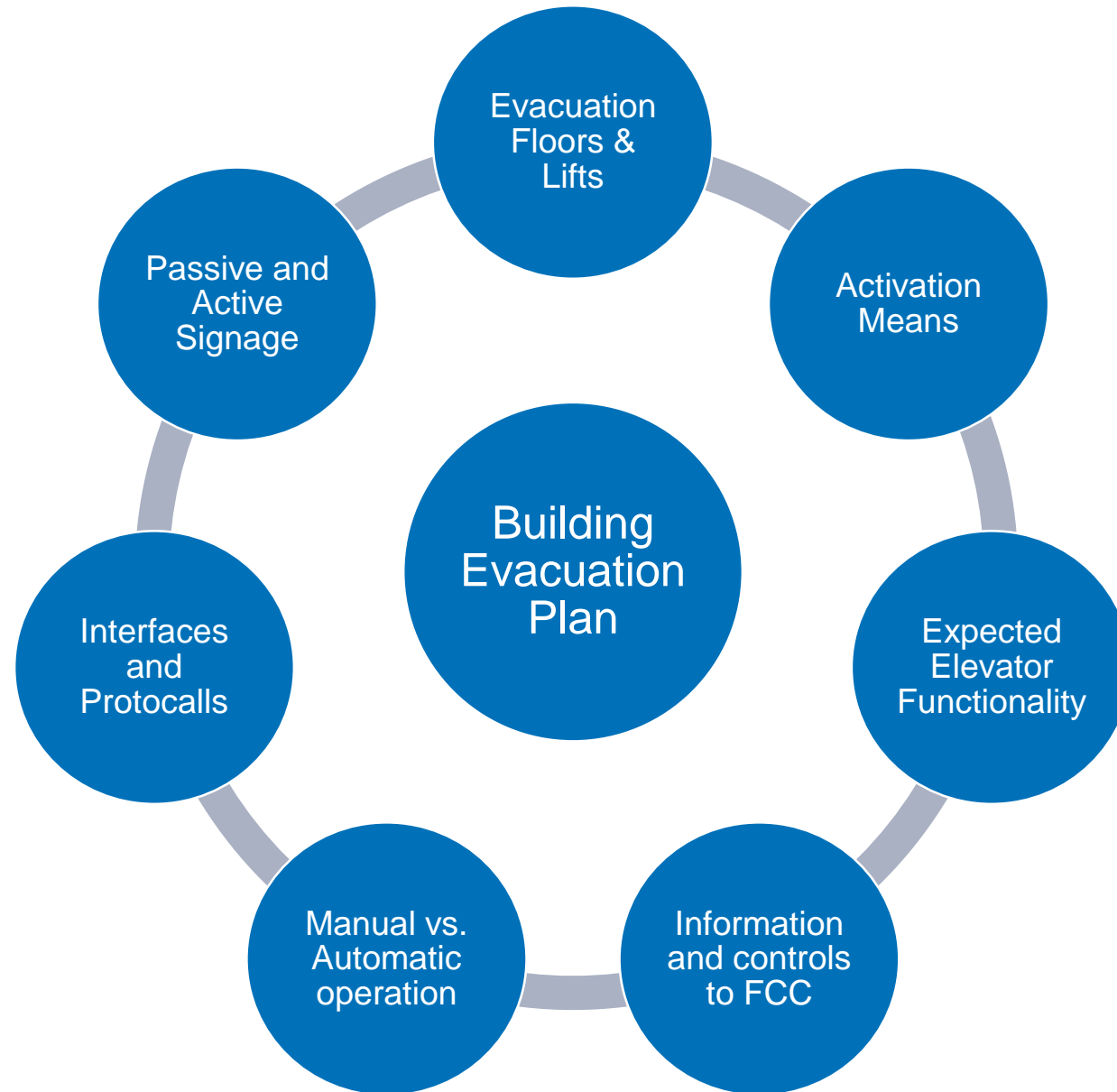
Protected elevator

1. Pressurized elevator car in hoistway improved with sensors, heat and water resistant electrical components, and pressurization and blast-resistant walls
2. Lobby provided with two-hour rated fire doors, fire pressurization shaft, and direct access to emergency stairs within a separate fire and blast-protected compartment
3. Standpipe and hoseracks in lobby



System Operating Logic

CODE DEFINITIONS TO PRACTICE



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destination

- 10 KONE Escalators
- 9 KONE Elevators
- 8 Coffee Beans
- 7 Jinyang Enterprises
- 6 Corporate Headquarter
- 5 Conference Center
- 4 Conference Center
- 3 Toy Factory
- 2 Software Center
- 1 Monkey Business



evacuation mode



5

EXIT



evacuation mode

next elevator
in 3 minutes





How should evacuation elevators be promoted?

Investment is required (building and elevator system)

Typical approaches include narrowing stairs or cutting the number of staircases required by a third (IBC)

Investing in advanced evacuation systems may enable greater net rentable floor space

- ➔ No need to sacrifice additional floor space for stairs
- ➔ City authorities and decision makers have key role in this!



Conclusions

All megatall buildings use elevators for evacuation

In buildings over 20–30 floors high, elevators are the fastest means of evacuation

Local authorities have key role in enabling more m² when investing in advanced evacuation systems

Operation rehearsals required to train users how to use advanced systems



Over 20-30 floors, elevators should be considered

Building evacuation strategy

Situational awareness

Number and width of staircases

Codes and regulations

Elevator systems

Thank you

Mr. Tomi Sipilä



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