

FIRE AND LIFE SAFETY IN THIS NEW ERA OF THE SUPERTALL BUILDING

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Organizadores / Organizers



FUNDACIÓN **MAPFRE**

Madrid, 20 – 22 de Febrero de 2013
Centro de Convenciones Mapfre

SUMMARY

WHY BUILD TALL?

WHY BUILD SUPERTALL?

TRENDS IN DESIGN

BUILDING TALL SAFELY

WHY BUILD TALL?

- **Global Urbanization**
- **Maximize Land Value**
- **Economic Efficiency**
- **Potential For Sustainability**
- **Maximize Purchaser Value**

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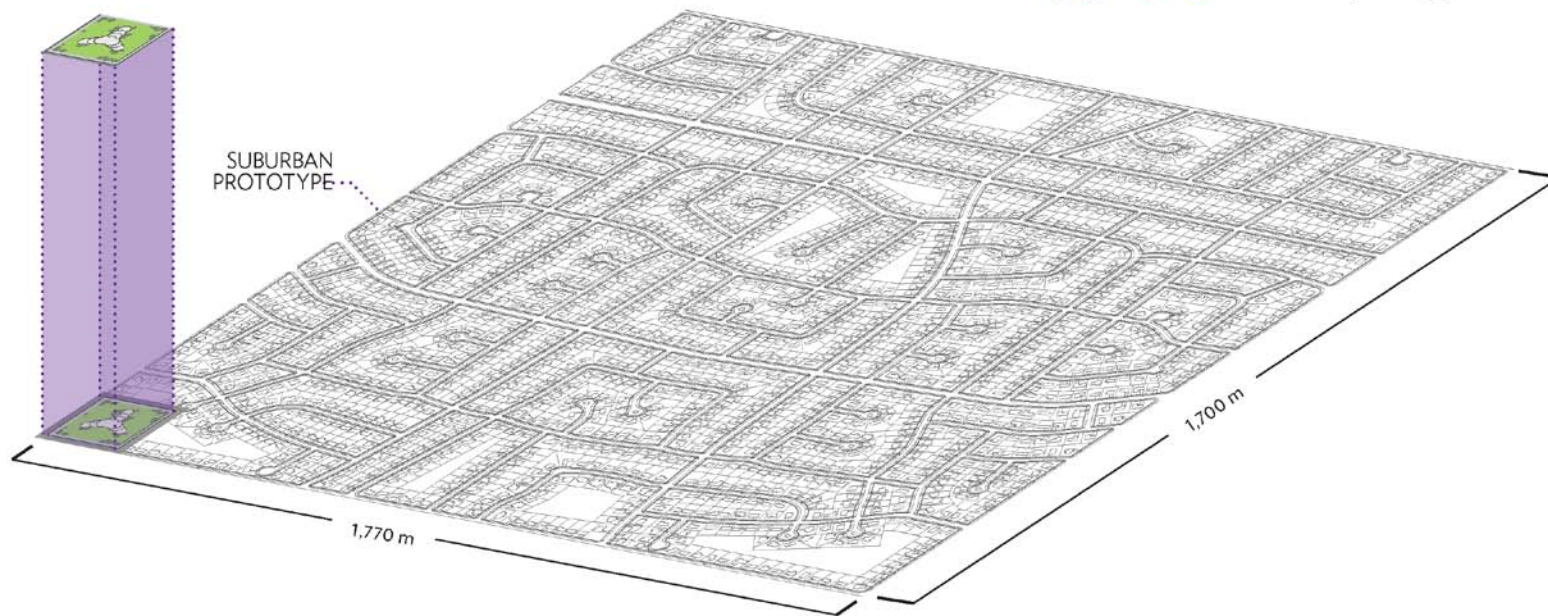
WHY BUILD TALL?

SUPERTALL PROTOTYPE EXAMPLE

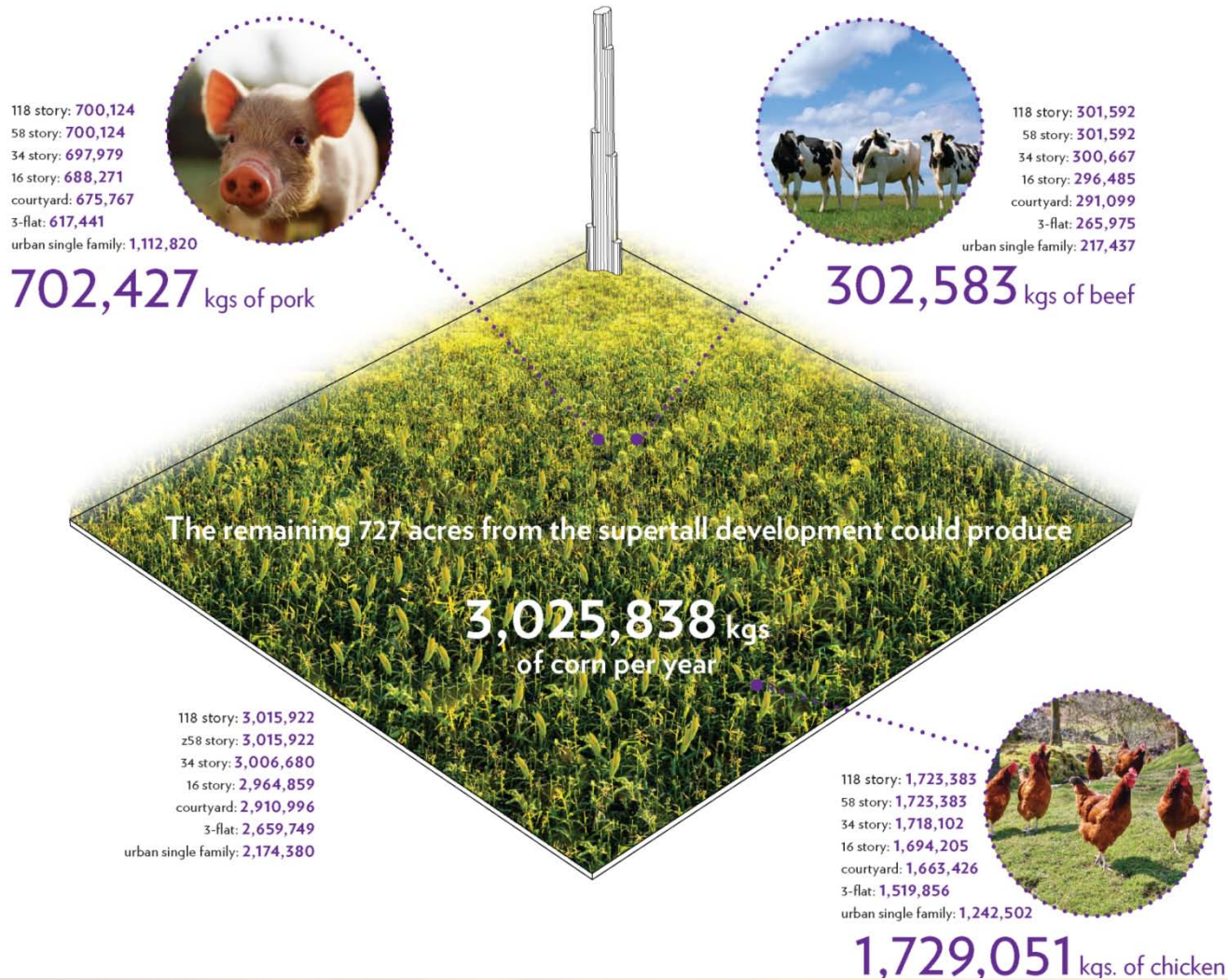
210 STORY

NUMBER OF BUILDINGS:	1
NUMBER OF UNITS:	2,000 / BUILDING
PARCEL AREA:	14,641 m ²
UNITS / HECTARE:	744
FAR:	27.3

.9% of the land use of the Suburban prototype



WHY BUILD TALL?



WHY BUILD TALL?

- Global Urbanization
- Maximize Land Value
- Economic Efficiency
- Potential For Sustainability
- **Maximize Purchaser Value**

WHY BUILD TALL?

Superior Views



Proximity to Urban Amenities



WHY BUILD SUPERTALL?

- **Landmark**
- **Catalyst for Economic Development**
- **Symbol of Prestige**
- **Iconic and Egocentric**

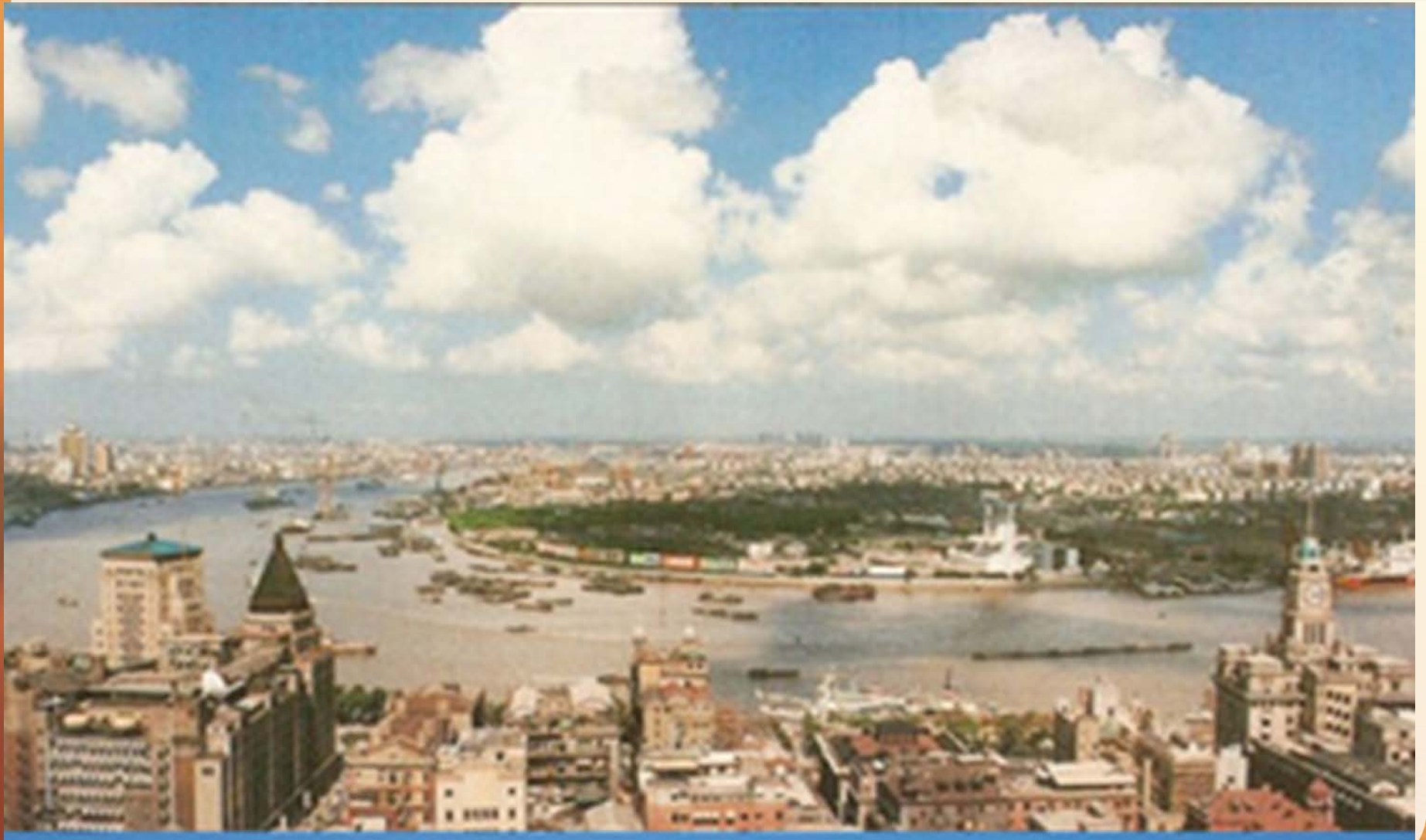
WHY BUILD SUPERTALL?



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- **Catalyst for Economic Development**
- Symbol of Prestige
- Iconic and Egocentric

WHY BUILD SUPERTALL? SHANGHAI 1990



WHY BUILD SUPERTALL? SHANGHAI 2010



WHY BUILD SUPERTALL?

- Landmark
- Catalyst for Economic Development
- **Symbol of Prestige**
- Iconic and Egocentric

WHY BUILD SUPERTALL?



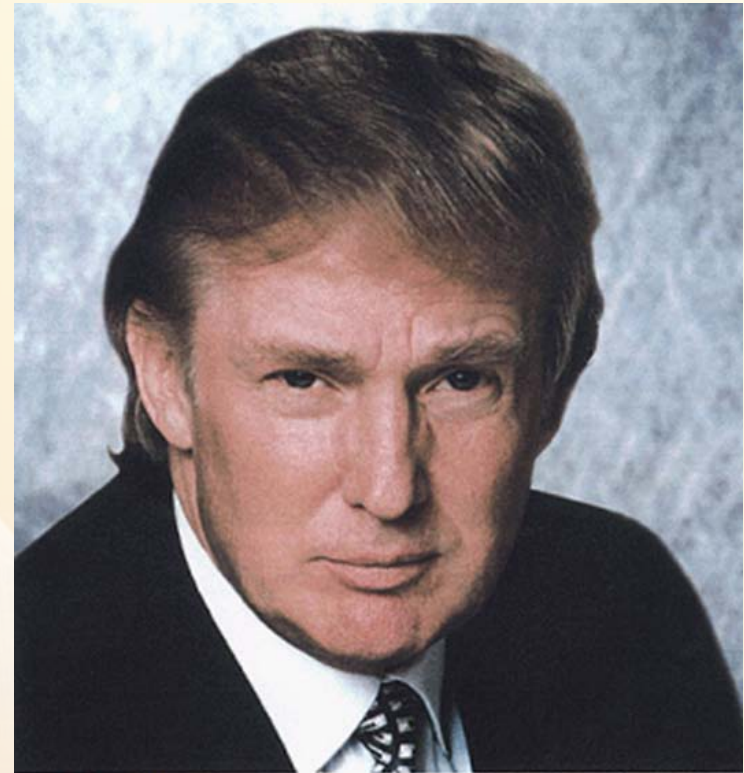
WHY BUILD SUPERTALL?

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- **Iconic and Egocentric**

WHY BUILD SUPERTALL? ICONIC



WHY BUILD SUPERTALL? ICONIC AND EGOCENTRIC

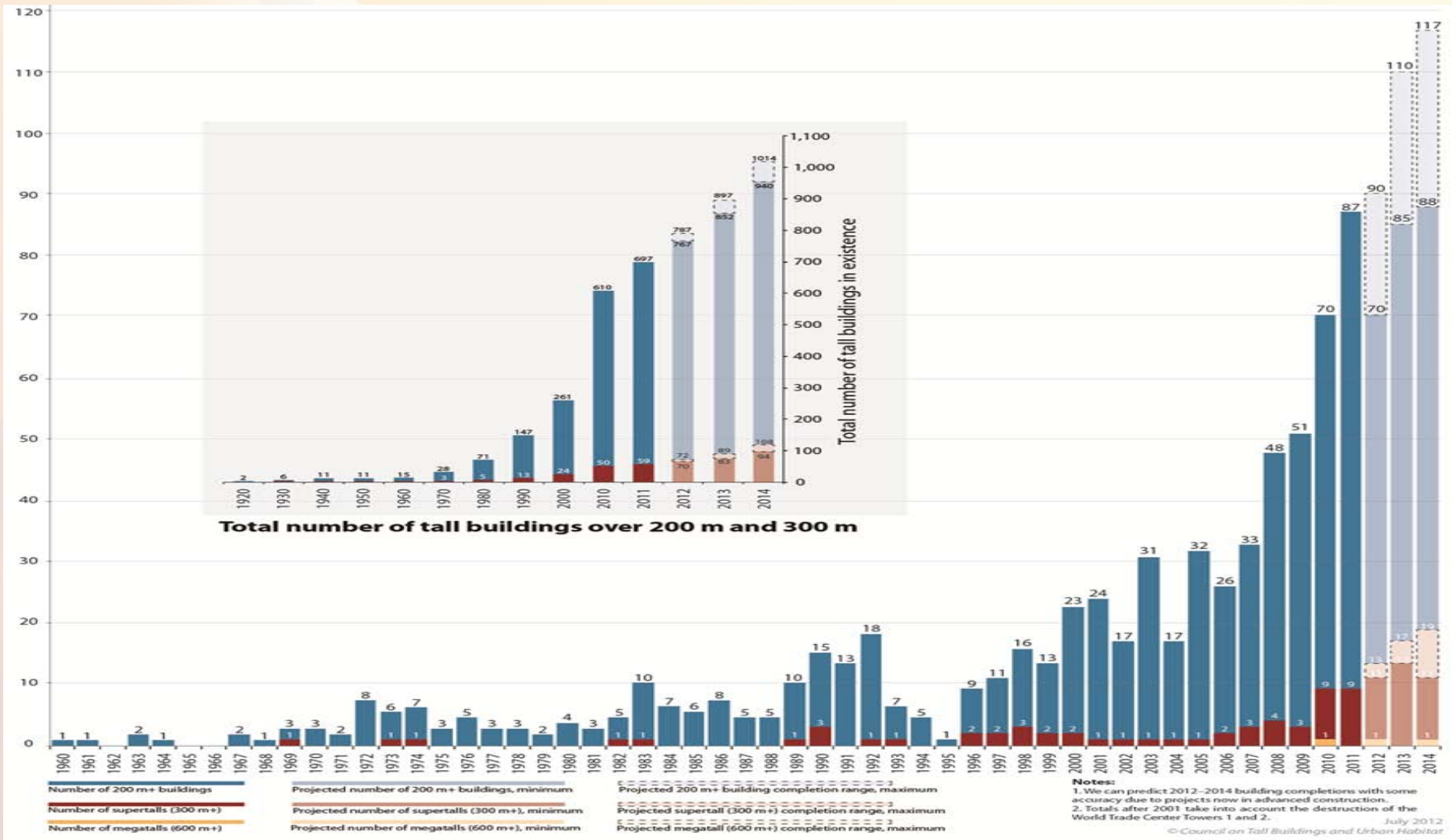


DONALD
TRUMP
THE AMERICA WE DESERVE

TRENDS IN DESIGN

- **Height**
- **Density**
- **Place Making**
- **Value Creation**

TRENDS IN DESIGN: HEIGHT



TRENDS IN DESIGN

- Height
- **Density**
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- Value Creation

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TRENDS IN DESIGN: BURJ KHALIFA



TRENDS IN DESIGN: DOWNTOWN BURJ KHALIFA



TRENDS IN DESIGN: DOWNTOWN BURJ KHALIFA



BUILDING TALL SAFELY

- **The Regulatory Framework**
- **Threats Beyond Fire**
- **Operations and Maintenance**

BUILDING TALL SAFELY

LOCAL CODES AND STANDARDS

中华人民共和国国家标准

National Standard of the People's Republic of China

高层民用建筑设计防火规范

Code for fire protection design of tall buildings

CODE FOR FIRE PROTECTION DESIGN OF TALL BUILDING

GB 50045-95

GB50045-95

(2005 年版)

(2005 version)

主编部门：中华人民共和国公安部

批准部门：中华人民共和国建设部

施行日期：1995 年 11 月 1 日

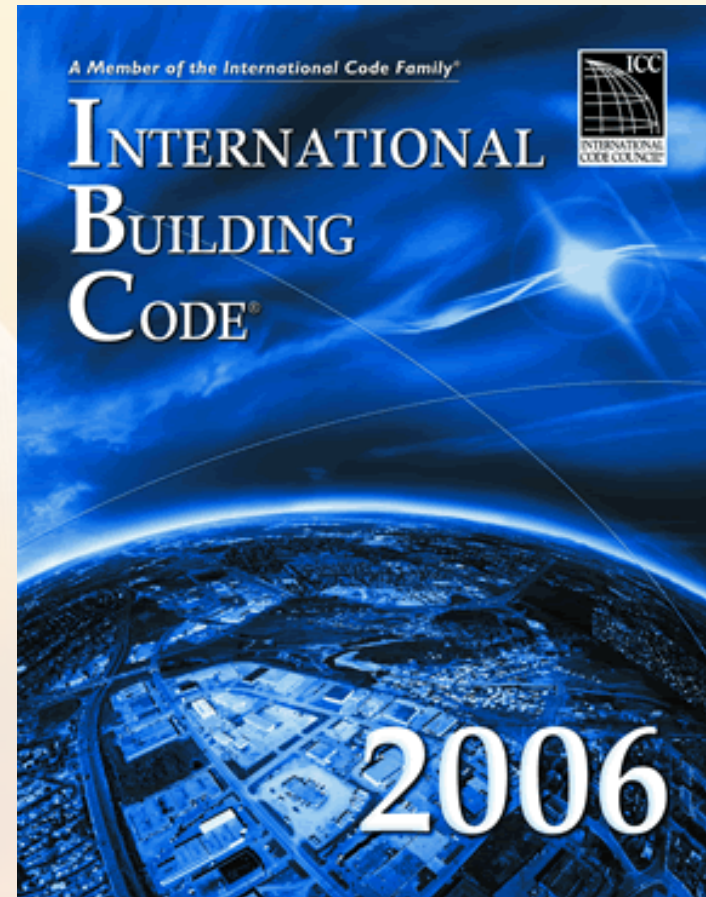
भारत की राष्ट्रीय भवन
निर्माण संहिता 2005
National Building
Code of India 2005

Saudi Building Code Requirements

201	Architectural	
301	Structural – Loading and Forces	
302	Structural – Testing and Inspection	
303	Structural – Soil and Foundations	
304	Structural – Concrete Structures	
305	Structural – Masonry Structures	
306	Structural – Steel Structures	
401	Electrical	
501	Mechanical	
601	Energy Conservation	
701	Sanitary	
801	Fire Protection	
901	Existing Buildings	

BUILDING TALL SAFELY

INTERNATIONALLY RECOGNIZED CODES



BUILDING TALL SAFELY

THE APPROVALS PROCESS

- Engage Fire Officials Early and Often
- Establish a Working Group
- Continue from Design to Construction and Beyond



BUILDING TALL SAFELY

ENHANCEMENTS: “BEYOND THE CODES”



SOCIETY OF FIRE PROTECTION ENGINEERS



Refuge Floors: Challenges of Life Safety, Cost Effectiveness and Sustainability

CTBUH: Council on Tall Buildings and Urban Habitat
Fire and Safety Working Group

WORKING DRAFT: An in-progress draft report: for review, comments, discussion, and updating

This Draft: February 5, 2011

BUILDING TALL SAFELY

- The Regulatory Framework
- **Threats Beyond Fire**
- Operations and Maintenance

BUILDING TALL SAFELY: FIRE

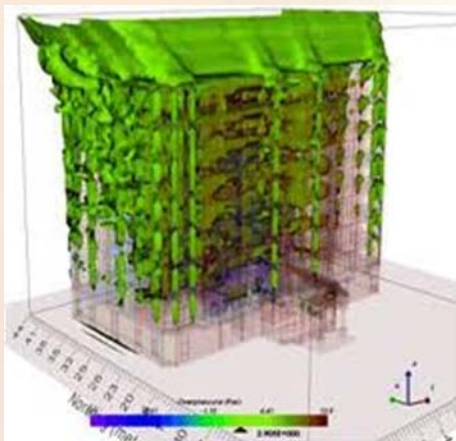


BUILDING TALL SAFELY

- **Design for Non-Fire Events**
- **Design for Partial Systems Failure**
- **Design for Full Building Evacuation**

BUILDING TALL SAFELY: NON-FIRE EVENTS

TERRORISM



INFRASTRUCTURE FAILURE



WEATHER



BUILDING TALL SAFELY

- **Design for Non-Fire Events**

Types of Events to Consider

- Terrorism
- Infrastructure Failures
- Weather

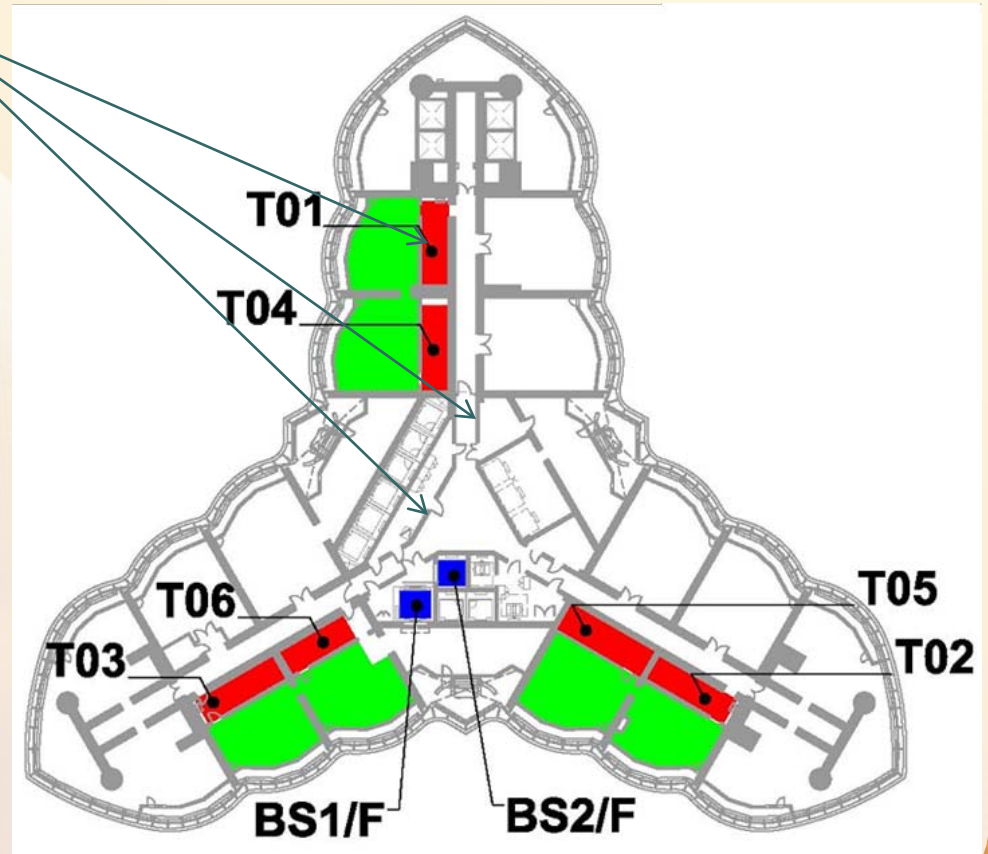
Building Design Features

- Reinforced Concrete Structure
- Impact Resistance Standards for Egress Partitions & Fireproofing Materials.
- Enhanced On-Site Power and Water

BUILDING TALL SAFELY: NON-FIRE EVENTS

- **Reinforced Concrete Structure**

Protects exit stairs,
emergency elevators
and critical life safety
system risers



BUILDING TALL SAFELY: NON-FIRE EVENTS

- **Impact Resistance Standards**

IBC 2009

Section 403.2.3 Structural integrity of exit enclosures and elevator hoistway enclosures. ASTM C 1629/C

Section 403.2.1.1 Type of construction. For buildings greater than 420 feet (128 m) in *height*, no reduction in *fire-resistance rating* of the building elements.

Section 403.2.4 Sprayed fire-resistant materials (SFRM).

BUILDING TALL SAFELY: NON-FIRE EVENTS

- **Enhanced On-site Power**

Multiple Emergency Power Feeds up the Building

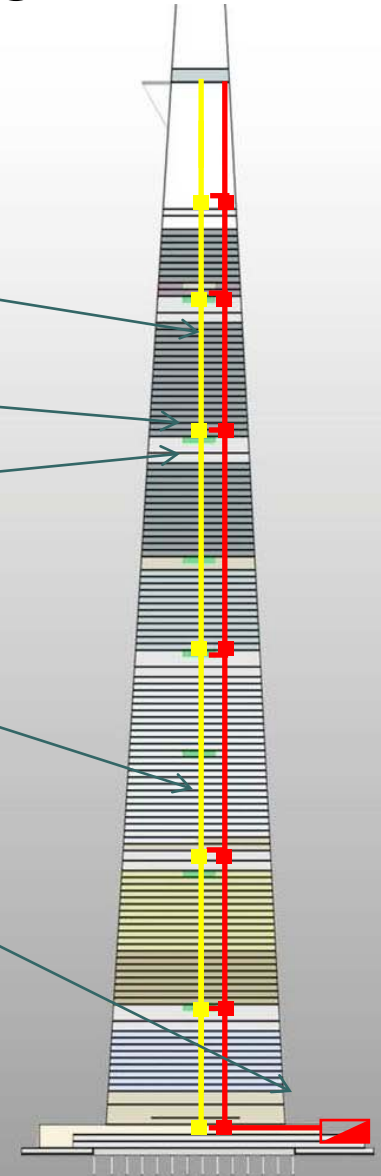
Emergency Power Transformers at

Mechanical Floors

Zone Emergency Power Switchboards

Zone Emergency Power Distribution

Redundant Diesel Generators



BUILDING TALL SAFELY: NON-FIRE EVENTS

- **Enhanced On-site Water**

Water is Pumped to High Level Tank

1 Hour Capacity

Water by gravity fills Intermediate Level Tank

1 Hour Capacity

Water is Pumped to Mid Level Tank

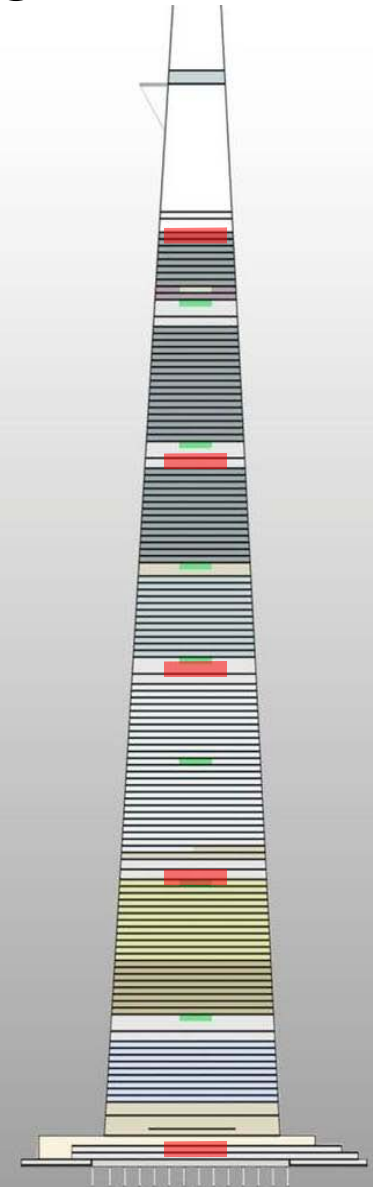
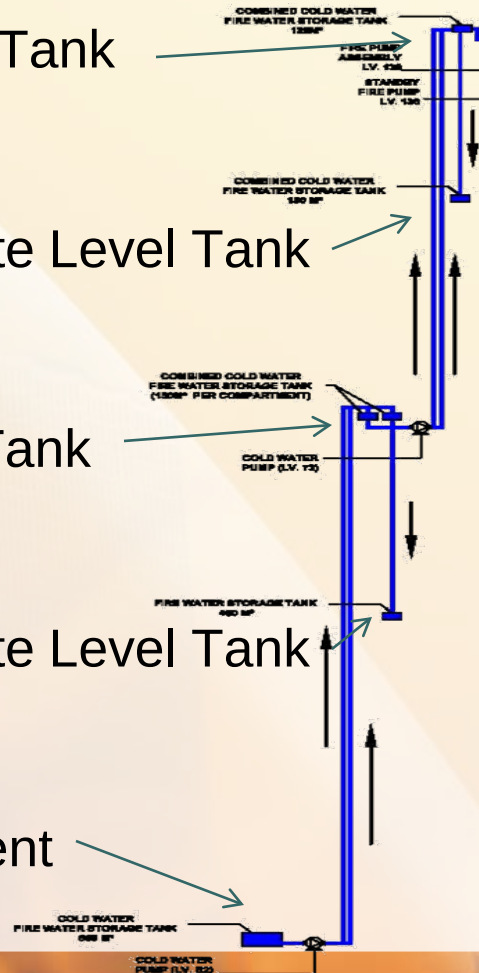
1 Hour Capacity

Water by gravity fills Intermediate Level Tank

1 Hour Capacity

Primary Storage Tank - Basement

2 Hour Interior Capacity



BUILDING TALL SAFELY

- **Design for Partial Systems Failure**

Types of Failures to Consider

- Mechanical or Electrical System Failures or Impairments
- Structural or Curtain Wall Failures

Design Features for Partial System Failures

- Redundant System Risers
- Gravity Fed Suppression Systems

BUILDING TALL SAFELY

- **Design for Full Building Evacuation**

Events that May Necessitate Full Building Evacuation

- Terrorism
- Loss of Power or Mechanical Systems
- Weather

Design Features for Full Building Evacuation

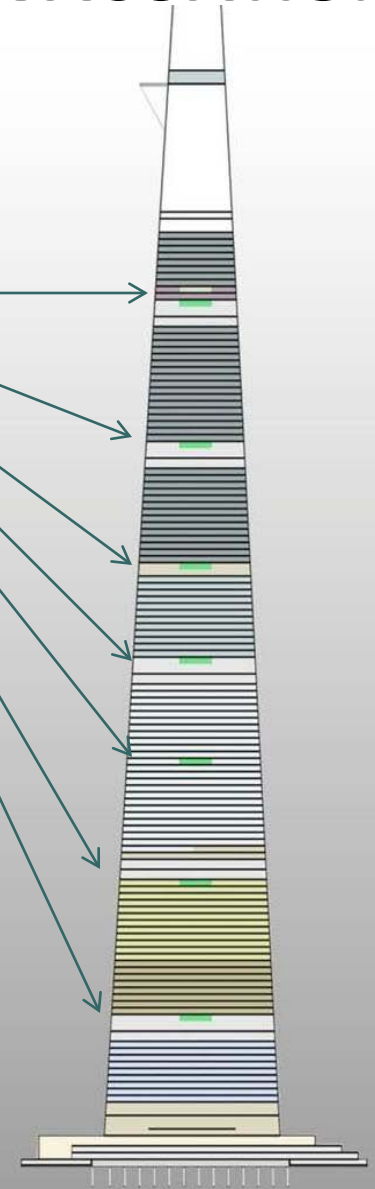
- Refuge Floors
- Increased Number or Width of Stairs
- Elevator Assisted Evacuation

BUILDING TALL SAFELY: FULL BUILDING EVACUATION

- **Refuge Floors**

Located at 15 to 30 floor intervals with the following features:

- 2 hour construction
- No combustible finishes or contents
- No mechanical systems except those serving the AOR
- Mechanically Pressurized to limit smoke spread
- Directly connected to exit stairs
- Directly connected to Evacuation Elevators

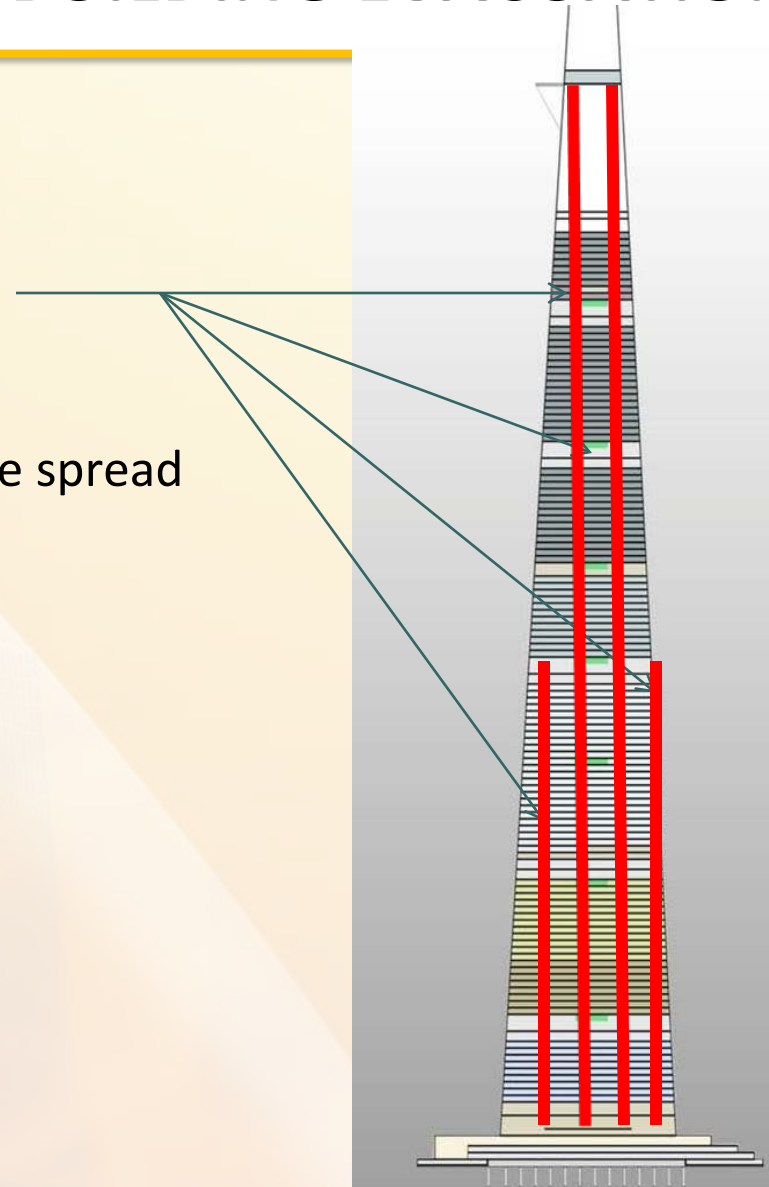


BUILDING TALL SAFELY: FULL BUILDING EVACUATION

- **Exit Stairs**

Increased Number and Width:

- 2 hour “robust” construction
- Mechanically Pressurized to limit smoke spread
- Directly connected to AOR’s

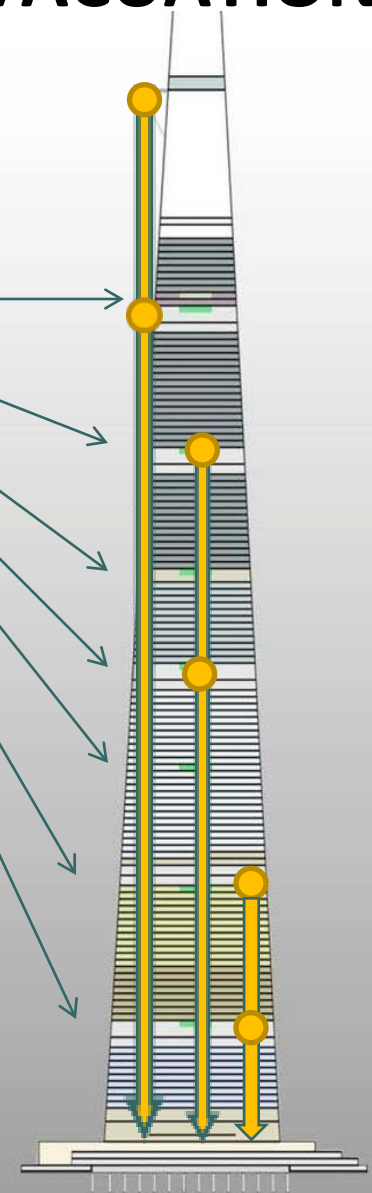


BUILDING TALL SAFELY: FULL BUILDING EVACUATION

- **Evacuation Elevators**

Located at 15 to 30 floor intervals with the following features:

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BUILDING TALL SAFELY

- The Regulatory Framework
- Threats Beyond Fire
- **Operations and Maintenance**

BUILDING TALL SAFELY

Building Operation and Maintenance

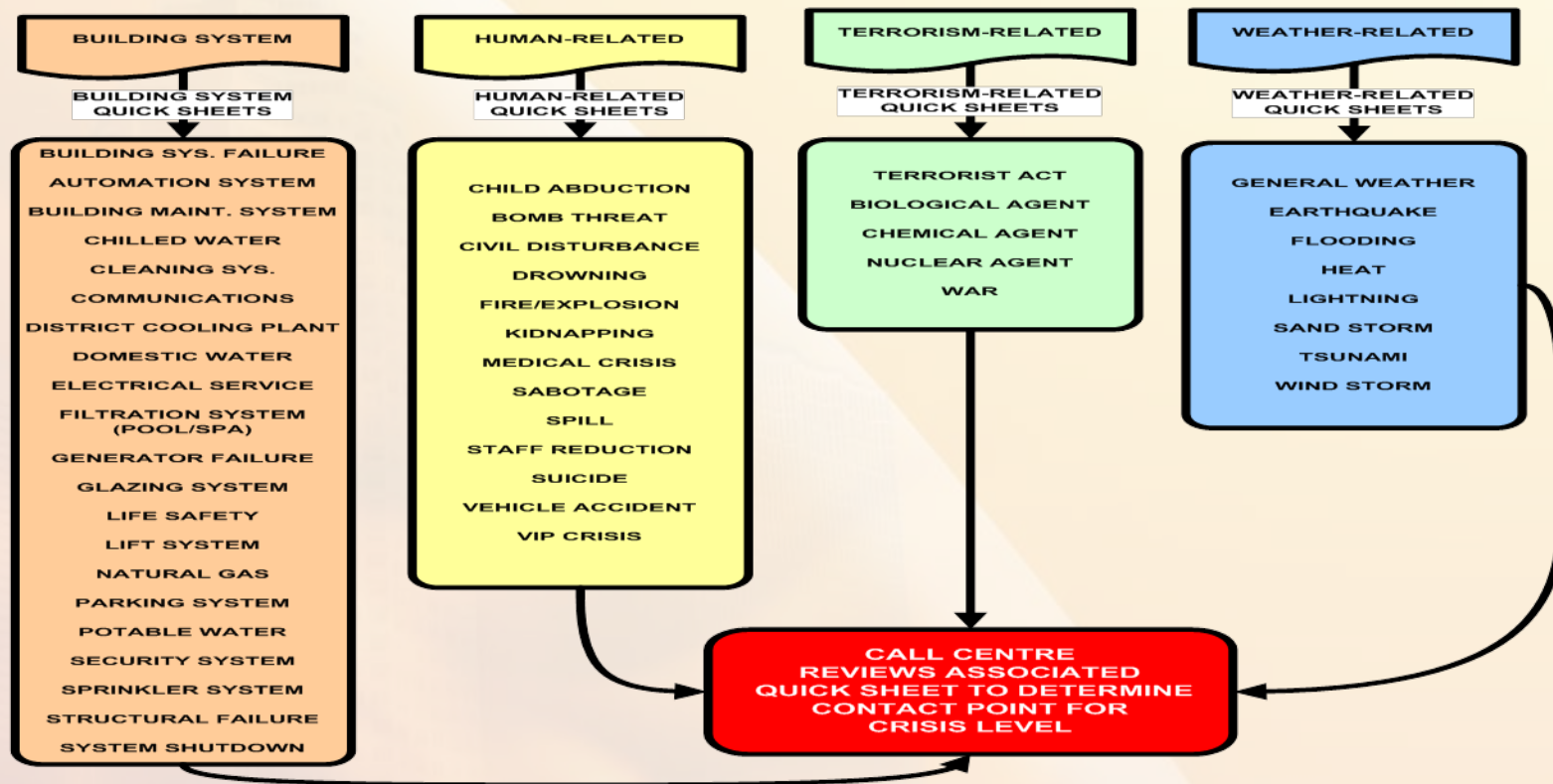
- Adequate Staffing and Training
- Maintenance of Life Safety Systems

Crisis Management Plan- Prepared by RJA

- Define Threats
- Pre-Planned Response Procedures
- Training
- Security Issues

BUILDING TALL SAFELY

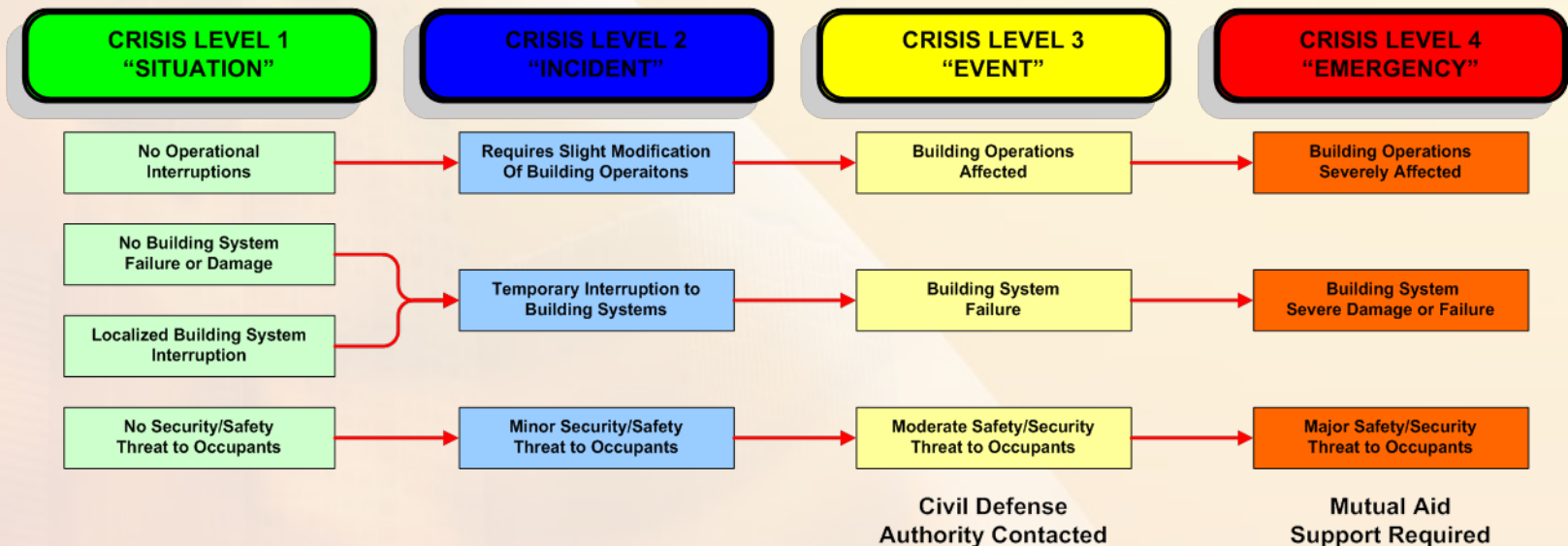
Crisis Management Plan: Specific Procedures for Each Event



Prepared by RJA

BUILDING TALL SAFELY

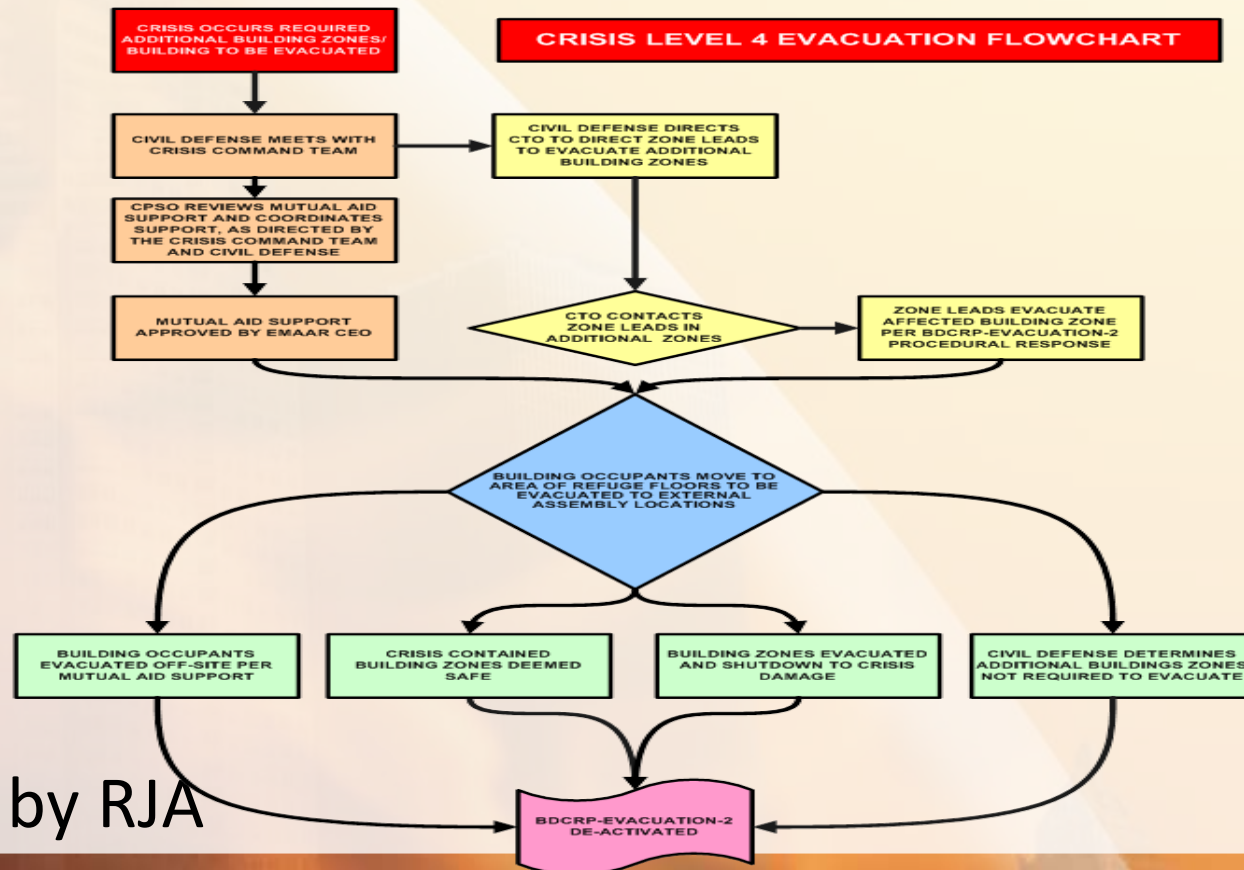
Crisis Management Plan: Crisis level determined by the effect the crisis has on building operations and systems



Prepared by RJA

BUILDING TALL SAFELY

Crisis Management Plan: Crisis Level 4 “Emergency” Full Building Evacuation



Prepared by RJA

CONCLUSION

TOPICS COVERED:

- **WHY BUILD TALL?**
- **WHY BUILD SUPERTALL?**
- **TRENDS IN DESIGN**
- **BUILDING TALL SAFELY**

CONCLUSION

**FOR ANY BUILDING PROJECT TO BE SUCESSFUL,
INDIVIDUALS MUST TO JOIN TOGETHER AND ACT AS A
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**FOR A “SUPERTALL” BUILDING PROJECT TO BE
SUCCESSFUL, THE TEAM MUST BE “SUPER” TOO!**

CONCLUSION



Gracias por su atención
Thanks for your attention



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