

Fire Safety Engineering Workshop Session III A: Case Study on Fire Safety of Tall Buildings

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Quality Fire Safety Management

Presented at the Fire Safety Engineering Workshop at Sichuan Fire
Research Institute, May 26, 2015, Chengdu, China

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Goal

- Present case study for tall building conducted in New Zealand
- Present issues & critique of case study
- Discuss unique considerations for fire safety of tall buildings
- Recommendations to SCFRI for developing technology base for tall building fire safety

Tall Building Case Study

- Conducted by New Zealand & presented at 9th International Conference on Performance-Based Fire Safety Design
- Building description provided by SFPE
- Both prescriptive & performance-based designs developed
- Issues & critique of case study provided

Building Description

- Super tall building 99-stories, 490 m high
- Retail space on ground floor, office on floors 2-40, & apartments on floors 41-99
- 4.9 m floor height, 4 staircases, 13 passenger & 4 fire fighting elevators
- Occupant density for floors as per C/VM2

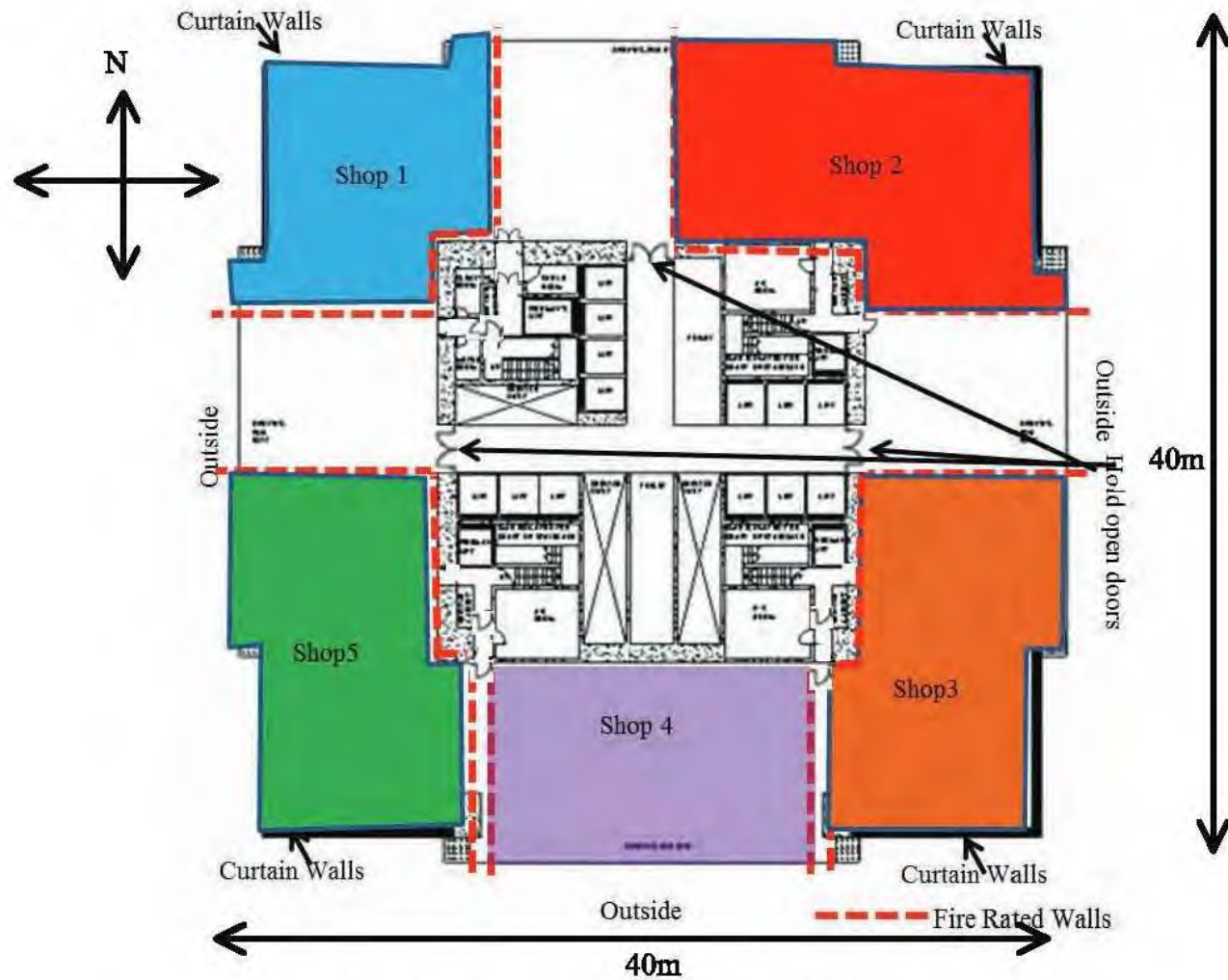


Figure 1 – Typical floor plan for retail space on the ground floor

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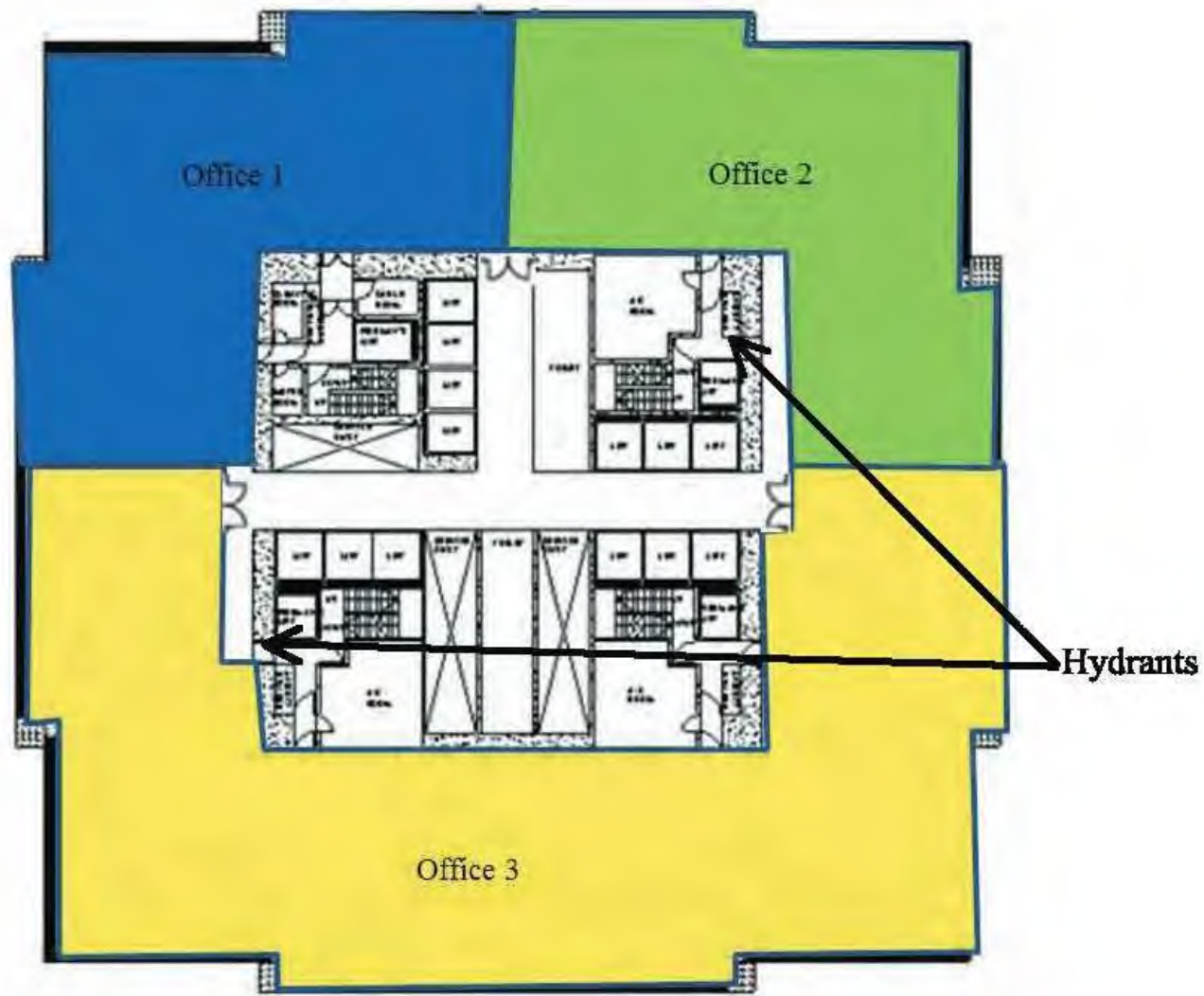


Figure 2 – Typical floor plan for offices on Floors 2-40

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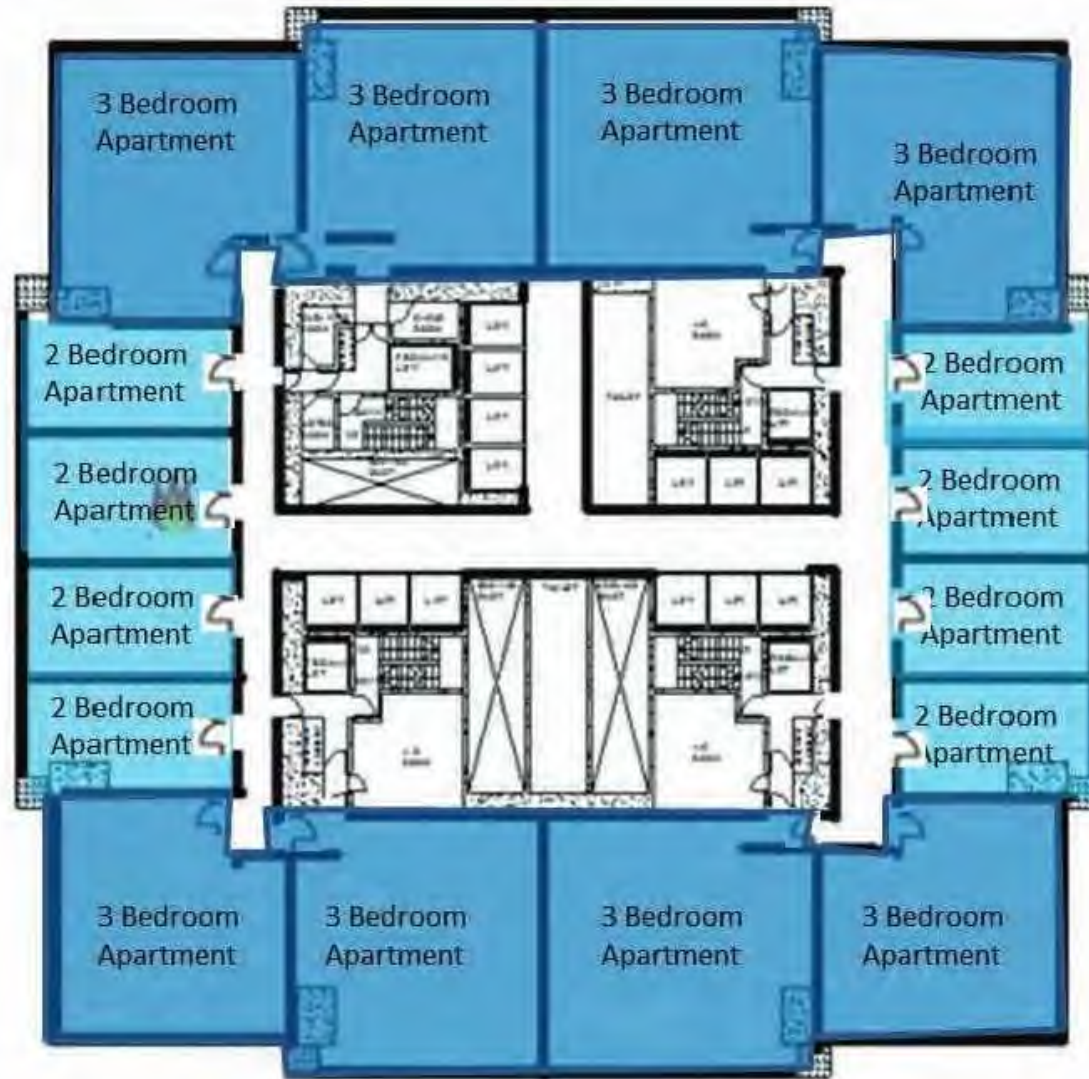


Figure 3 – Typical floor plan for residential floors (41-99)

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Prescriptive Solution

- Show compliance with New Zealand Building Code (NZBC), design in accordance with C/AS1
- Purpose groups & occupant densities
- Fire safety precautions required in C/AS1

Occupant Load Distribution per C/AS1

	Location	Purpose Group	Fire Hazard Category	Occupant Density (p/m ²)	Gross Area (m ²)	Occupant Load
Level 1 (Ground floor)	Shop	CM	2	0.3	930	279
Total:						279
Level 2- Level 40 th	Offices	WL	2	0.1	1200 per Level	120 per Level
Total:						4680
Level 41 – Level 99	Residential	SR	1	As number of beds	1200 per level	80 per Level
Total:						4720
Total of the building occupant load						9679
Note 1: Spaces (e.g. storage, wardrobe, backstage, toilet facilities etc.) used for intermittent activities are not assessed for occupant load.						

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Fire Safety Precautions in C/AS1

- Fire cell in greatest escape height governs requirements for that purpose group
- FRR for fire cells specified in C/AS1
 - Level 1: F0
 - Level 2-40: F 90
 - Level 41-99: F 60
- Alarm types based on height of floor, modified if any floor height > 25 m

Buidling	Purpose Group	Occupant load	Escape height	F Rating (min)	Other Protection Required
Level 1	CS	100<279<500	0 m (for single floor)	F60	6,16, 18c
Level 2-Level 40	WL	100<120<500	>58m	F 90	7,9,13,15,16,18,19,20
Level 41-Level 98	SR	0>80>100	>58m	F 60	7e,13,15,16,18,20

Legend

FRR of F60 60/60/60 shall apply for level 1

No F-rating for Level 99 but S-rating may apply in case of separate titles.

According to clause 6.9.2 the safe path shall be separated from all adjoining firecells by fire separations having the same FRR throughout its length and that will be F90.

FRR of F90 F 90/90/90 will apply from Level 2 - Level40 for life safety

FRR of F60 F 60/60/60 will apply from Level41-Level98 for life safety

- 6 Automatic fire sprinkler system with manual call points
- 7 Automatic fire sprinkler system with smoke detectors and manual call points.
- e The smoke detection element is Type 5 within firecells containing sleeping accommodation. (See Appendix A of C/AS1 for description of Type 5.)
- 9 Smoke control in air handling system.
- 13 Pressurization of safe paths.
- 15 Fire Service elevator control.
- 16 Visibility in escape routes.
- 18 Fire hydrant system.
- 19 Refuge areas.
- 20 Fire systems center.
- C Required where Fire Service hose run distance, from the Fire Service vehicular access to any point on any floor exceeds 75m.

(*Note the above only gives the F-rating for all the purpose groups. The final fire resistance rating shall be decided after evaluating the S-rating for the above purpose groups and then the higher of the two shall apply)

