Malta Insurance Association

Risks in High-Rise Buildings

Report as at January 2009 on Behalf of MIA

dhi PERITI

Architects | Structural, Civil, Municipal Engineers | Valuers | Quantity Surveying Services

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RISKS IN HIGH RISE BUILDINGS

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Risks to be Considered

- Malta's Building regulations
- Windstorm Risk } Structural
- Earthquake Risks } Eurocodes
- Ground conditions
- Flooding
- Tsunami
- Terrorism
- Probable Max Loss
- Fire

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Building Regulations to Date

- In Draft since 1995 -7 sections Parts A-G of which Part F issued
- "Fuel, Power & Conservation of Energy"
- Handbook on part C issued "Design Guidelines on Fire Safety for Buildings in Malta"
- BICC had not published "Structural Integrity" handbook referred to Part C, although various CPD courses undertaken

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Windstorm risks

- Malta's climate is defined as well behaved with hurricanes not the case for Malta.
- Malta's Wind Rose Diagram should act as a guide on positioning high rise.
- Strongest gale recorded 12/88 at 34m/s (66 knots)
- Eurocode Provision (EN1991 - 1.4) refers to a 10 min wind speed at 10m above open country which appears to approximate to 23m/s.

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Earthquake Risk

- Eurocode EN1998 - 1.1 requires the 175 year return period

Real Estate Damage & No of Casualties according to Earthquake Intensity

EARTHQUAKE INTENSITY	RETURN PERIOD years	REAL ESTATE Loss €	NO OF FATAL CASUALTIES
vi	125 (2-5)%g	165,000,000	-
Vii	1,000 (5-10)%g	1,189,000,000	45
Viii	10,000 (10-20)%g	2,870,000,000	2,370

(Source: dhi periti)

- The 475 return period hovers around 0.06g – 0.08g
- This classifies Malta as lying in a low seismicity zone as falling within <0.10g but > 0.04g

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Ground Conditions
(damage to adjacent properties)

- Pembroke – strong lower coralline (tal-qawwi)
- Paceville

  Gzira

  Luqa - stiff lower globigerina (tal-franka)

  Marsa
- Tigne – possibly shattered
- Qawra – soft middle globigerina
- Deep excavation in rock is to be monitored via PPV method

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Flood Risks

- Malta's average annual rainfall stands at 550mm (global average 1000mmm)
- For the max 24 hr precipitation Malta's flash floods are in the 100-200mm group (max global 500mm/24hr)
- Highest Maltese storms intensity 226mm Sept 2003, flow velocity 9km/hr (5km/hr person swept away).
- Flash floods average out at 2.5 years with an average intensity of 144mm per 24 hr
- Flooding risks poised by the Marsa park, Gzira and Paceville (lower end) sites.

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Flash flood at Valley Rd, Birkirkara 4thJune 2007 highest recorded for June at 57.6mm in 24 hrs.

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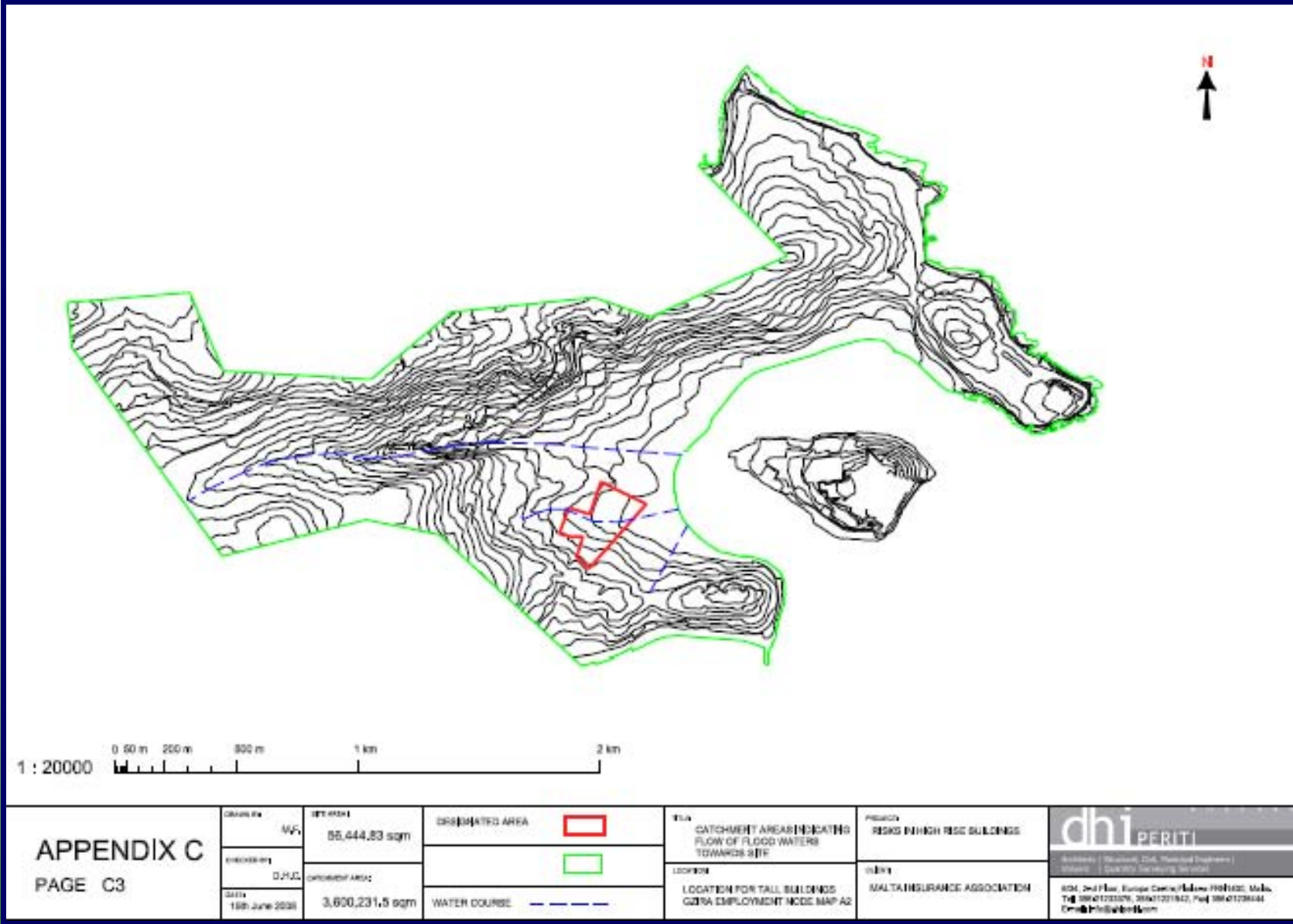

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Tsunami Risks

- The greatest tsunami damage with 7.00m ht run-off is expected from the Aegean Sea with 90min warning From Eastern Sicily only a 0.5m high run-off is expected with a 50min warning period.
- Greatest Tsunami damage is expected in the Marsa Park & Gzira
- Qawra, Paceville & Tigne has a small fraction exposed, with Luqa outside.

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Inundation of the Maltese Islands up to the 10m mar

Source: dhi periti

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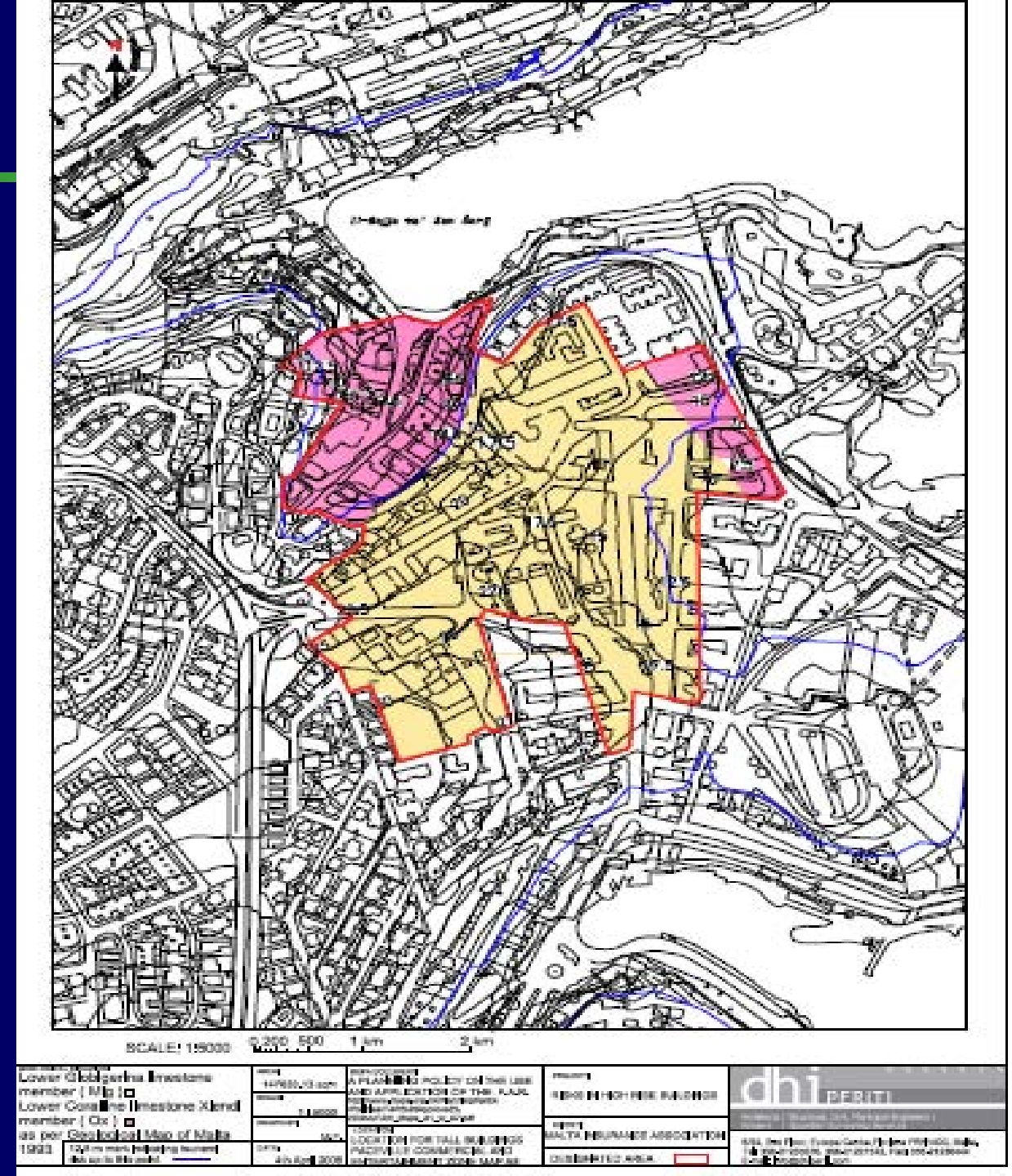

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Terrorism Risks

- Have been increasing on a global scale since 1988 (Lockerbie) culminating in more than a total loss 11/09/2001 – Twin Towers.
- Appropriate prevention measures – to be included in the design

- round columns
- anti-resistant glazing
- Design against disproportionate collapse (Roman Point 1968) blast loading
- Islamic Banking (Smart City) growing American presence in Malta
- Low level of National Security, scarcity of land to provide for security buffer zones

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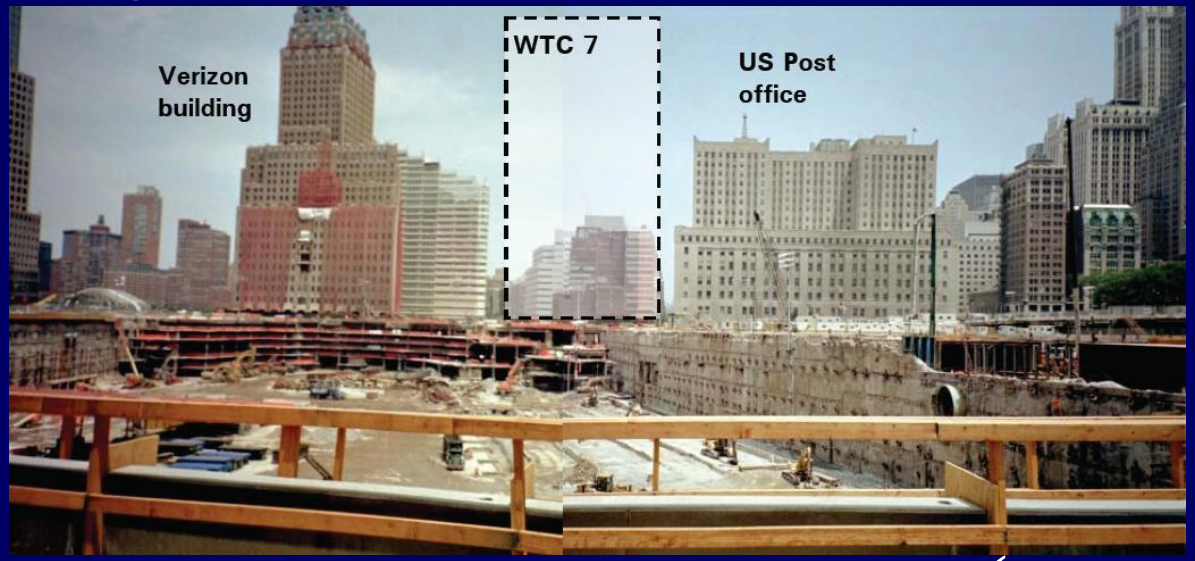
Probable Max Loss - PML

- The events of 9/11 have altered the PML philosophy behind terrorism
- What had previously been considered inconceivable has now occurred, a PML>100%
- The fire PML is the most important element of a high rise



Art deco Verizon building still in place. (Source: Swiss Re)

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Fire Engineering Post 9/11

- Photo indicates necessity of installing a fire-fighting lift
- Old Trafford with a spectator capacity of 80,000 may be vacated in 8 minutes

Limitation of fire fighting hose reels noted in the Windsor Building Madrid (Source: Swiss Re)

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Present Day Fire Safety Legislation

- Fire engineering has moved away from prescriptive measures ("do it like this approach") toward engineered solutions ("achieve this")
- Handbook on "Fire Safety in Malta" is based on prescriptive measures and for buildings with a max height of 28m (under 10 storeys)

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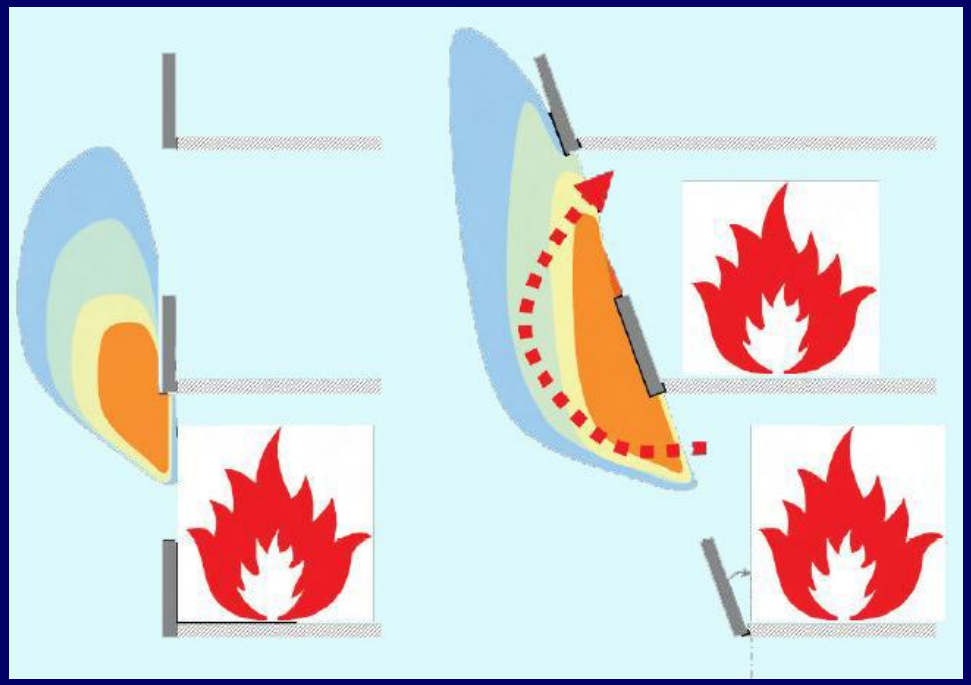
Changing Trends, Changing Risks & Fire Design



(Source: NCE)

With a simple, vertical façade the cooling as the hot gases leave the fire compartment is such that the potential for re-entrant fire spread is typically low. When the façade is inclined, the region of higher temperature is extended further up the façade and the potential for fire spread is much higher

Further placing sprinklers close to the façade may provide sufficient 'wetting' in the event of a fire, with this approach used instead of alternatively fire-rating a facade

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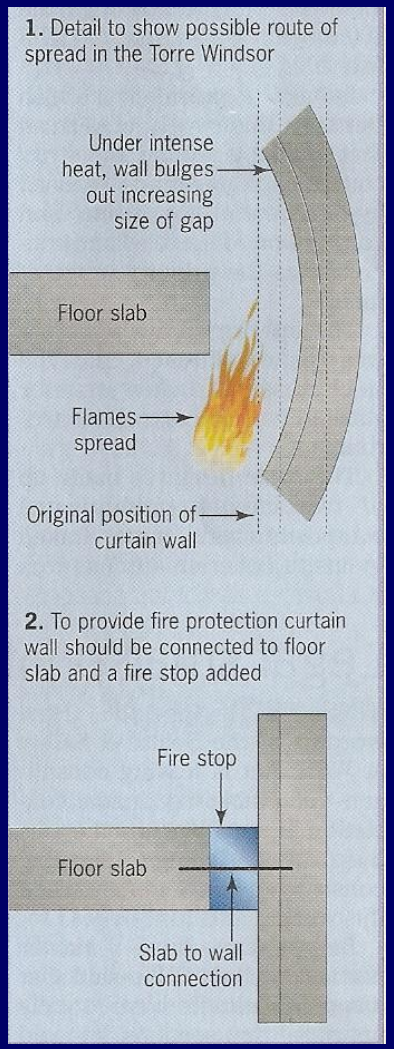
Structural Fire-Protection Measures

- These include for fire-resistant constructions, fire-resistant sealants & fire compartments

- On the other hand, fire detection systems fire-extinguishing equipment may be treated as suspect



Fire spread via floor to floor
(Source: NCE)

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Swiss Re's Malta Report 2008

- Notes that structural fire protection is generally rated as adequate, as benefitting from fire resistant concrete construction
- (Prof Ali for MEPA notes that Maltese appear well equipped for concrete construction – steel construction could have unsorted problems)
- Fire and smoke detection above ground level is rated as adequate
- Small access road widths in between blocks hamper maneuverability for fire engines and ambulances

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Conclusions & Recommendations

- Being late in high rise construction signifies that good practices of other countries should be adopted
- Risk-reduced advantages consist of adopting concrete/masonry construction with limited glazing
- High rise should be designed to achieve the discussed structural parameters for blast, wind earthquake and progressive collapse, with National Annexes to the Eurocodes undertaken prior to March 2010.
- Although best practice regarding technical protection is followed, regulatory control to ensure quality of construction is presently weak
- An overall Regulatory Body is necessary to oversee that the above robustness measures are in place

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