High Rise Building Construction

Underwriting considerations

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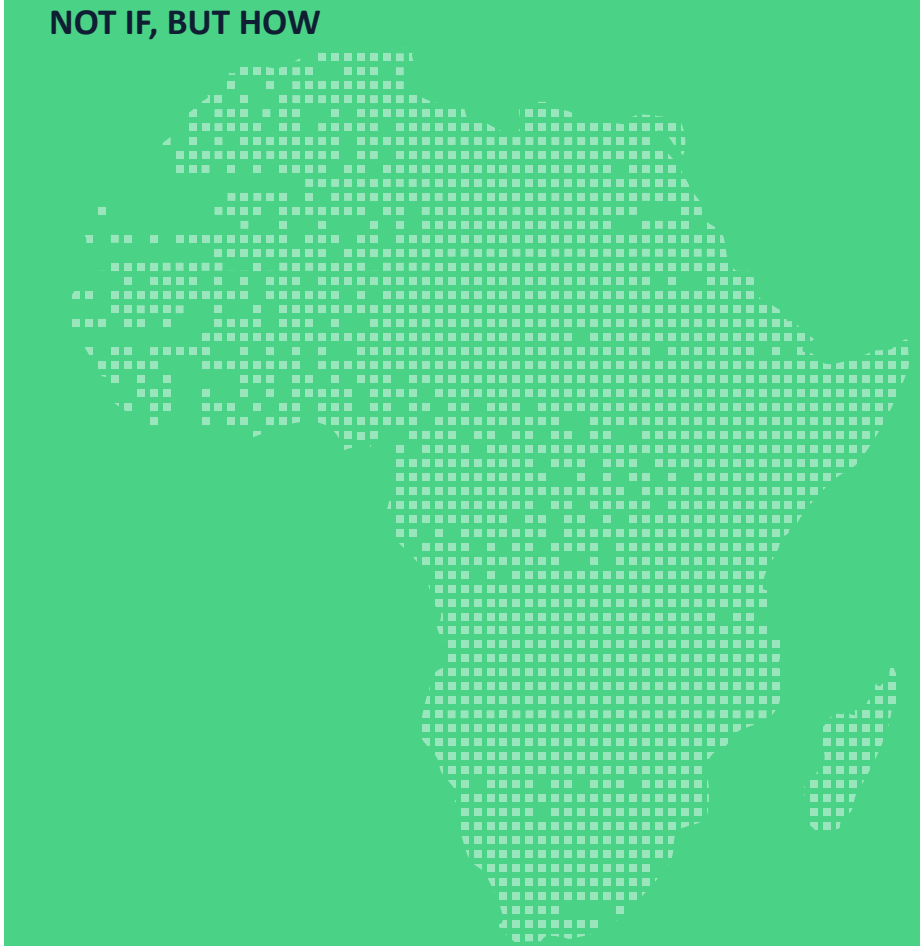

Image: Munich Re

Agenda

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Definition (by Munich Re)

The general definition for high-rise buildings is not exactly consistent in literature. However the differences in respect of the height are minor. In general, a high-rise building is defined as follows:

A building that is over 23 m high (generally these buildings have 6 or more storeys). This is based on fire protection industry conventions defined by the vertical reach limitation of external manual firefighting equipment.

Introduction

01

Image: Munich Re

High Rise buildings

- A Highrise building can be used for many purposes such as office building, residential & hotel space
- Because of their height and their large occupant populations, high-rises require the careful provision of life-safety systems. Fire-prevention standards should be strict, and provisions for adequate means of egress in case of fire, power failure, or other accident should be provided.

Marina Bay sands

Postel Tower in Abidan

Source: Postel Tower-Wikipedia

High Rise building during construction:

Source: High Rise building during construction

Underwriting information :

The following information is required for underwriting purposes

- Location
- Scope of works
- Design and execution methodology
- Geotechnical soil report
- All Participants of the project
- Breakdown of the project value
- Construction bar chart including critical path
- Description of surrounding and existing properties
- Site Plans and drawings

Predominant cause of losses : Fire

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Reason	Frequency [%]	Amount [%]
– **negligence**	**43**	**33**
– unspecified reasons	24	8
– short circuit	9	4
– **welding operations**	**9**	**18**
– insulation work	6	9
– **arson**	**4**	**24**
– explosion	3	2
– lightning	2	2

Source : Property day 2009/ Christian Bendel& Alexander Schroder

What cause fire on construction site ?

- **Hot Works –** sparks during the grinding and welding of metals on site
- **Flammable materials –** use of highly flammable chemicals and plastic materials.
- **Poor fire protection measures-** blocked evacuation routes and no safe storage of flammable materials.
- **Arson-** burning down of things intentionally with purpose of vandalizing or stealing from the construction site.

Risk Assessment

02

Image: Munich Re

Risk Assessment

- Scope of cover required/policy wording
- Building Characteristics (Basement, storeys...)
- Location of risk (Natural hazard, site access, congestion of site)
- Ground conditions (Clay, sand, etc…), water level
- Type of foundations
- experience of contractors
- Design overview
- Method statement
- Risk management (risk register, Quality control, Supervision and inspection of workmanship)
- Construction bar chart including critical path
- Impact of works on the surrounding properties
- Fire risk management

Fire Risk management

- Fire prevention / protection
  - fire safety plan
  - fire brigades
  - sprinkler systems
- Storage areas (compartments, materials)
- Housekeeping
- Hot work permit
- Façade /cladding

Source: Hot Works during construction

Risk Assessment

Source : Wet Riser

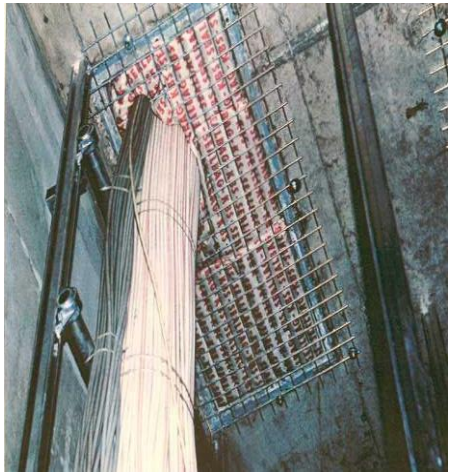
Temporary pumps and tank
for wet risers and hose reels

Source : Temporary water tank

Risk Assessment

Fit out and E&M scope

- Scope of works/description of the project
- Values of materials
- Installed equipment
- Special or unusual features (innovative methods or materials, prototypical features)
- Storage of material
- Protection of water ingress (project schedule)



Source: Cable ducts

Risk Assessment

Third Party Liability (TPL) :

- Distance to other buildings
- Dilapidation report
- Possibility of ground settlement / collapse
- Fire and / or explosion risk form construction work
- Height of construction work
- Construction machinery (e.g. cranes)
- Existing cables and pipelines
- Monitoring of settlement

Underlying Exposures

03

Image: Munich Re

Underlying exposures during construction of high-rise structure :

Excavation and Foundation:

- Collapse of excavation or failure of foundation due to Natural hazards
  - Storm
  - Earthquake
  - Flooding
- Collapse of excavation, failure of retaining wall
- Water ingress
- Failure of foundation (e.g. due to faulty, workmanship or design)

Source: Dubia construction leak

Underlying exposures during construction of high-rise structure :

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Material Storage:

- Fire & explosion
- Theft
- Accidental damage (during lifting and handling) or malicious damage
- Storm and Floods

Building Material storage at the construction site

Underlying exposures during construction of high-rise structure :

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Superstructure:

- Collapse (main structure or scaffolding or crane)
- Fire (e.g. hot works, scaffolding, housekeeping)
- Water damage (due to leaking pipes)
- Accidental damage during lifting procedures
- Malicious damage
- Inundation, storm and earthquake

The PGC building after the February 22, 2011, earthquake

Underlying exposures during construction of high-rise structure :

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Fitting Out (Electrical and mechanical works):

- Fire & explosion (materials, housekeeping)
- Accidental or malicious damage
- Water damage internal and external
- Failure electrical and mechanical equipment

Claim Example :Fire in Hong Kong (March 2023)

- A 42 –story skyscraper in Hong Kong
- Building was still under construction but close to completion
- **Cause of fire :** The bamboo scaffolding caught fire
- Electrical pump on ground floor of construction site was not in working order, a situation that constituted a fire hazard.
- Estimated loss USD 25 - 63 million

Source:Fire In Hong Kong (March 2023)

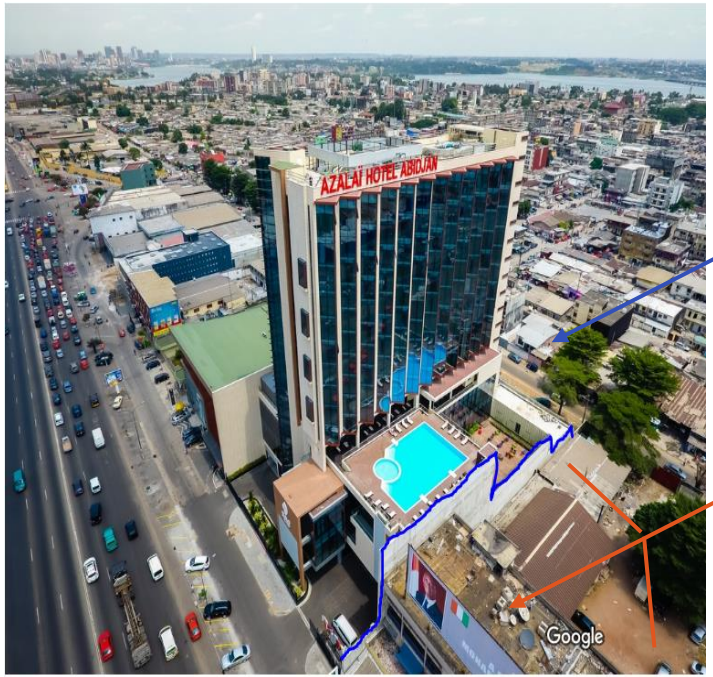
Claim Example :Building collapse in Shanghai ,China(2009)

- A 13 story residential building under construction collapsed
- **Cause of the collapse :** the weight of the piles created a pressure which led to a shift in the soil structure resulting into the weaking of the foundations.
- The incident resulted into one death.

Source: Building collapse in Shanghai, China(2009)

Claim example : Third party liability –Azalai hotel in Abidjan

- A 4-story hotel building Abidjan, Ivory cost
- After the realization of the deep foundations & Piling, essentially the two separation walls had cracks due to the internal constraints generated by the execution of the foundations.
- TPL coverage triggered.



AZALAÏ HOTEL ABIDJAN - Google Maps

Separation Wall in concrete

Properties to be demolished in replacement of the Novotel & Adaggio Hotel

Pricing

04

Image: Munich Re

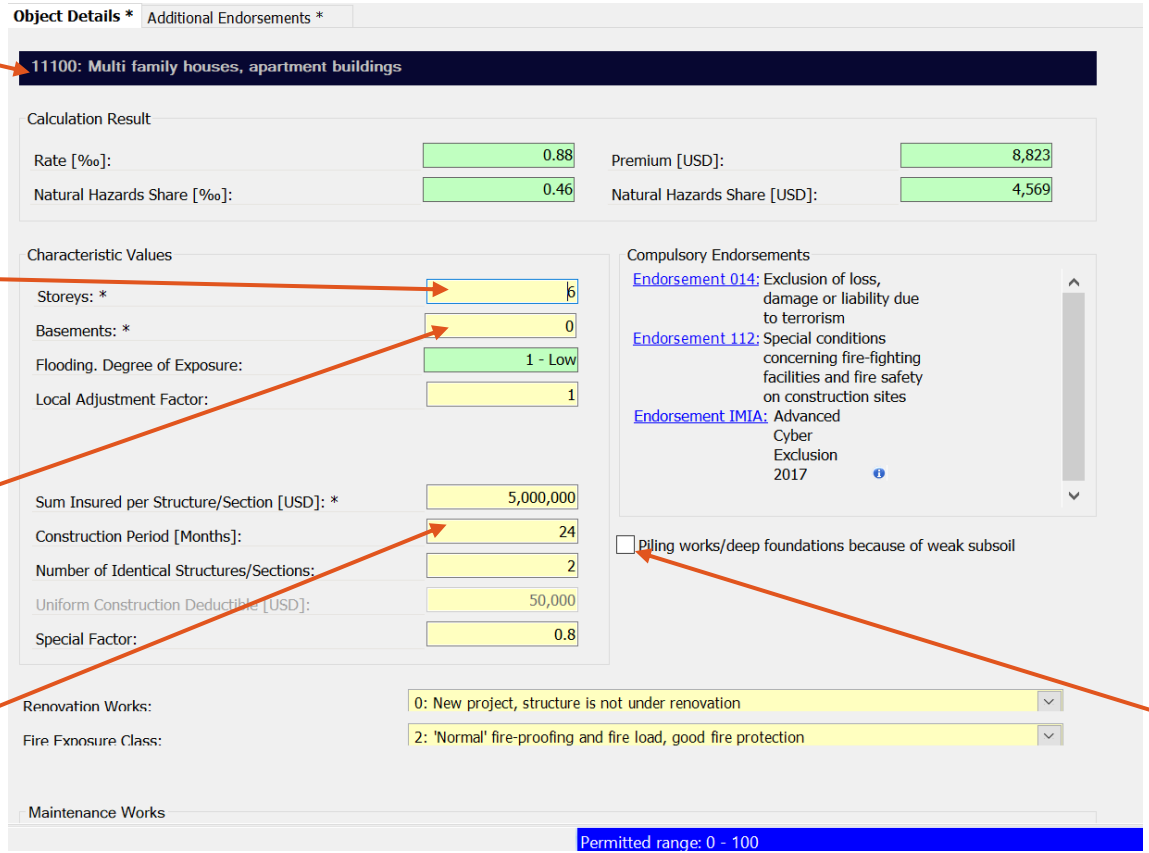
Pricing:

Occupancy code

Number of stories

Number of basement

Construction period



Piling works

Source: Munich Re Engineering tool.

PML: Probable Maximum Loss

04

Image: Munich Re

Definition

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MR PML Definition*:

By **PML** - Probable Maximum Loss we understand the probable (not possible) maximum loss, i.e. the maximum loss that might be expected, at a cautious estimate, to occur as a result of a single loss event, taking into consideration all the circumstances of the risk.

PML : High rise building during construction….cont’d

The PML amount of high-rise buildings usually consists of the reconstruction costs of the building and additional expenses, e.g. for ALoP, debris removal or firefighting facilities.

Some general points should be considered by the underwriter when assessing the PML:

- No credit is given for active fire protection or firefighting measures, e.g. sprinkler protection
- No credit is given for fire department response
- Only passive fire protection measures can be regarded to mitigate the PML exposure, e.g. physical separation with adequate fire walls

Framework for PML

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The scenario-based PML approach

Identify relevant PML loss scenarios

A. Human-made scenarios
Always mandatory

B. NATCAT
Only considered, if:
- Not located in ***selected CAT zones***, and
- Multiple high-rise buildings

(see further guidance in section 2B)

Calculate damage for each scenario

- Using the PML scenario description and guidance
- Consider scope of cover & limits

Choose highest % damage as the PML

- Document all workings and the final PML estimate

General factors to consider

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Structure and Materials	Layout / Form	External / environment condition	Design and human factors	Insurance Cover
• Type of structure - occupancy • Materials used for building • Other contents or storage in the building • Façade materials	• Number of buildings • Shape of the building & connections • Distance between buildings • Shared podium or basement • Internal space division and passive protection	• Natural environment • NATCAT exposure • Surroundings properties / structures	• Design standard / codes. • Quality of construction & on-site management • Experience and capability of the contractor and other stakeholders • Fire risk	• DSU • Sub-limits • Design • Endorsements – Debris removal • Deductibles

PML scenario : Fire

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Description of scenario:

- Fire occurs at the end of the construction period – during testing and commissioning
- Cause of fire: human factor (smoking, welding, in the on-site storage areas)
- Location: common podium area / basement
- Fire spread uncontrollable throughout the fire area – through facades, lift shafts, services shafts.
- Incomplete automatic fire control systems.
- Only spatial / passive fire separation are effective
- Fire brigade not effective and fire burns completely
- Residual structural capacity lacking, demolish or major repair works

Fire: PML Example loss calculation

- **High rise building**: up to 100 stories
- **Total insured value:** up to $1bn

  Not affected by fire: earthworks, foundations, external works (approx. 20% of TIS)
- **Fire PML scenario:** Fire in basement spreading to rest of building.

  UW assesses this as one fire area affected
- **PD Damage:** To whole building except those parts unaffected by fire, 80% of TIS
- **+ Extensions** All relevant ones affected by fire @100%
- **+ DSU** 100%
- **PML:** Summary of above

Important Endorsements

05

Image: Munich Re

Essential technical endorsements

MR 110 : Safety measures with respect to precipitation, flood and inundation

MR 112 : Fire-fighting and safety on construction sites

MR 121: Pilling foundation and retaining wall works

Thank you for your attention!

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NOT IF, BUT HOW

Image: Munich Re