

LIMA Programme 2023

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NOT IF, BUT HOW



01

Introduction

02

Technical Aspects

03

**Exposures and
Underwriting**



Image: Munich Re

01

Introduction



Structure:

Massive structure of rock, earth, concrete or a combination always with an impervious core or face.



Source: [Hoover Dam](#)

Introduction

Usage

- Water storage
 - Water Supply
 - Irrigation
- Flood protection
- Power generation
- Mine Tailings
- Navigation
- Recreation

Aspects when building a dam

- Usage
- Location
- Design
- Quantity of water (river discharge / retention)
- Accessibility => Amount of new infrastructures required
- Geological conditions
- Seismic conditions
- Climatic & seasonal conditions
- Environmental aspects
- Surrounding property and interests
- ESG criteria



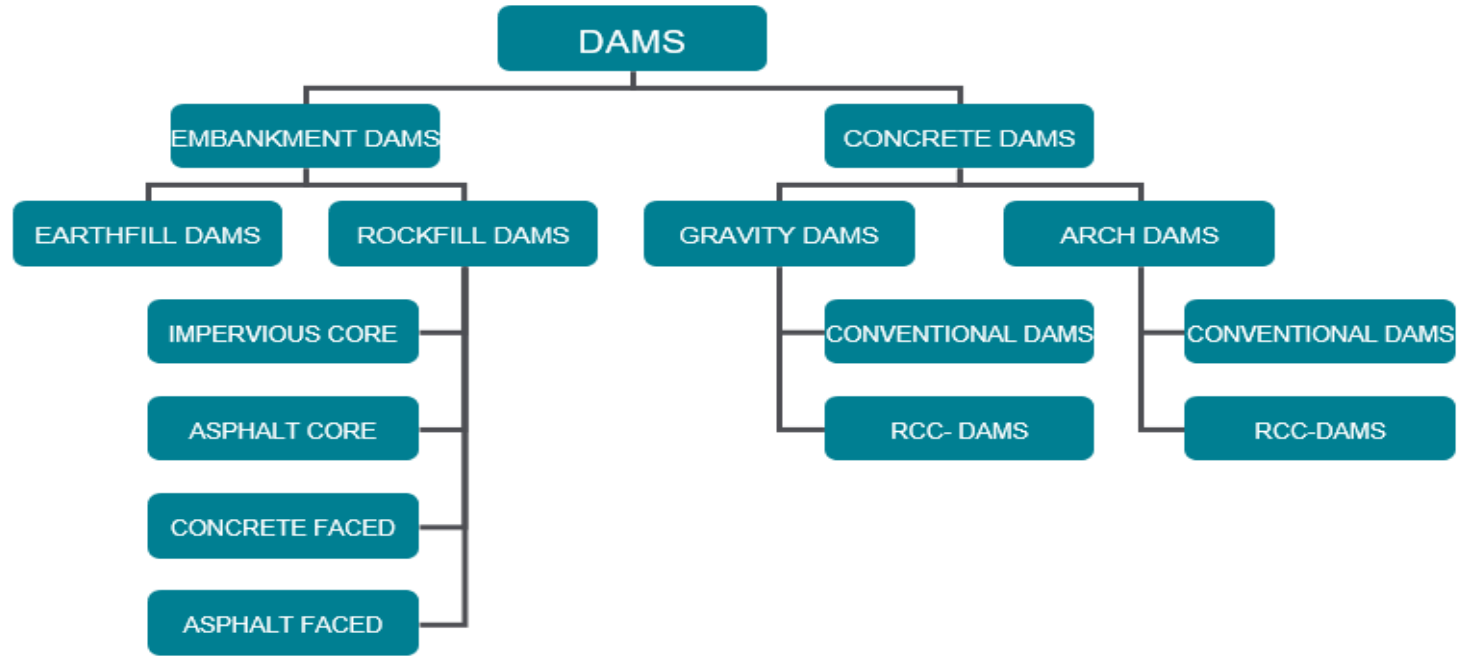
Image: Munich Re

02

Technical Aspects

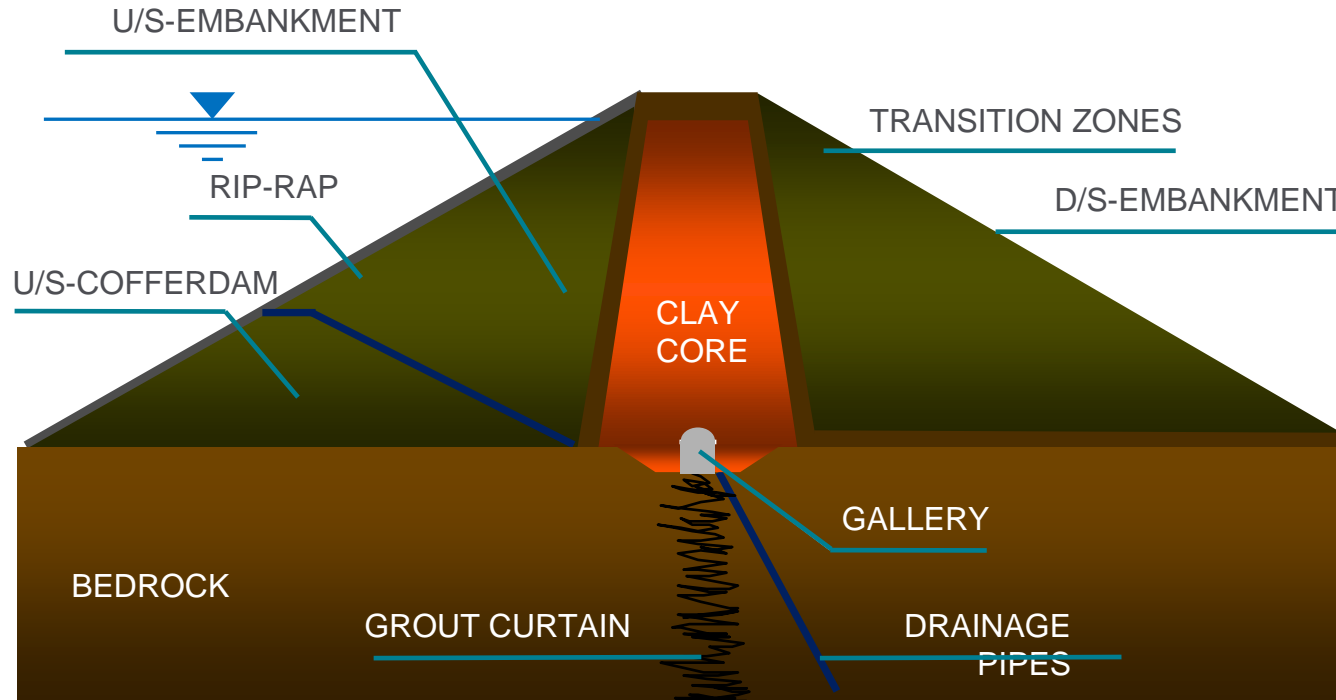
Technical Aspects

Dam Types



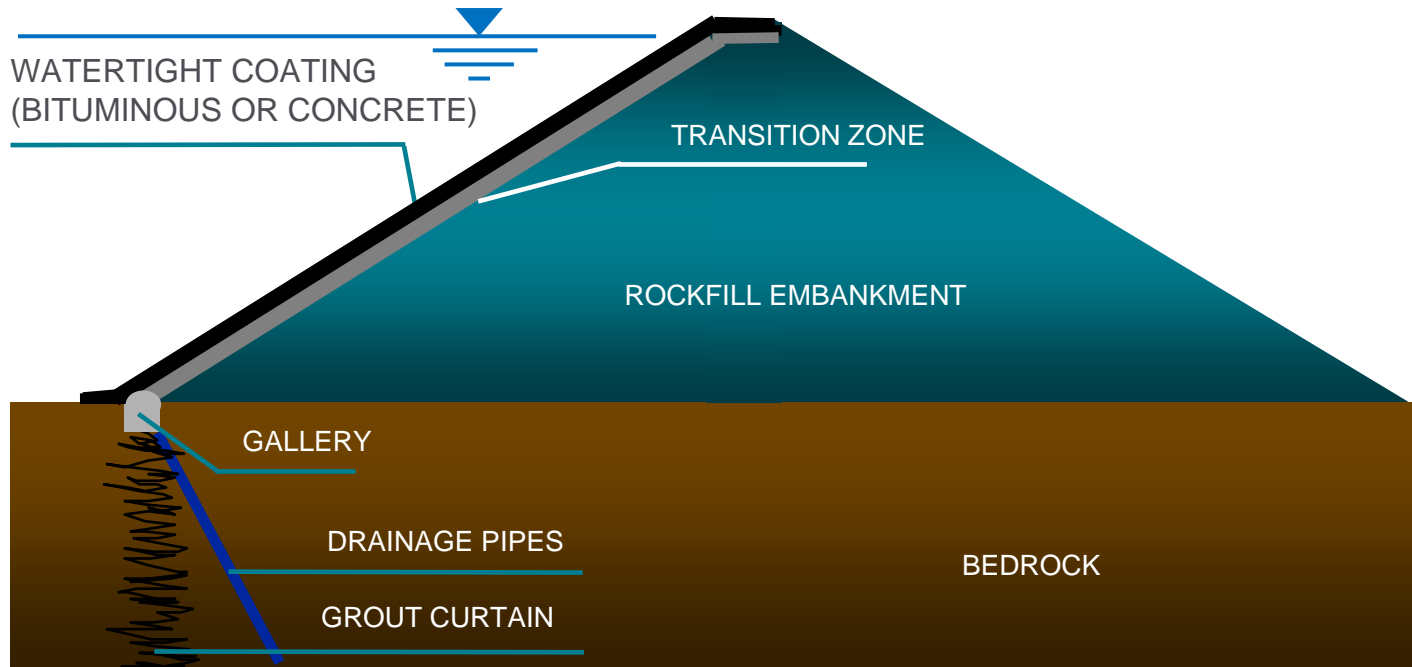
Technical Aspects

Impervious Core Rockfill Dam



Technical Aspects

Concrete Faced Rockfill Dam



Technical Aspects

Concrete Faced Rockfill Dam



Source: [Bakun Dam](#)

Technical Aspects

Roller Compacted Concrete Dam



Source: [Dam Construction](#)

Technical Aspects

Concrete Arch Dam



Source: [Hoover Dam](#)

Technical Aspects

River Diversion: Cofferdams, Tunnels

Technical Aspects

River Diversion: Cofferdams, Tunnels



Image: Munich Re

03

Exposures and Underwriting

Exposures and Underwriting

Site Preparation, Access Roads, Infrastructure

Exposures

- Landslides, slope collapses
- Damage to access roads by rain / flooding
- Damage to temporary bridges
- Flooding of camps, stores, warehouses, site offices, plant
- Fire to camps, stores, warehouses, site offices, plant
- Road accidents, fire to earthmoving equipment

Exposures and Underwriting

Access Roads

Exposures and Underwriting Landslides



Source: [Guatemala landslide](#)



Source: [Landslide in Compostela Valley, Philippines](#)

Exposures and Underwriting

Natural Hazards



Source: indiamart.com/proddetail/v-hydro-power-project

Exposures and Underwriting

Site Preparation, Access Roads, Infrastructure

Underwriting

- 103 Crops, Forests
- 106 Section Limit => Roads!
- 107 Camps and Stores - sublimits
- 108 Construction Plant - Equipment list
- 109 Construction Material
- 110 Safety Measures
- 111 Removal of Debris
- 112 Fire Fighting Facilities
- 121 Piling Clause
- Exclude any type of roads after construction is completed
- Exclude or limit landslide

Exposures and Underwriting

Plant and Equipment

Exposures and Underwriting

River Diversion: Cofferdams, Tunnels

Exposures

- Breach or overtopping of Cofferdams
- Tunnel collapses

Exposures and Underwriting

Failure of temporary structures

Exposures and Underwriting

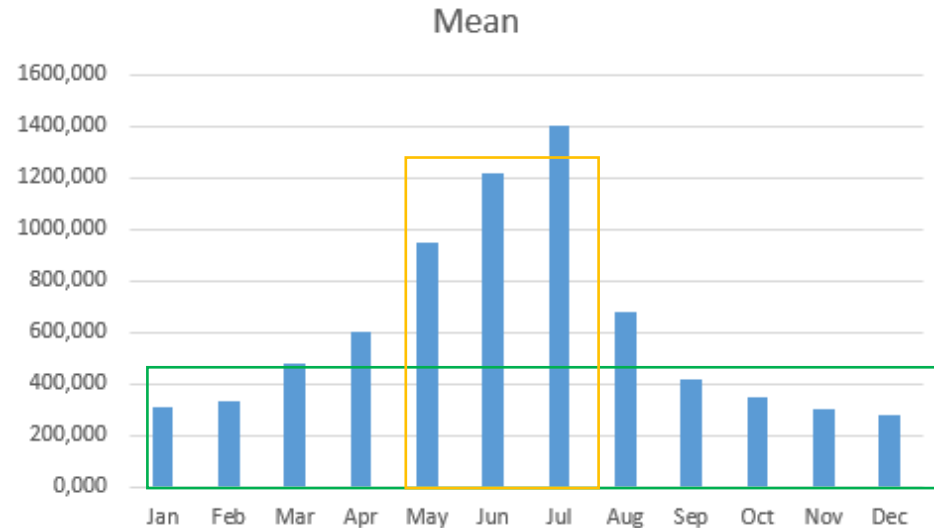
Failure of temporary structures

Exposures and Underwriting

Mean River Discharge

Important Information

- Design capacity for main dam
- Design and layout of temporary structures
 - Minimum return period for cofferdam e.g. 20y



Exposures and Underwriting

Failure of temporary structures



Source: sandblings.blogspot.com

Exposures and Underwriting

Failure of temporary structures



Source: Hidroituango dam in Colombia



Exposures and Underwriting

River Diversion: Cofferdams, Tunnels

Underwriting

005 Deviation of Time Schedule
max 4 – 6 weeks

Exclude or limit overtopping of cofferdams

101 Tunnels, max: 130%

Tunnel code of practice (TCoP)

104 Dams and Water Reservoirs

110 Safety Measures

111 Removal of Debris,

e.g. Limit: 10% / US\$ 5 million

121 Piling Clause

Exposures and Underwriting

Main Dam, Spillway, Bottom Outlet

Exposures

- Overtopping
- Breach of dam after impounding of reservoir due to internal erosion
(embankment dams only)
- Cracking, leakages (concrete dams)
- Uplift of structure due to seepage
- Defects of curtain wall
- Structural collapses in spillway structure (temporary and permanent works)
- Problems during erection of spillway/bottom outlet gates, valves and weirs

Exposures and Underwriting

Main Dam, Spillway, Bottom Outlet

Overtopping of dam



Source: [Oroville Dam](#)

Height of earthfill dam 230 m

Emergency overflow not lined nor in concrete

Max discharge 5.400m³/s

Evacuation of 180.000 people

Exposures and Underwriting

Main Dam, Spillway, Bottom Outlet

Failure of Rockfill Dam in Zimbabwe



Source: [Failure of Tokwe-Mukosi Dam](#)

Exposures and Underwriting

Main Dam, Spillway, Bottom Outlet

Underwriting

104 Dams and Water Reservoirs

109 Construction Material

110 Safety Measures

111 Removal of Debris, e.g. Limit: 10% /US\$ 5 million

Endorsement 104

Special conditions concerning the construction of dams and water reservoirs

It is agreed and understood that otherwise subject to the terms, exclusions, provisions and conditions contained in the Policy or endorsed thereon, the Insurers shall not indemnify the Insured in respect of

- grouting of soft rock areas and/or other additional safety measures even if their necessity arises only during construction,
- expenses incurred for dewatering even if the quantities of water originally expected are exceeded substantially,
- loss or damage due to breakdown of the dewatering system if such breakdown could have been avoided by sufficient stand-by facilities,
- expenses incurred for additional sealing or waterproofing and additional facilities for the discharge of run-off and/or underground water,
- loss or damage due to subsidence if caused by insufficient compacting,
- cracks and leakage.

Exposures and Underwriting

Insurance Underwriting Criteria

- Experience of designers and owner's engineer
- Experience and reputation of contractors
- Quality of geotechnical report
- In-depth analysis of schedule and critical path
- Cost breakdown realistic ?
- Thorough Nat-Cat analysis
- ESG compliance check



Source: [floodwaters spilled over the new Cotter Dam wall](#)

Thank you for your attention!

NOT IF, BUT HOW

