

LARGE SCALE USAR OPERATION MORANDI BRIDGE AND OTHER CASE STUDIES

THE ROLE OF THE STRUCTURAL ENGINEER AND ITS SUPPORT TO THE MANAGEMENT OF THE INCIDENT

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Agenda

- SE in the INSARAG Guidelines
- Scenario^s in Genova
- New challenges from Genova experience
- Perspectives

✓ **Position Prerequisites:**

- Academic degree in civil engineering and/or training in rescue engineering

Structural Engineer

Minimum Training Standards for Medium and Heavy USAR Teams

✓ **Roles and Responsibilities:**

- Understanding of all disciplines and capabilities within the USAR team
- Understanding of INSARAG Methodology
- Understanding of USAR operations, **tactics** and **safety considerations**
- **Gather information** on affected area structural profiles
 - Practical application of available technologies
 - Functional knowledge of hazards associated with disaster environments
 - **Personnel management techniques:**
 - Communicate
 - Cooperate
 - Coordinate



*Source: INSARAG Guidelines MANUAL
A – Capacity Building*

Structural Engineer

- Operational responsibilities:
 - Conduct structural assessment
 - Identify structural types
 - Identify specific structural hazards
 - Building marking
- Practical solutions for tactical problems pertaining to structural instability:
 - Is structure safe?
 - If no, can structure be made safe and if so how?
 - Design and supervise implementation of structural shoring
 - Design and supervise implementation of structural de-layering
 - Coordination with USAR team Riggers and Operations Chief and/or local Incident Commander
- Information management:
 - Preparation of a post mission engineering report



*Source: INSARAG Guidelines MANUAL
A – Capacity Building*

Structural Engineer

Minimum Training Standards for Medium and Heavy USAR Teams

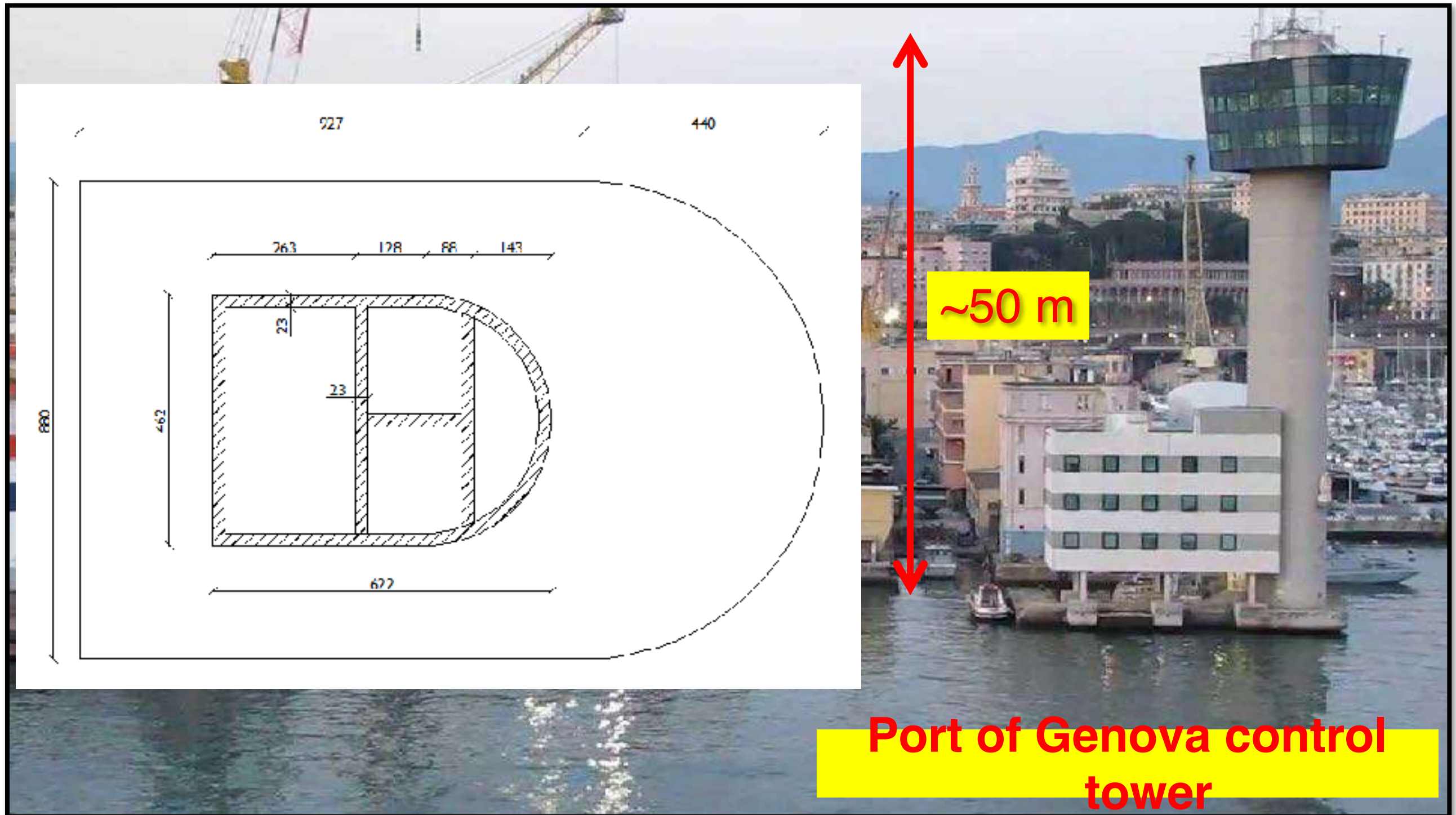
Position	Training	Performance Criteria	Equipment
<i>Structural Engineer</i>	Medium or Heavy <ul style="list-style-type: none"> Identifying structure types, assessing structural damages and hazards Designing, inspecting and supervising construction of structural shores Structural monitoring 	Medium or Heavy <ul style="list-style-type: none"> Recognise the risks associated with this type of construction and potential consequences Identify construction materials and triage collapse patterns (related to void formation) 	Medium or Heavy <ul style="list-style-type: none"> Tools, supplies and equipment required to monitor building stability and design shoring systems

Scenarios in Genova (2013)



Port of Genova control tower

Scenarios in Genova (2013)



The incident



- May 7th 2013
- 11.03 p.m. (local time)
- 9 dead
- 4 injured
- Rescuers (IFRS) on site:
 - 3 teams (15 units)
 - 2 k9
 - 2 Marine rescue teams
 - 4 scuba divers
 - 1 Airlift (2 units)
 - 5 fire officers

SE Support

- Gathering information
- Safety considerations (es. update collapse patterns during demolitions/delaying)
- Investigation (materials, obvious construction or design errors)
- Post-accident report (including how much does a ship “weigh”?)

$$F_{d,x} = 121.000 \text{ kN}$$

$$F_{d,y} = 60.500 \text{ kN}$$



Scenarios in Genova (2018)



Scenarios in Genova (2018)



Polcevera (Morandi) bridge

SE Support – New challenges

Large rubble



Excavators and Cranes by private companies

Safety issues

Risk assessment

- crushing due to overturning of the vehicles
- collision (vehicles/rescuers)
- vibrations
- noise (mechanical hammers)
- projection of fragments
- communications!



SE Support – New challenges



SE Support – New challenges

Unsafe portions of
the structure

Monitoring

GeoRadar



SE Support – New challenges

Investigations

Support to
investigative bodies

- TAS
- Judicial Police
- Fire Officers

- choice of the item to be taken
- catalog
- georeferencing
- assistance during the inspection of the technicians appointed by the judge



The role of the SE - Perspectives

- Position Prerequisites: Academic degree in civil engineering and/or training in rescue engineering;
- Training contents
- Instruments (and SOPs) for monitoring
- Safety Issues
- Flexible assistance
- ...

**Thanks
for your kind attention**

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