Maintenance of grouted ground and rock anchors

Deryck Chan (dykc3@cam.ac.uk)  Industry partner: Sergio Solera (Mott MacDonald)

Grouted anchors support structures and slopes by transmitting a tensile force to a load-resisting formation of soil or rock.

Maintenance is crucial to an anchor’s long-term performance. This desktop study reviews current maintenance practices and recommends improvements.

Literature review

**BS 8081  Code of practice for ground anchorage / grouted anchors**
- Criteria for monitoring requirements depend on the likely costs of damage in case of failure
- Test at 6-month intervals initially, increasing to up to 5 years
- Sampling: minimum 3 anchors; 10% of first 100 anchors; 5% thereafter

**CORROSION**
is the predominant cause of anchor failure

**ANCHOR HEAD**
is the most vulnerable part of a grouted anchor

**CONCERN**
is expressed regarding workmanship and adherence to guidelines

Industry survey

8 stakeholders
17 projects
all nations of the British Isles

Frequency of inspection
- Visual, gauges, and mechanical: 59%
- Proxy measures only: 11%
- Visual inspections only: 6%
- Visual and gauges: 12%
- Visual, gauges, and mechanical testing: 12%
- Every 2 years initially, increasing later on: 20%
- Every 2-3 years: 20%
- No regular inspection: 40%

Detail of inspection

<table>
<thead>
<tr>
<th>Location of asset</th>
<th>Type of asset</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scotland 23%</td>
<td>Highway 41%</td>
</tr>
<tr>
<td>Wales 32%</td>
<td>Masts 23%</td>
</tr>
<tr>
<td>England 18%</td>
<td>Others 12%</td>
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</tbody>
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Stakeholder comments

1. Variation between projects due to emphasis on “mission criticality” in maintenance decisions

2. Fragmentation of maintenance regimes due to reliance on other standards

3. Contract arrangements give responsibility to client, but specialist contractor is better-suited for the job

4. Old anchors are being rediscovered and added to maintenance plans

5. Standardisation is desired by most stakeholders

Recommendations

- Propose a portfolio of standard maintenance plans
- Focus on record-keeping and supervision
- Enshrine maintenance requirements into long-term contracts
- Anchor head protection is more important than load testing
- Use load cells as the primary means of measuring load

Acknowledgements
We would like to thank the following industry partners for their input:
- Arup Local Government
- Badby Stakeholders | Graham Thompson
- BAM Ritchies | Owen Francis, David Gibson
- CIRIA | Lee Kelly
- Gwynedd Council | Geoffrey Doherty
- Highways England | Richard Shires
- Transport Infrastructure Ireland | Miles Friedman
- Transport for London | Derail Delargy, Raymond Glass, John McRobert
- Transport Scotland | Martin McLaughlin

References
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