Cable Technologies For Footbridges

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1. Steel Wire Cable

Open spiral cable

- Galvanised steel wires
- Circular outer shape
- Highly efficient cross section

Full locked coil cables

- Z shape allows flat contact and low contact stress between cables
Locked Coil Cables – Main Advantages

- Excellent clamping capabilities
- Simple connections
- Compactness (85% – 90% of structural area)
Locked Coil Cables – **Durability**

**Single layer corrosion protection for outer wires**
- Zinc or Galfan® coating of the wires
- Possibility to apply an additional coating
- Recoating to be planned every 10-15 years

**Corrosion inhibitor compound**
- Can be added during stranding to fill the voids
- Required according to Eurocode 3-1-11 4.3
- Exudation is possible during installation and service life

**Fatigue**
- 150 MPa amplitude testing
Locked Coil Cables – Fabrication

Cable length

- Cables need to be fabricated at the exact length in factory
- Cables need to be prestressed to reduce the time dependent deformations
- Remaining creep: about 1.5mm / 10m for large Ø

Coils

- Cable need to be coiled on large diameters (usually 30x cable diameter)
- Turntables required for uncoiling without torsion for long cable
- Cable cleaning to be allowed for after installation
Risk of damage on cables

- Care needs to be taken to not damage the corrosion protection
- Bending radius needs to be managed carefully
- Some examples of cable wrapping to cope for galvanisation damage during installation

Tensioning

- Hydraulic jacks and transfer beams
- Collar retightening after tension
Locked Coil Cables – Domain of Use

• Light structures, suspended structures, hangers
2. Parallel Strand System (PSS)

A bundle of parallel strands for redundant corrosion protection

- Parallel independent strands
- Redundant corrosion protection
- Factory made corrosion protection
  - Industrial process
  - Individual redundancy
- Eliminates risk of gangrene
Parallel Strand System (PSS)

**Typical strand**

- T15.7mm, 1860Mpa (breaking load 279kN)
- Quantity of strands per tendon to be adapted to cable force (up to 100 strands per cable)

**Individual corrosion protection**

- galvanization
- wax
- HDPE sheath
Parallel Strand System (PSS)

Bundle located inside a HDPE Duct

- Guide for strand threading
- Cable aerodynamics
- UV durability

**External layer:** Colour and UV protection

**Internal layer:** Mechanical resistance

**Two helical fillets:** Limitation of rain & wind induced instability

- Wide range of colours available for architecture purpose
Freyssinet PSS system for light structure

Derived from Freyssinet PSS H2000 stay
- Small units: 1, 4, 7, 12, 19 T15 strands
- Semi-prefabricated or fully prefabricated cables

2 continuous and redundant corrosion
- Protection barriers (nested barriers concept, conforming with fib and PTI)

200 MPa amplitude fatigue testing
- Special swages, with high fatigue resistance
- Same wedges as highway bridge stay cable systems (many fatigue testing references)
PSS – H1000 Anchorage system

Forks (fixed or adjustable)
Anchor block (fixed or adjustable)
Wedges or swages
PSS – H1000 Installation

Sydney Airport - strand by strand installation

• H1000-19 strands. Anchors
Installation of duct
Threading strands one by one
Tensioning with Monostrand Jacks with Isotension®
Narellan Road

- 12H1000
- Forks both end
- Fixed on the top
- Adjustable on bottom
Prefabrication

- Standard product
Installation
Modularity
• The number of strands is adjusted to the force in the cable

Flexibility
• The number of strands is adjusted to the force in the cable

Durability
• The double nested corrosion protection barrier + outstanding fatigue performance

No long term effect
• No loss in cable force, no cable elongation after initial tensioning

Light components
• assembly on site out of standard components, for a quicker delivery
## 3. Comparison

<table>
<thead>
<tr>
<th></th>
<th>Parallel Strand PSS</th>
<th>Locked Coil Cable</th>
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<tbody>
<tr>
<td>Fatigue</td>
<td>200mpa</td>
<td>150mpa</td>
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<tr>
<td>Double corrosion protection</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Individual double corrosion protection</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Aesthetic</td>
<td>Many colors</td>
<td>Compact</td>
</tr>
<tr>
<td></td>
<td>Larger diameter</td>
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<tr>
<td>Flexibility for installation</td>
<td>Prefabricated on site with standard elements</td>
<td>Fabricated in factory at length</td>
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<tr>
<td>Transport</td>
<td>Typical coil diameter 1.5/2m</td>
<td>Larger coils</td>
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Thank you for your attention