



SOLETANCHE BACHY



FREYSSINET

CABLE ROOFS

Stéphane JOYE

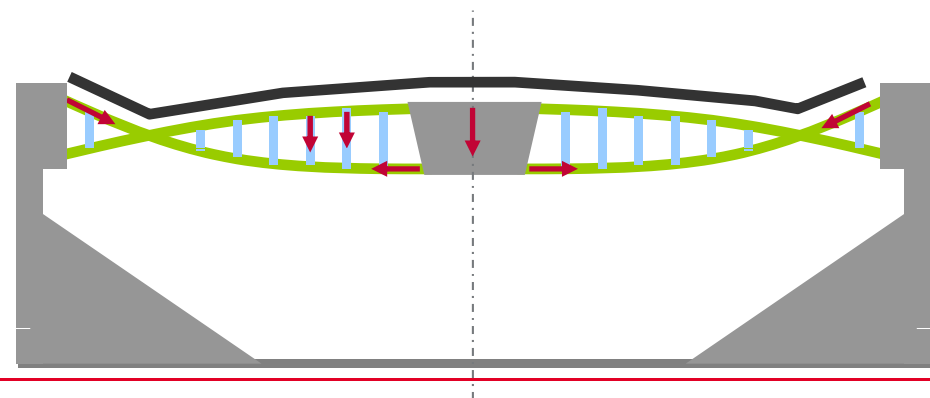
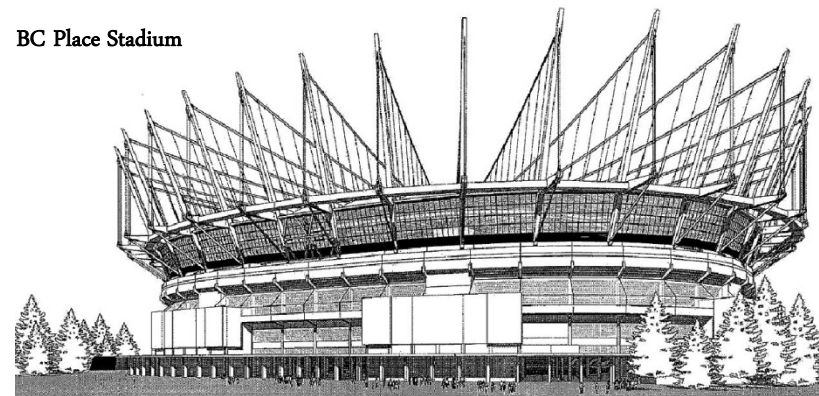
1st SOLETANCHE BACHY & FREYSSINET MEETING - PARIS - 10 JUNE 2010

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- ***Minsk Arena, Biellorussia (2008)***
 - ***New Delhi Stadium, India (2010)***
 - ***BC Place Stadium, Canada (2011)***

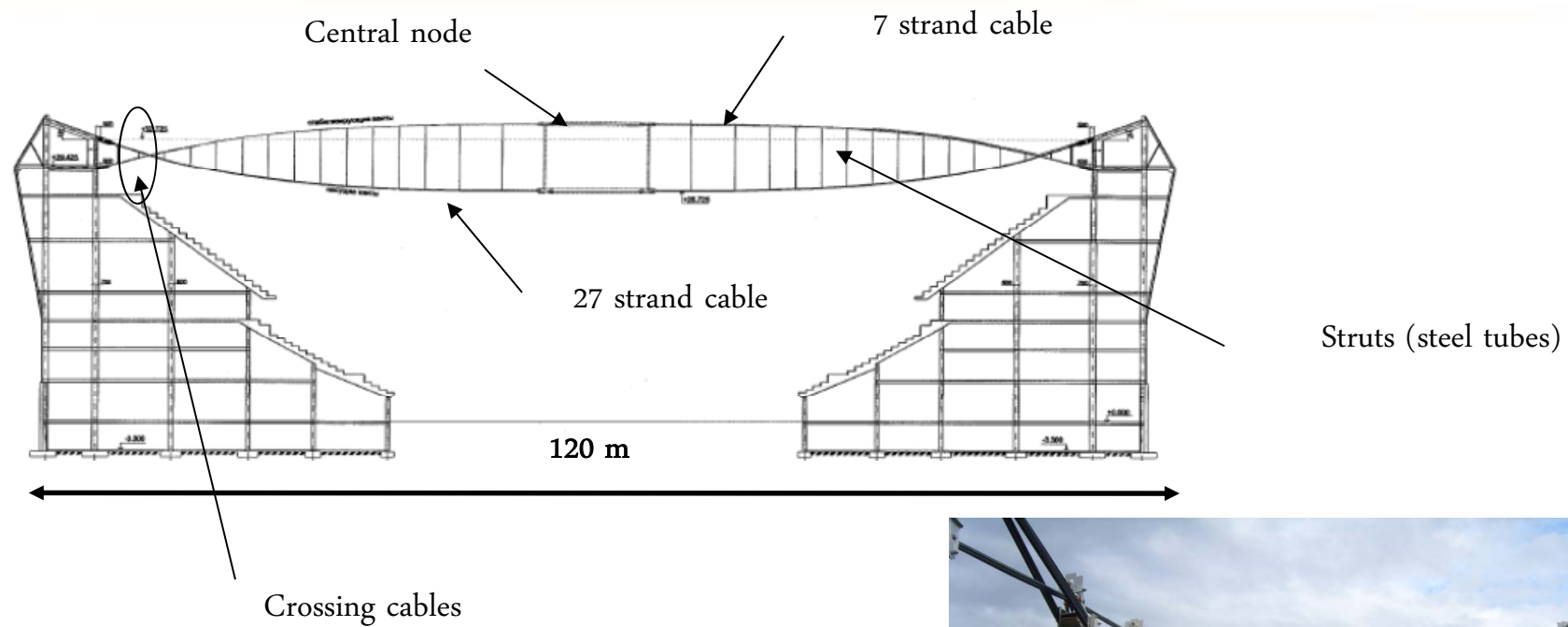
1. Cable roof Structures

Stadium roofs



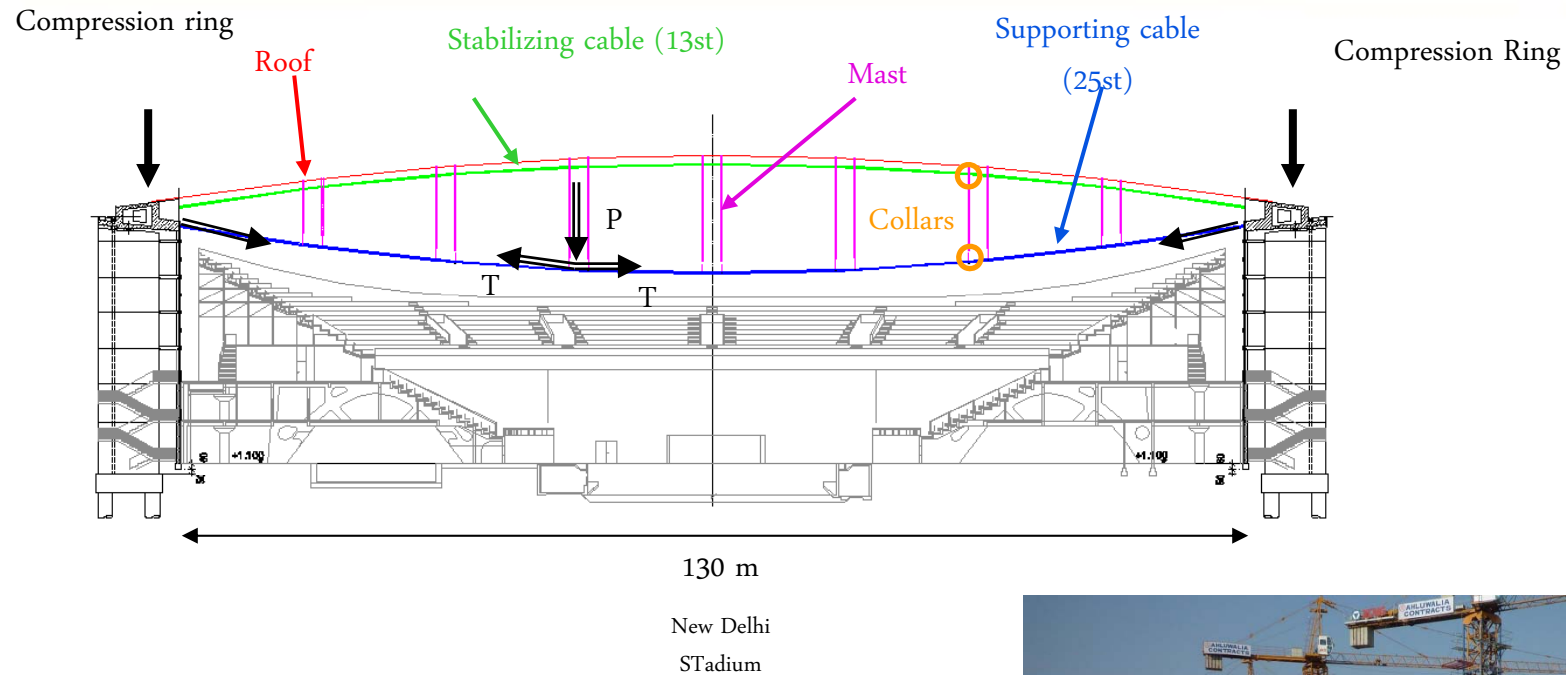
1. Cable roof Structures

Minsk Arena



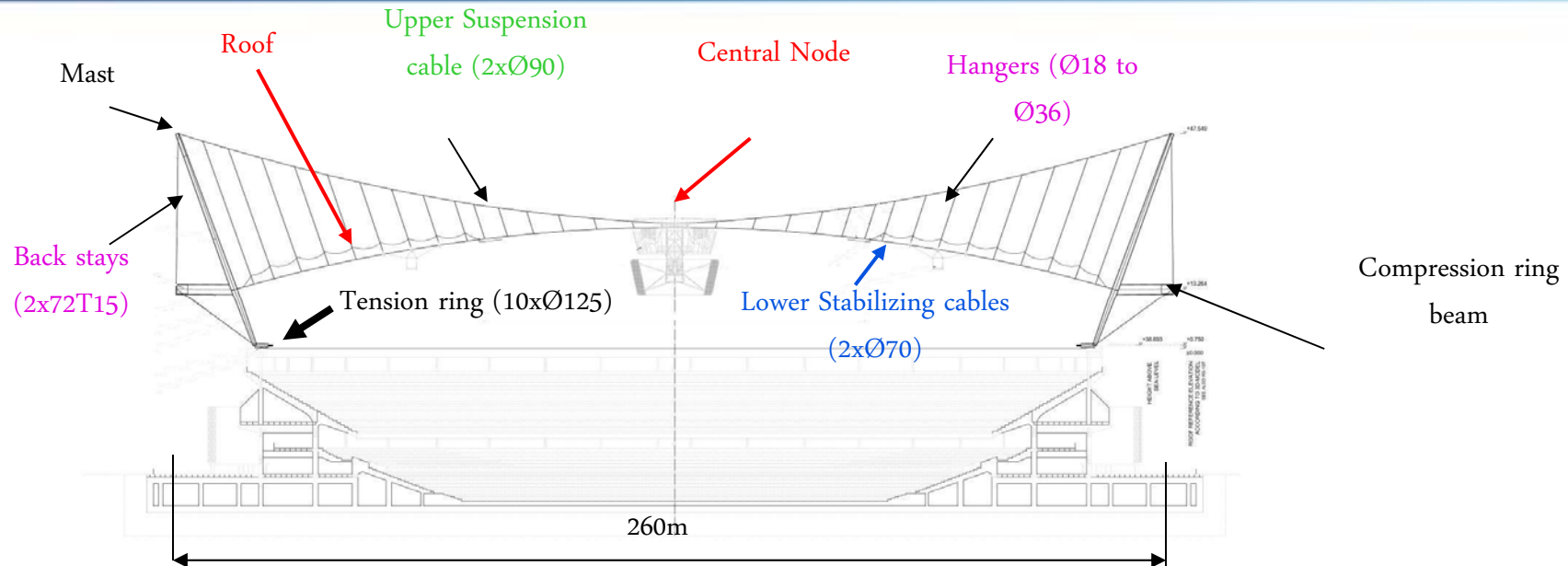
1. Cable roof Structures

New Delhi Stadium

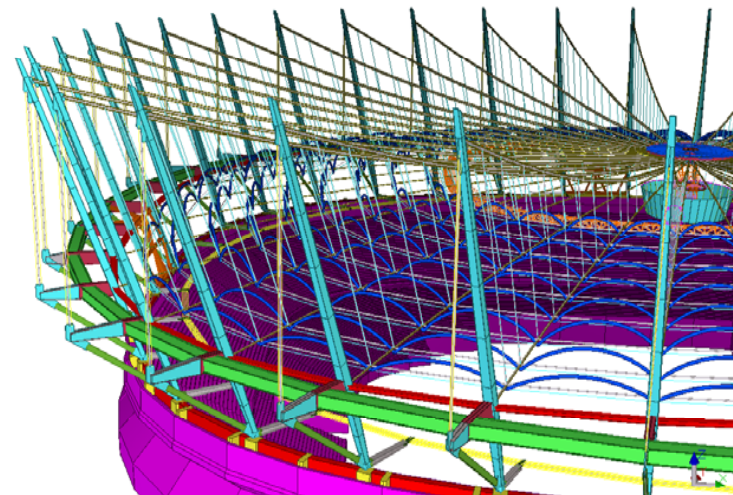


1. Cable roof Structures

BC Place Stadium



BC Place Stadium



- **Elements :**

- Roof
- Supporting suspension cable
- Hangers / compression masts
- Stabilizing cables
- Compression ring
- (tension Rings)

- **Advantages:**

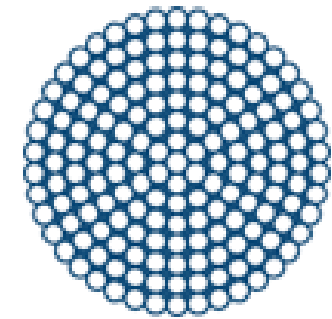
- Very large span without supports
- Light structure
- Aesthetics

2. Cable technologies

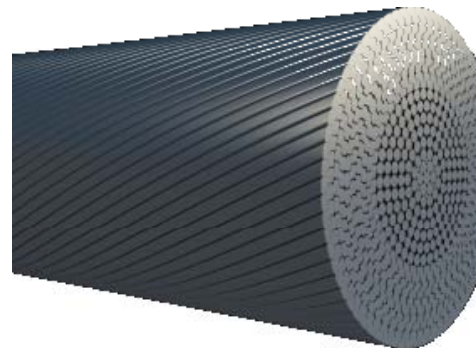
Prefabricated Cables

- **Spiral strand or Locked Cables**

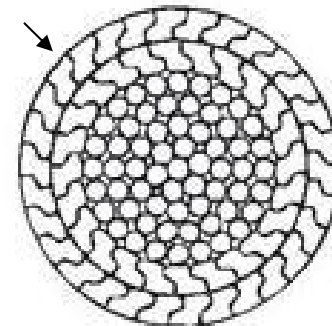
- Compactness
- Clamp “ability”
- Installation drawbacks
 - heavy cable
 - large anchorage (big jacks)
- Poor durability
 - rust in the cable
 - high maintenance cost (paint)
 - low fatigue resistance (100 MPa)



Spiral strand cables



Z shaped wire

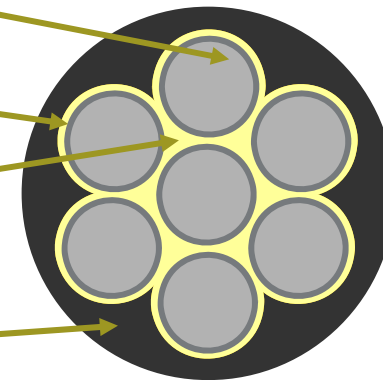


Locked coil cables

2. Cable technologies Multi strand cables : Cohestrand®

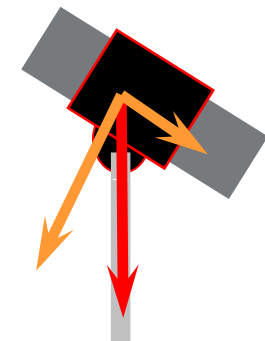
Durability requirement & Similarity with suspended bridges lead Freyssinet to propose a **Cohestrand solution** :

- **7 high grade steel wires**
- **Hot dip galvanisation**
- **Resin filling** around and within strand ensuring full bond of sheath on strand (7MPa)
- **Full-bonded HDPE coating (patented)**



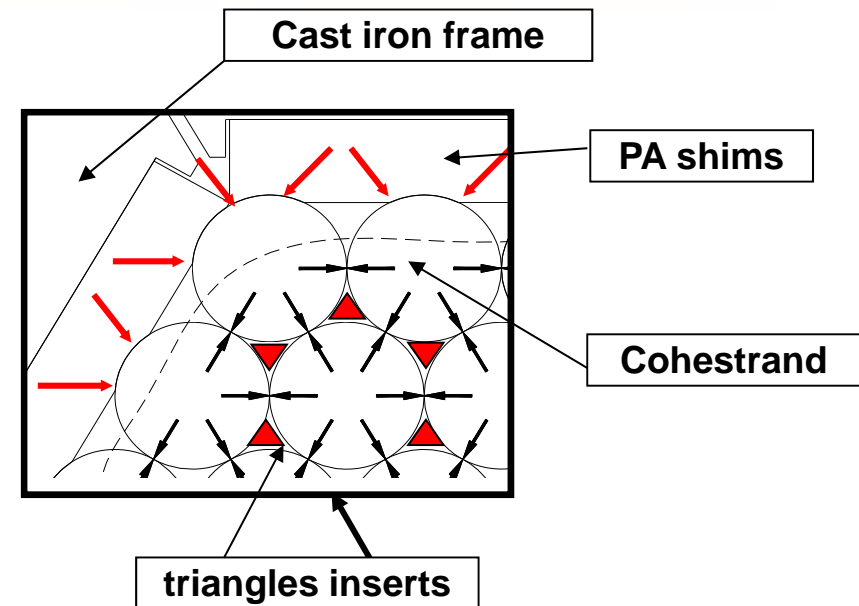
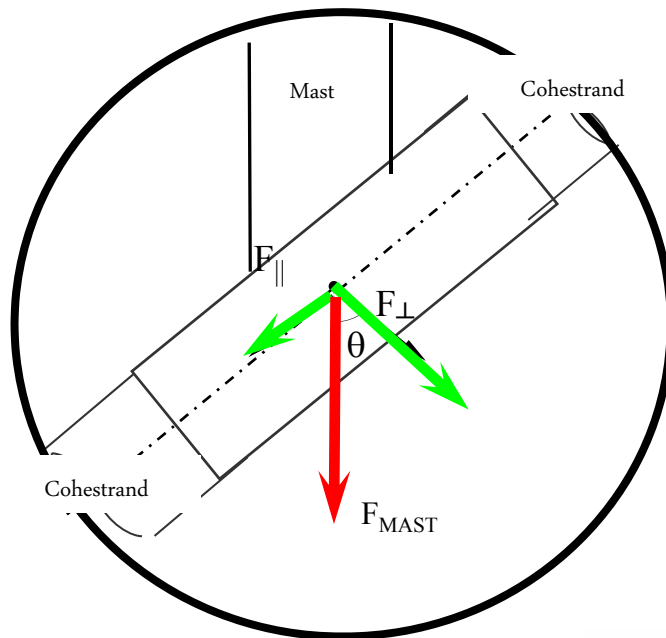
➡ **Advantages:**

- Sliding forces are transmitted from the HPED duct to the strand steel through the resin
- High fatigue performance
- Corrosion protection :
 - Double layer corrosion protection
 - Continuity of the protection all along the cables
- Strand by strand installation

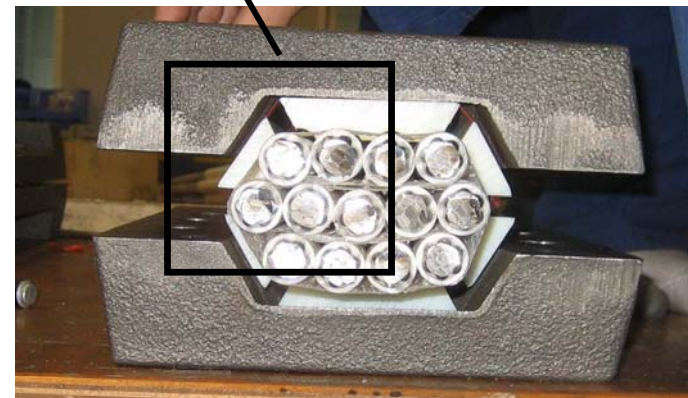
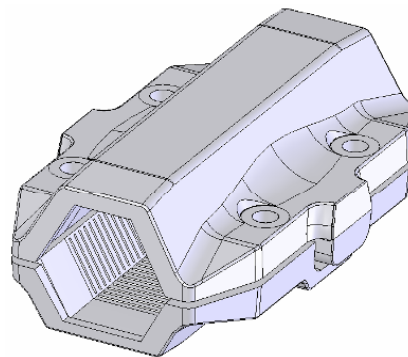


3. Clamps

Collars

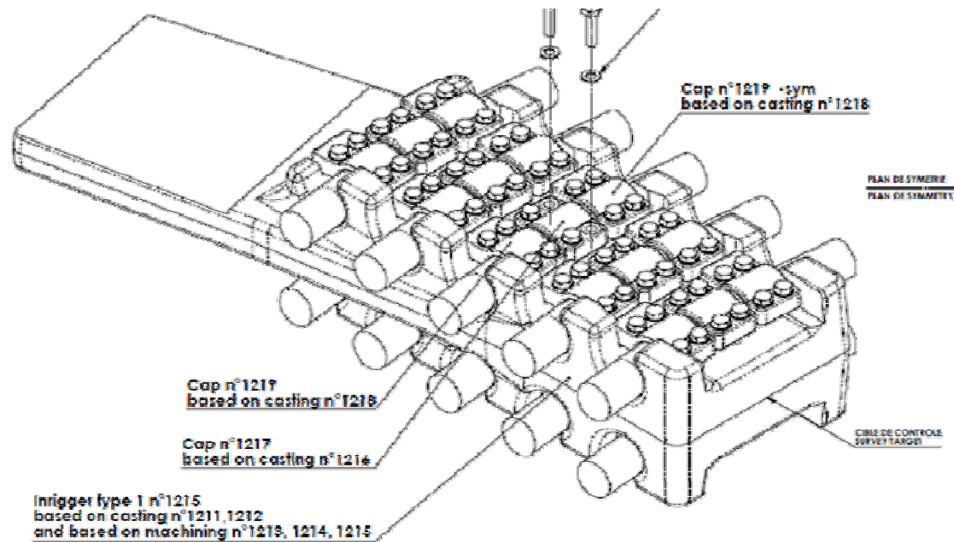


- ⇒ Continuity of the corrosion protection through the collar
- ⇒ Plastic / Plastic tightening



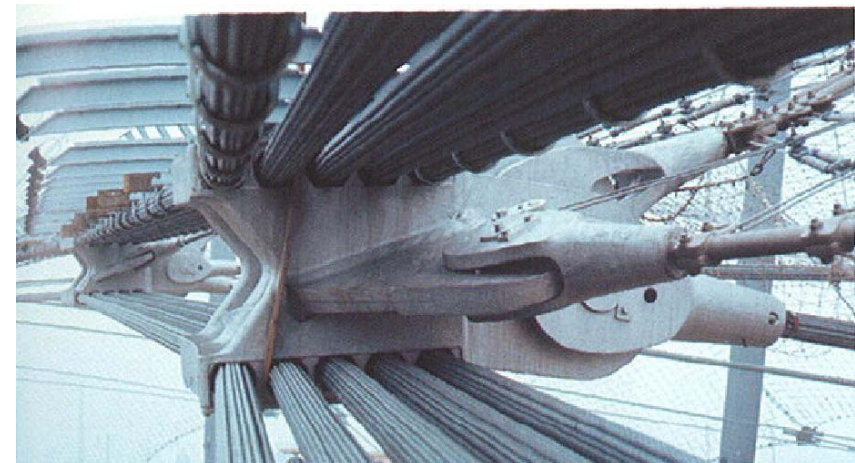
3. Clamps

Deviation « saddle »



- Target :
Accommodates angle variations of the cables while limiting the flexural stresses

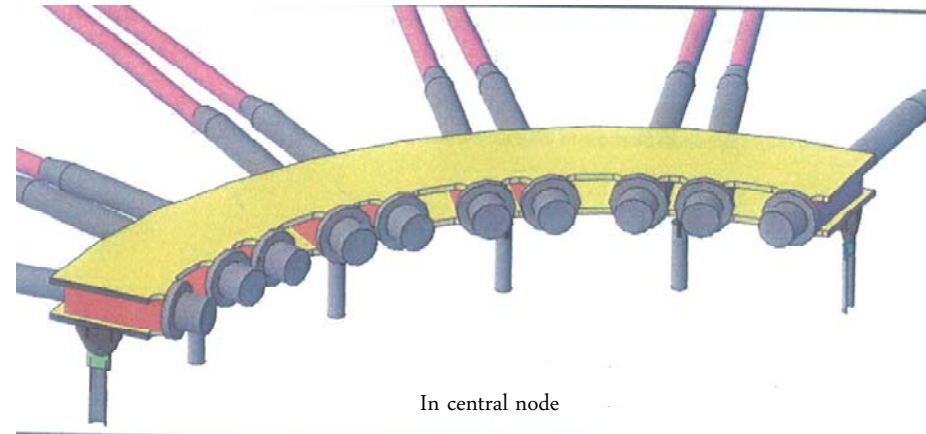
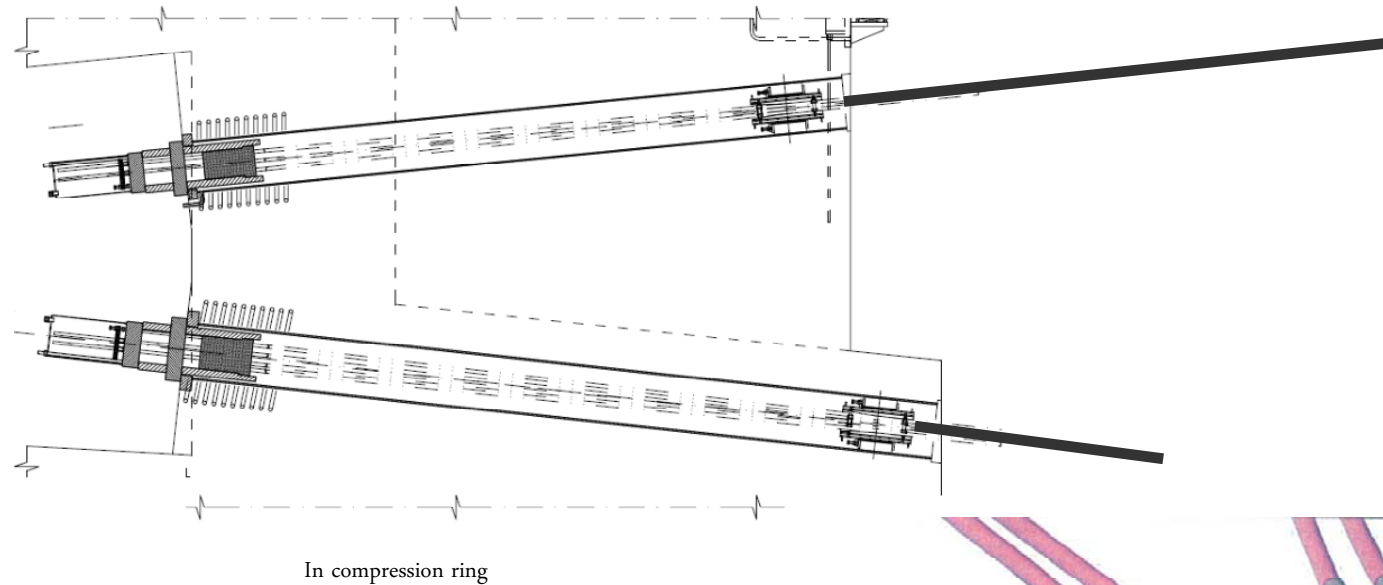
- Principle of “saddle clamps” :
Impose a acceptable radius of curvature of the cables



4. Anchorages

Classic

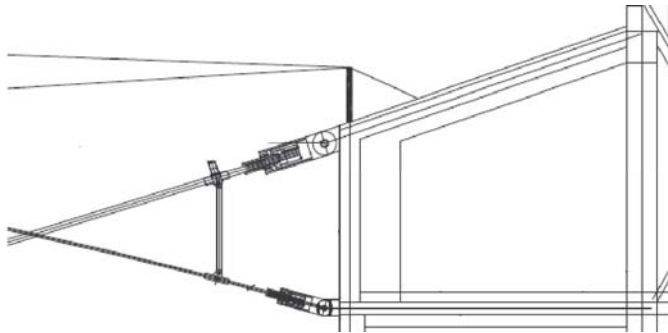
- **Classic anchorages (bloc and bearing plate) :**



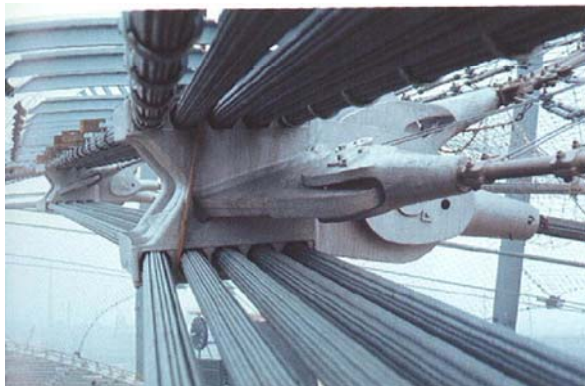
4. Anchorages

Fork

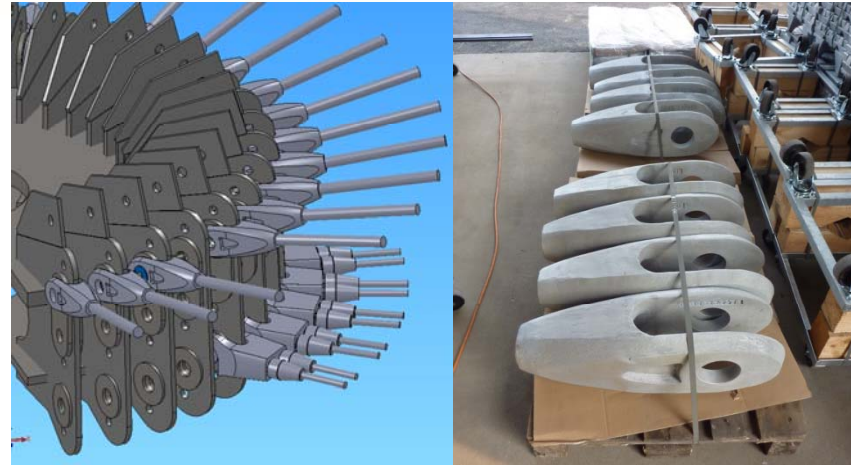
- Fork anchorages :



In compression ring



In tension ring cables



On central node



On masts

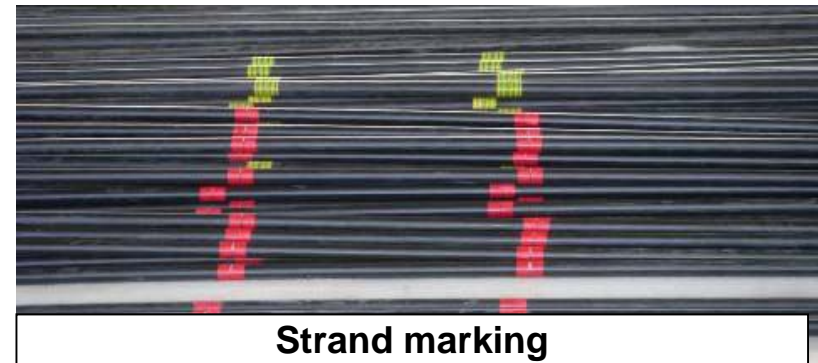
5. Methods

Ph 1 : Prefabrication

- Cable prefabrication bench



Prefabrication bench



Strand marking



Storage



Marking and unsheathing

5. Methods

Ph.2 : Clamp Connections



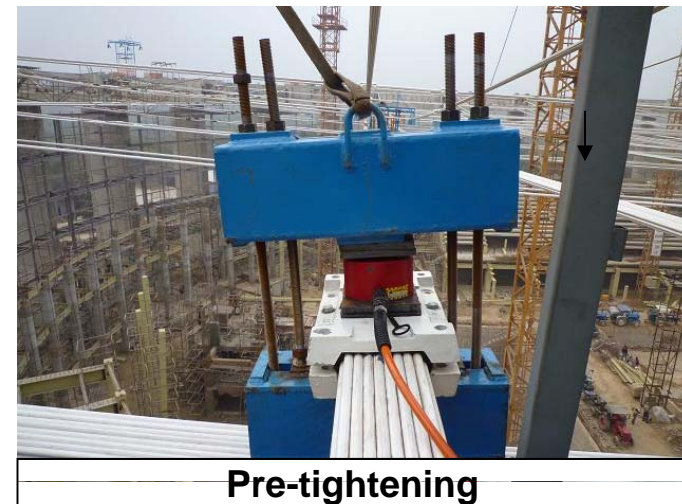
Strand bundle compaction



Clamp connection with pre-curved cable



Clamp installation



Pre-tightening

5. Methods

Ph.3 : Launching



Cable launchin with mast installation



Cable net launching

5. Methods

Ph.3 : Launching



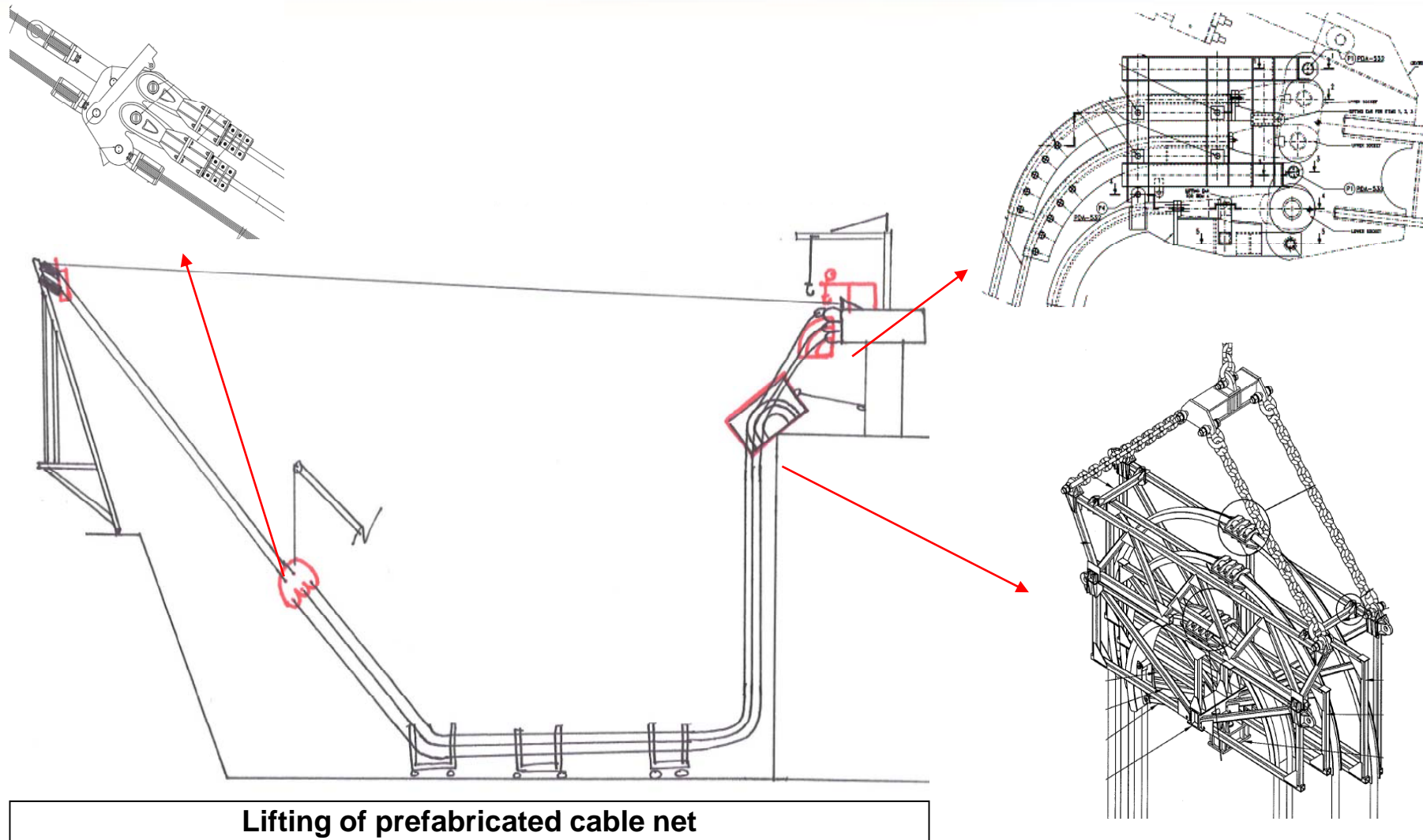
Initial ref. strand launching and adjustment (sag)



Strand launching

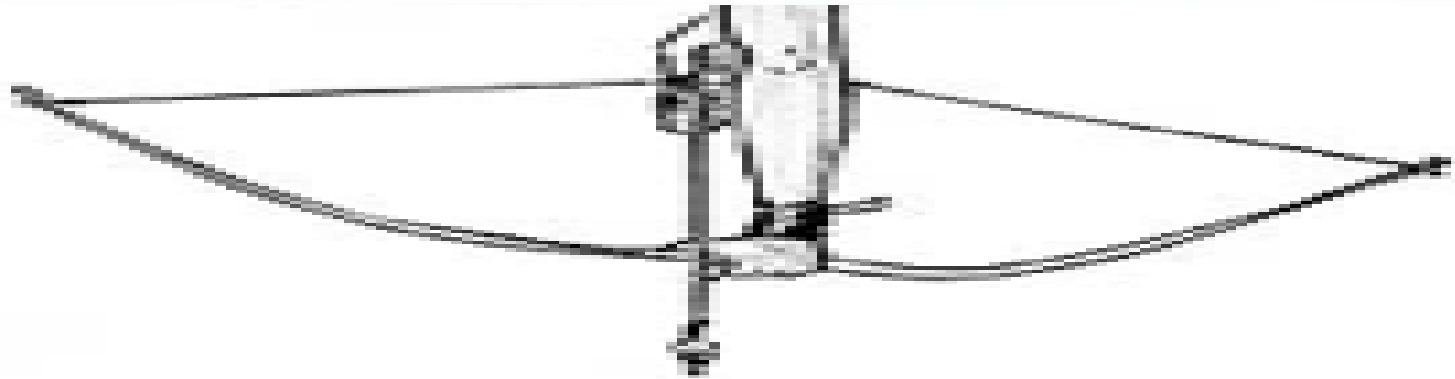
5. Methods

Ph.3 : Lifting



5. Methods

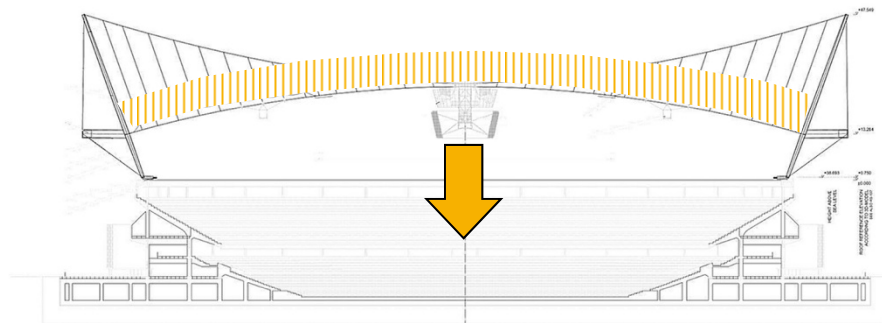
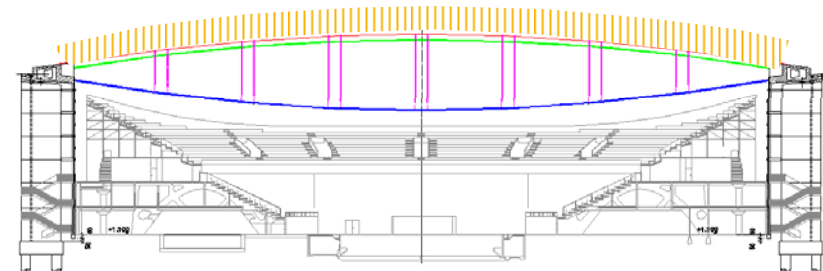
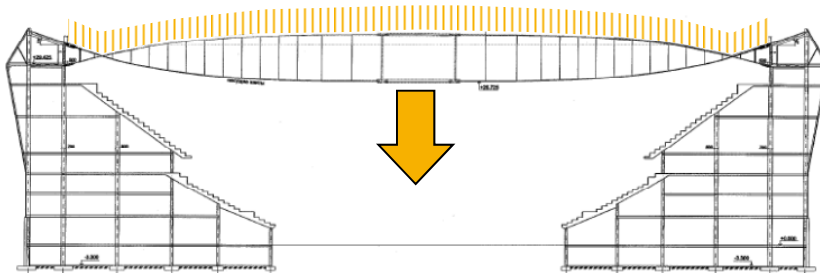
Ph.4 : Separation and mast installation



5. Methods

Ph.5 :Stressing

- Fabrication at length
 - > (Adjustment at sag if possible)
 - > (Pre-load : Central node release)
 - > Application of roof load



Thank You

