

CABLE NET LIFTING & TENSIONING SYSTEM

THE WORLD... OUR PASSION
SINCE 1955

TECHNICAL BROCHURE

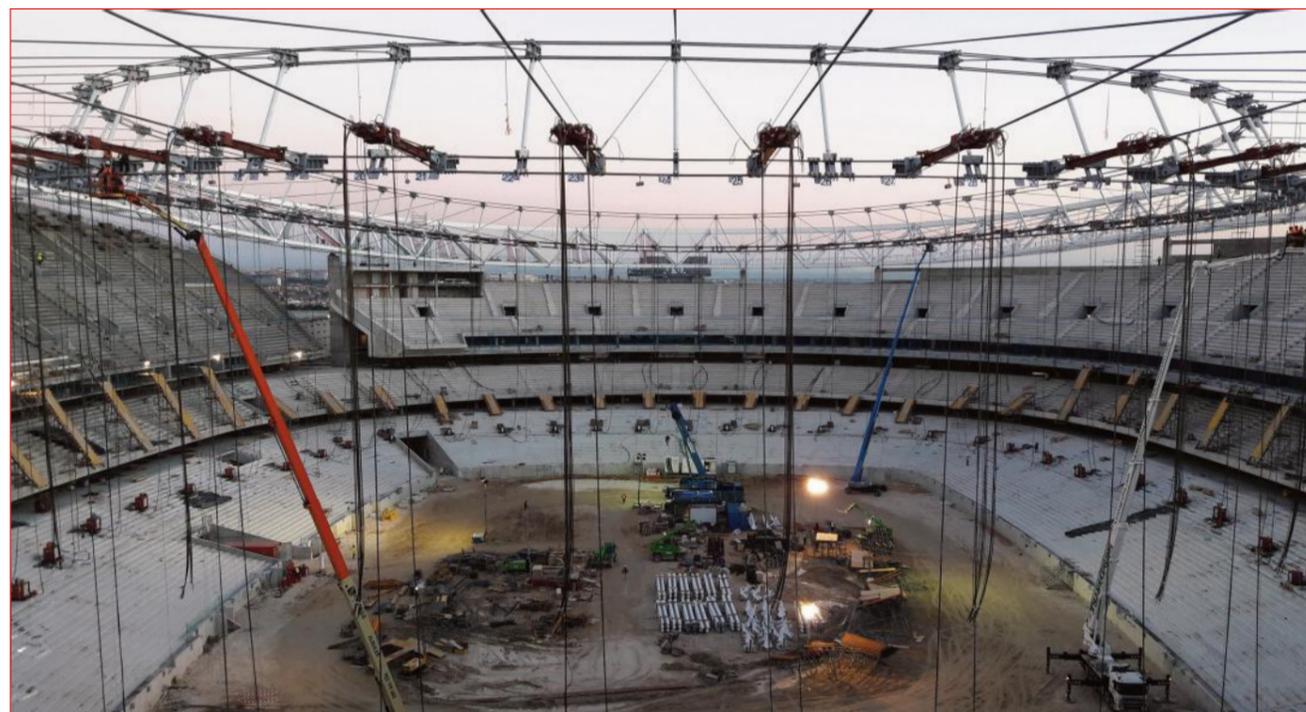
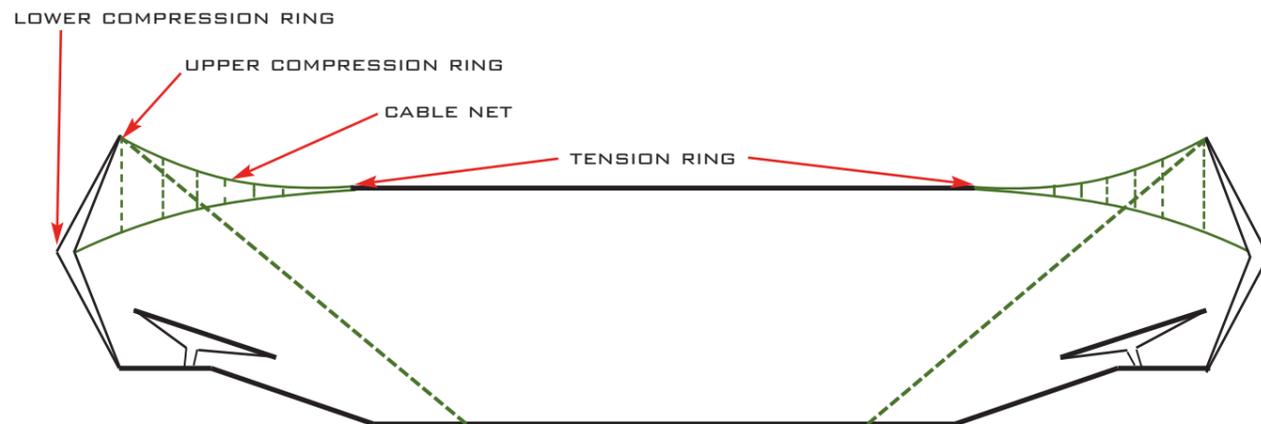
APPLICATIONS

Fagioli's Cable net Lifting & Tensioning System is designed for the elevation of complex tensile structures such as roofs, facades.. This kind of work requires the lifting system to be flexible in possible configurations in order to allow installation on the main structure and easy connection at each and every radial cable for lifting and tensioning operations.

ROOF LIFTING CONCEPT

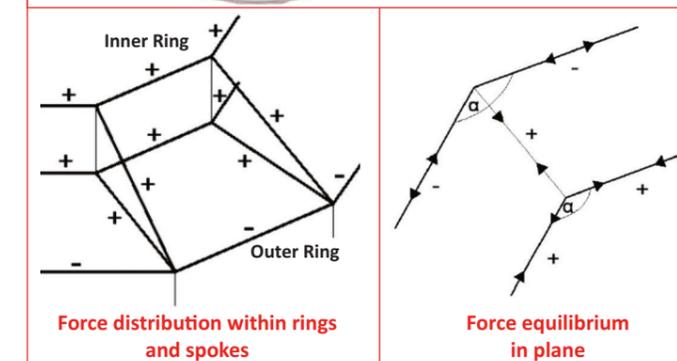
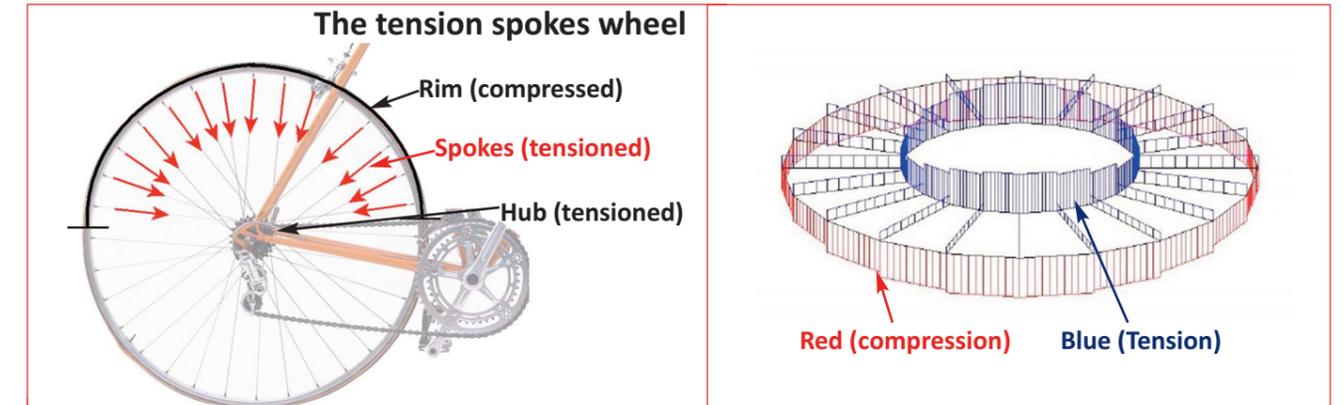
The lifting process is ultimately effected by tensioning the Upper and Lower Radial Cables. The tensioning of cables is achieved by pulling the cables end sockets using strand jacking equipment. Step by step the distance between cable end sockets and tension ring connectors («distance to pinning») is gradually reduced and the whole cable net is forced to lift-off from the ground, to raise up to its final height and to assume the final geometry at the pinning step. At the final pinning step all the roof components (radial cables, tension rings and compression ring) reach the designed prestressing loads, which give the stability to the whole roof.

MAIN ELEMENTS OF THE STRUCTURE AND CABLE NET



ROOF STRUCTURE - ENGINEERING PRINCIPLES

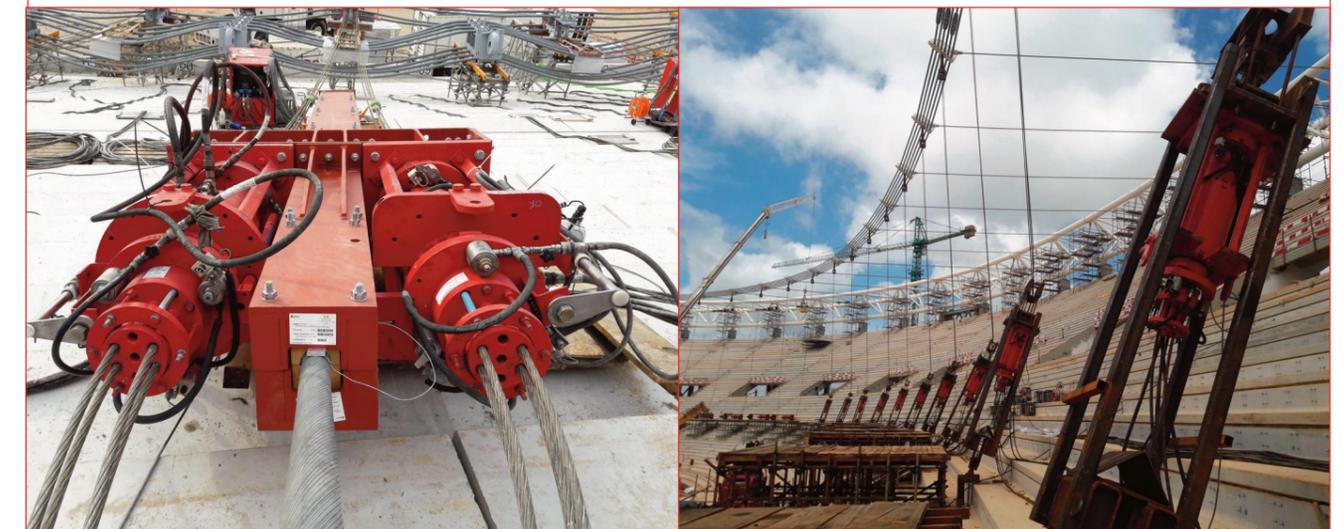
Large loading can be taken by very efficient lightweight structure which is able to withstand external loads with tension & compression forces (mainly).

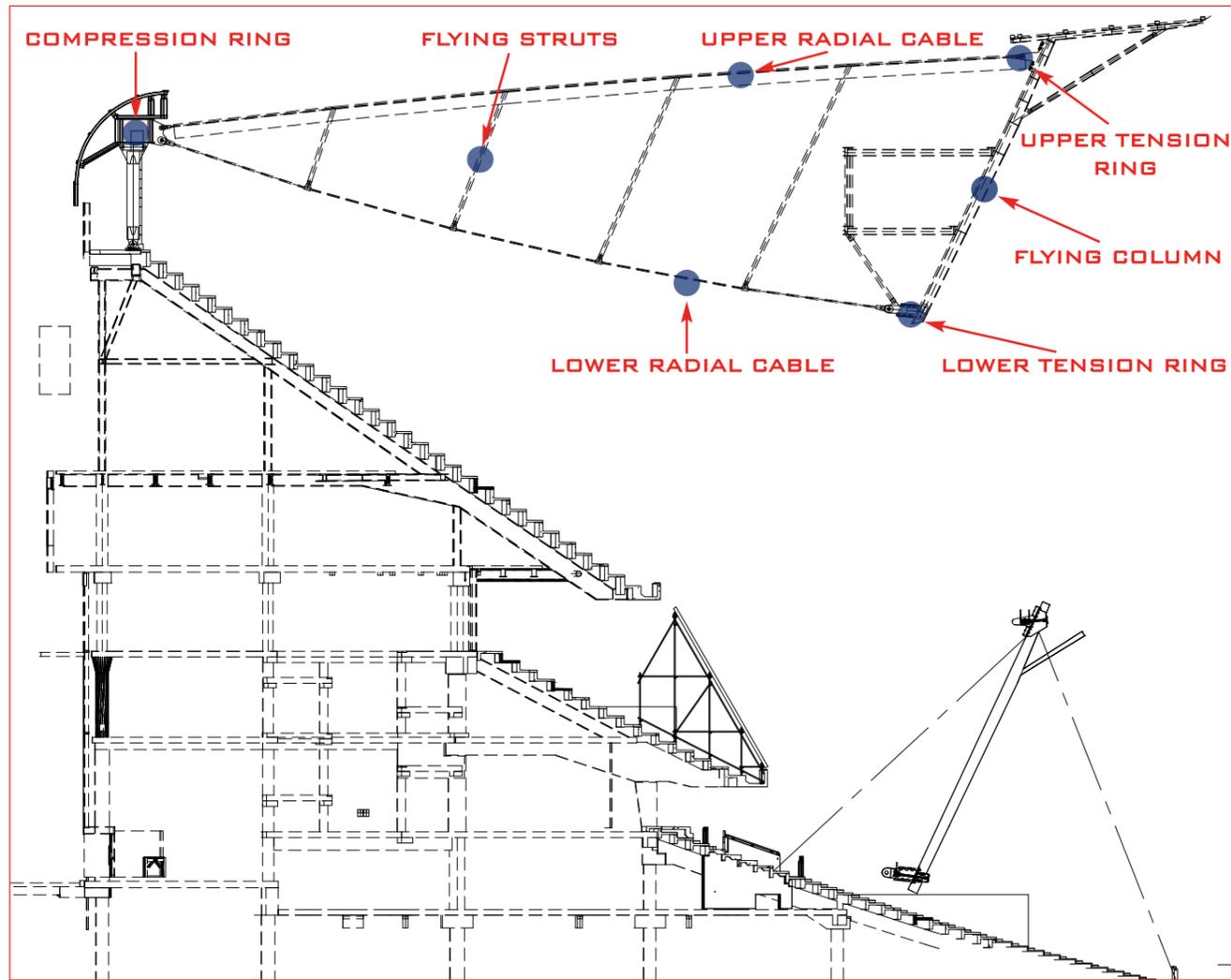


The roof cable net is generally composed by the following main elements:

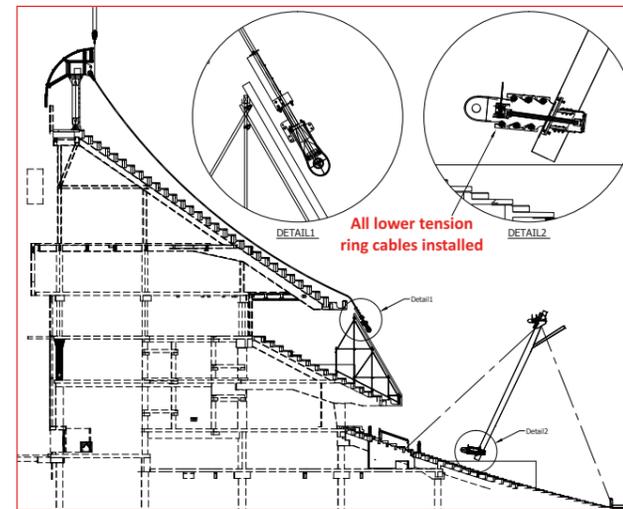
- 1 single external compression ring (CR)
- 2 internal tension rings: upper and lower (UTR; LTR)
- Upper radial cables (URC), connecting the compression ring to the upper tension ring
- Lower radial cables (LRC), connecting the compression ring to the lower tension ring
- Flying columns, connecting the upper and lower tension

rings flying struts (4 per axis), which separate the upper and lower radial cables. The strand jacking system will be connected between the ends of the radial cables and the tension rings by jacking frames and spreader beams. The strand jacks are used to lift and stress the cable net roof. For each flying column the standard procedure includes No. 2 strand jacks at the bottom to connect LTR and LRC and No. 2 strand jacks at the top to connect UTR and URC. The top and bottom strand jacks work together following the sequence of strokes steps. In this way the distance between radial cables end sockets and tension ring connectors are gradually reduced: the flying columns and the tension rings lift-off and the whole roof cable net starts to be raised. At the end, sockets and connectors are pinned together and the correct tension/compression loads are induced in the roof structure, according to client instructions.

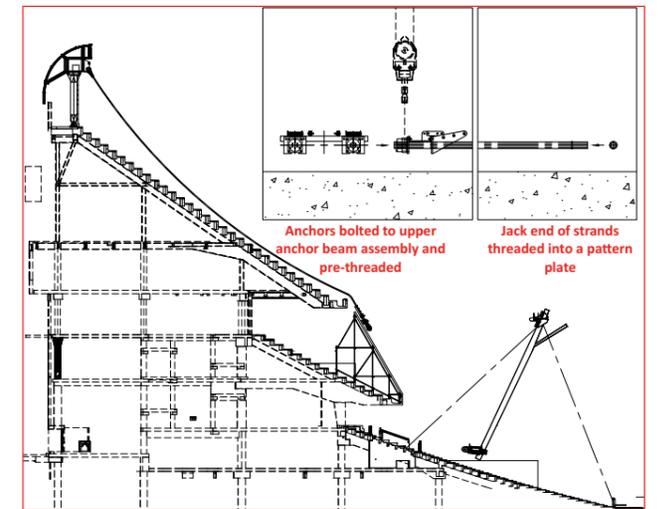




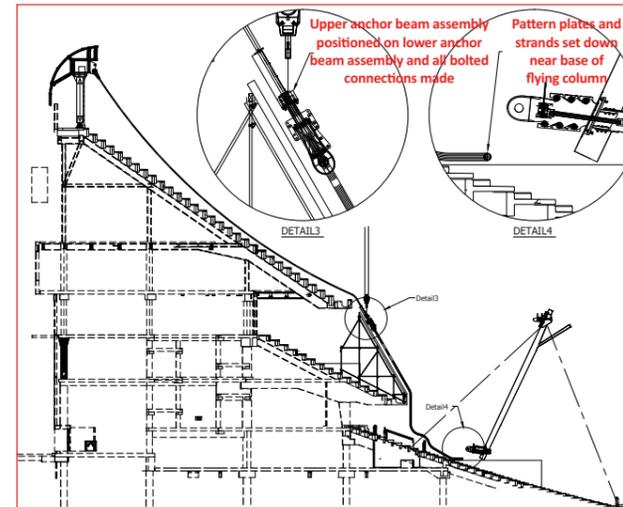
STAGE 1 - Flying columns positioned and stabilised / scaffold support structures installed (final cable net position shown for clarity)



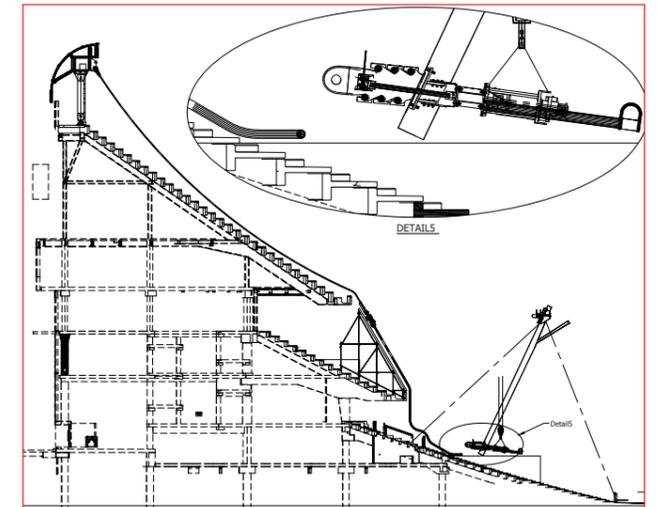
STAGE 2 - Lower anchor beam assembly installed on Lower Radial Cables / Lower Radial Cables installed on compression ring



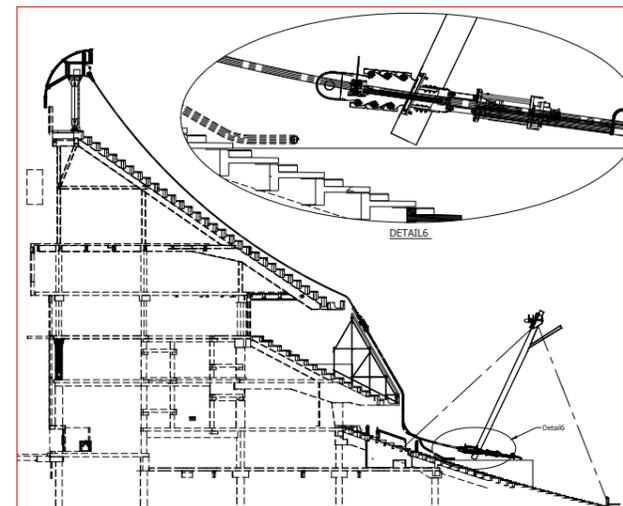
STAGE 3 - Strands cut and laid out / strands threaded (as shown)



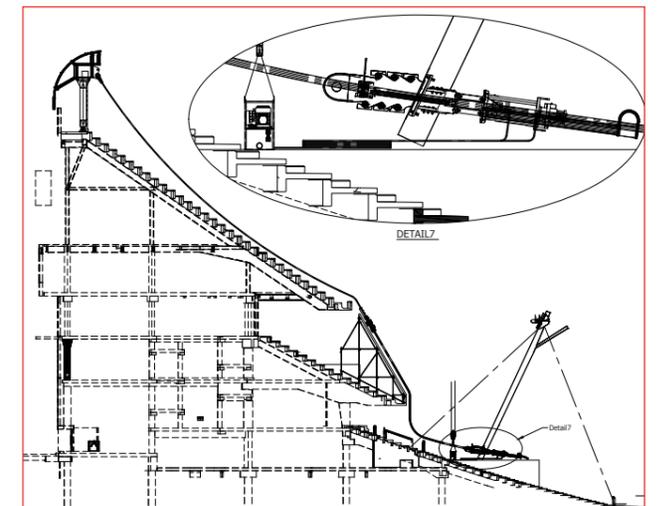
STAGE 4 - Upper anchor beam assembly, lifted with strands and pattern plates trailing



STAGE 5 - Jacks and jack support beam assemblies installed on bottom of the flying columns



STAGE 6 - Strands removed from the pattern plates one by one and threaded on to jacks / strands fitted on strand guides



STAGE 7 - Power pack units installed / electrical & hydraulic equipment installed on jacks and connected to PPUs

INSTALLATION OF TOTTENHAM HOTSPUR ROOF STADIUM

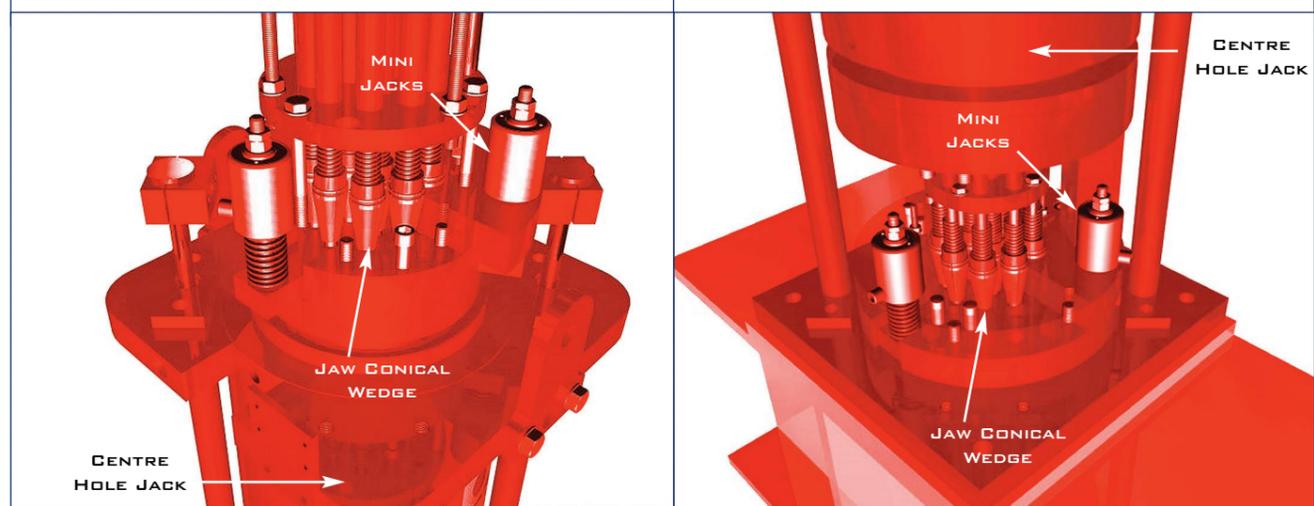
Fagioli's Cable net Lifting & Tensioning System features a fully computerized remote control system capable of operating in lift or lower / tension or de-tension mode on any combination of jacks. Jacks are controlled by the computer system and sophisticated electronics which can regulate and control hydraulic flow from the pump. Jacks can also be combined into groups of any configuration or number. Each group can be controlled as a single entity in combination with any number of discrete groups or individual jacks. The main components of the control system are as follows:- Ultra sonic transmitter / receivers indicate jack stroke.- Hydraulic pressure transducers to measure actual load in the jacks.- Micro switches fitted to the mini-jacks which are activated when the mini-jacks are open, i.e., grips disengaged.

EACH JACK IS EQUIPPED WITH FULL COMPUTER CONTROL CAPABILITY VIA PRESSURE TRANSDUCERS, STROKE ENCODER AND MINI JACK SENSORS



JACK TOP ANCHOR (SECTION)

JACK BOTTOM ANCHOR (SECTION)

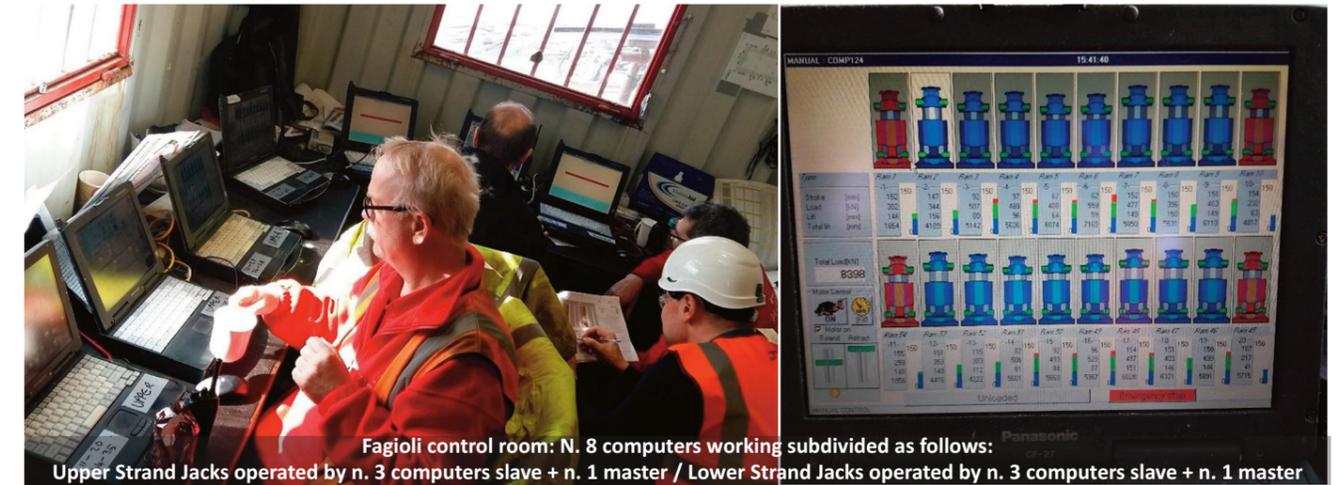


Fagioli's Cable net Lifting & Tensioning System jacks are equipped, both at top and bottom anchor, with secondary hydraulic systems named MINI JACKS which are incorporated in the gripping mechanism to override their automatic operation. This secondary hydraulic system allows the jacks to be opened without lifting during resetting and also allows the cable to pass through the lower grips when lowering.

The system has a data logging facility which allows simultaneous monitoring of information like:

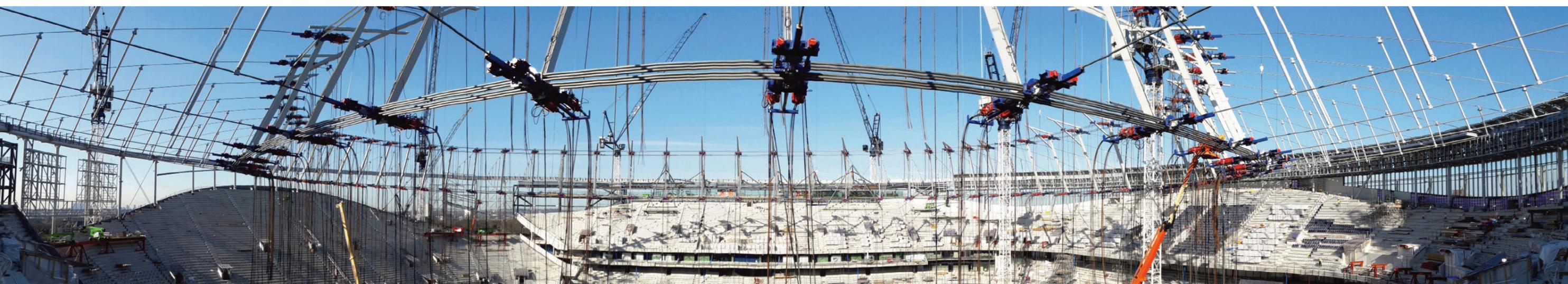
- The loads on the jacks,
- A sum of the total load per screen,
- A sum of the total load per system,
- The jack travel in a particular stroke,
- A calculation of the sum of the number of strokes to give an approximation of total movement.

As well as controlling the normal operating and monitoring functions of the standard jacking application, the control system can also be programmed to give all means of interaction between individual jacks and the pump as required by the lifting arrangement. As an alternative to the fully computer remote control system, Fagioli's Cable net Lifting & Tensioning System can also be configured with a combination of computer control for all lifting or tensioning operations and computer and manual control for any lowering or de-tensioning operations.



**Fagioli control room: N. 8 computers working subdivided as follows:
Upper Strand Jacks operated by n. 3 computers slave + n. 1 master / Lower Strand Jacks operated by n. 3 computers slave + n. 1 master**

In the combined computer control/manual system configuration, the term "manual control" means that the operation can be performed by the lead supervisor controlling the computer assisted by a skilled operator that visually observes each and every jack in function and reports by radio the status of the hydraulic piston stroke at an axis to the lead operator.

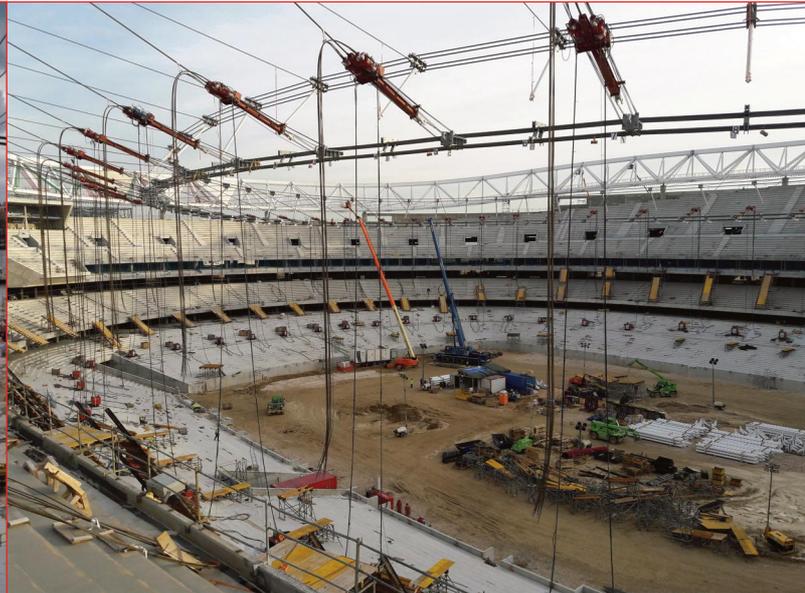


FAGIOLI CABLE NET SYSTEM - EXPERIENCE

UKRAINE OLYMPIC NATIONAL STADIUM IN KIEV
No. 160 FAGIOLI STRAND JACKS



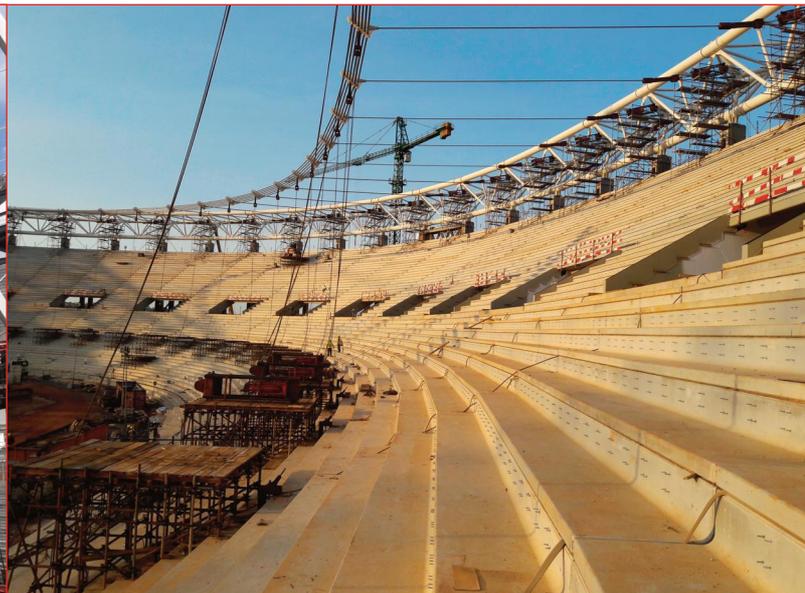
SPAIN - NEW ATLETICO MADRID STADIUM
No. 96 FAGIOLI STRAND JACKS



UK - TOTTENHAM FOOTBALL CLUB STADIUM
No. 216 FAGIOLI STRAND JACKS



CAMEROON - CO.S.O. STADIUM AT YAOUNDE
No. 68 FAGIOLI STRAND JACKS



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