



▲ The cable net structure was laid out before the lifting operation.

Bucharest has a spectacular new National Arena, named after Romania's famous female discus thrower, Lia Manoliu. One of the highlights of the 55,000-seat multifunctional arena is its very delicate filigree cable membrane roof.

The outer roof permanently covers the seating area and the inner retractable roof consists of a translucent membrane that creates the atmosphere of an open-air stadium, even when closed. The 9,000m² inner roof covers the playing field and can be opened

Equipment

- 56 SLU-330 and 24 SLU-120 strand jacks
- 14 EHPS-32 MS pumps

and closed within 15 minutes, guaranteeing that sporting events can take place in any weather conditions.

VSL Heavy Lifting was contracted to lift and tension the cable net structure.

The outer roof has three layers of radial cables with diameters up to 135mm. They secure the two pressure rings, which are held apart by struts in the form of flying masts.

The two layers of the inner roof are both connected to a single central node in the middle and to the two outside pressure rings.

Scope of work performed

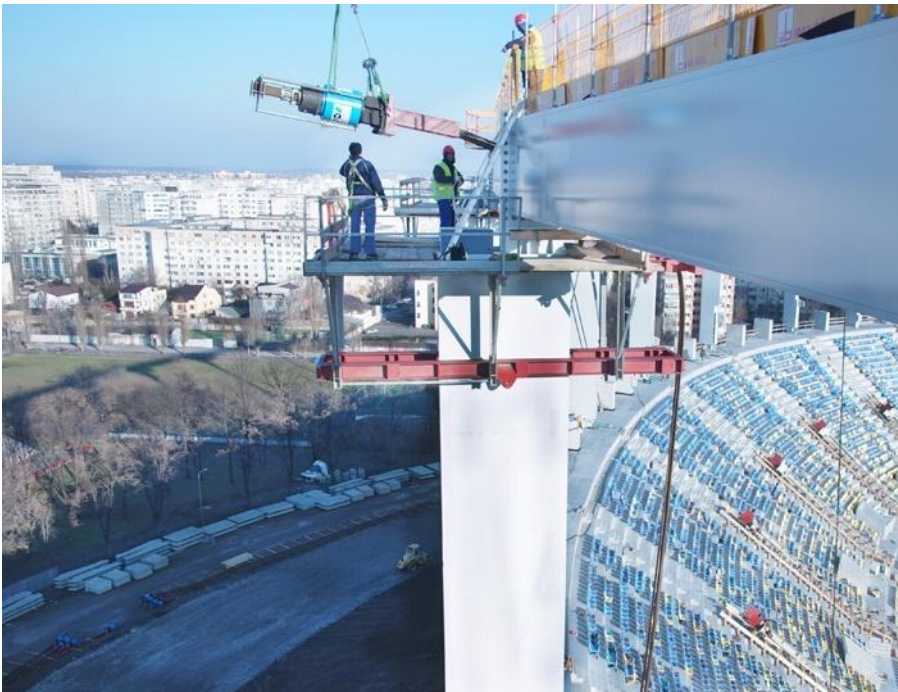
- Lifting and tensioning of the cable net structure



▲ Installation of a SLU-330 strand jack at the pressure ring



▲ *The cable net structure in its final position*



▲ *Installation of the strand jacks at the pressure ring*

Each cable layer consists of 40 radial cables. The total amount of strands was 92t, the maximum pinning force was 507t and the total installed stressing capacity was 16,000t.

The weight of the cable net was such that it wasn't possible to lift the entire structure by the upper cables alone.

VSL Heavy Lifting worked in close cooperation with the client and the designers to develop a special lifting procedure.

The upper and middle cable layers were lifted simultaneously, with a total of 80 radial cables being pulled from the pressure ring.

After the pinning of the upper radial cables, the stressing of the middle layer continued.

In accordance with VSL standard operational practice, all forces were monitored from a central control point and were compared to the calculated values at every stage. The forces developed as predicted throughout the lifting and stressing procedure.

OWNER

Municipality of Bucharest, Romania

CLIENT

Max Boegl Romania S.R.L.

STRUCTURAL ENGINEER

Schlaich Bergermann und Partner
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CABLE INSTALLATION

Inauen-Schätti AG, Switzerland

VSL ENTITY

VSL (Switzerland) Ltd.

Heavy Lifting

www.vsl-heavy-lifting.com

DATE

2011

The planned intermediate stops to allow the installation of the flying masts and the pinning of the lower radial cables took place at the precise positions required and allowed smooth progress.

Membrane installation and removal of the Heavy Lifting equipment started simultaneously straight after pinning the final cable.

Finally, the gaps in the rows of seats where the cable net had been laid out were filled with the missing seats in Romania's national colours.

The new National Arena opened on 7 September 2011 for the UEFA European Football Championship 2012 qualifying game against France.



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