New Structures

Cable Stays

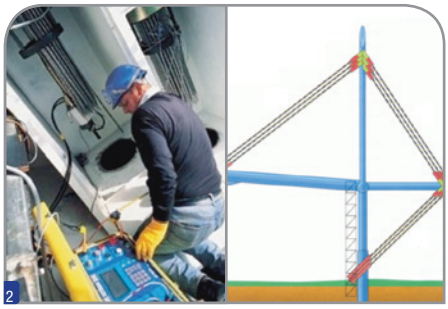
Cardiff Millennium Stadium

FREYSSINET
SUSTAINABLE TECHNOLOGY

Client
Millennium Stadium Plc
Architect
Lobb Partnership Limited
Structural Engineers
W.S. Atkins
Principal Contractor
Laing Civil Engineering
Completion
August 1999
Value
£2.3m

The Welsh Rugby Football Union was chosen to host the Rugby World Cup final during 1999, and decided to build an all new stadium in Cardiff worthy of the event. The old Cardiff Arms Park was replaced by the new 73,000 seat Millennium Stadium built on the same location. It is the first stadium in the United Kingdom with an opening roof. Freyssinet were contracted to design and install the stay cable system supporting the stadium roof. Weighing 9,000 tonnes, the stadium roof rests on a main frame comprising two 227m longitudinal trusses and two 181m transverse trusses. The trusses are suspended from stay cables attached to four 87m high masts.

1



2

3

4

The stay cable design made the full use of specialist lightweight equipment and technical know-how developed by Freyssinet over the last decade on many of the world's most prestigious bridge projects. The stadium masts are similar to bridge towers, and are composed of two cross-braced cylindrical steel legs. The two legs are parallel up to mid height, and then gradually join together in the form of an inverse V. At mid-height each of the four masts support 49m struts facing into the stadium and 26 m struts facing out. The inner struts support the roof truss, and are held in position by the stay cables. Three sets of six stay cables are attached between the extremities of the struts and mast, and transfer the roof loads into the foundations. The upper stays consisted of 61 strands each, the lower 75 strands, all winched into an outer duct. The cables were tensioned using Freyssinet's patented Isotension® process.

Delays elsewhere on the project led to principal contractor asking Freyssinet to accelerate cable stay installation by reducing the programme duration from three months to four weeks, thus allowing the crucial opening date to be met. Five well resourced installation teams rose to this challenge. Cable installation started in mid-July 1999, proceeded at a breathtaking pace, and finished on 12 August 1999. Tension adjustments, lasting one week were made a few days later to fully balance all the stay cable forces. This allowed the temporary span support towers to be removed on 25 August 1999, just three days before the friendly rugby match between Wales and France.

1 Four cable stay masts support the 9,000 tonne roof
2 Isotension® process / mast cross section
3 Views on the mast and stay cables during construction
4 Views on the mast and stay cables during construction

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