

# A new spoke wheel structure for the 60'000 spectators Yaounde Stadium

Massimo MAJOWIECKI\*, Stefano PINARDI\*, Giovanni BERTI\*, Luca PATRUNO<sup>a</sup>

\*MJW Structures

46/2 Via di Tizzano, Casalecchio di Reno, Bologna, Italy.

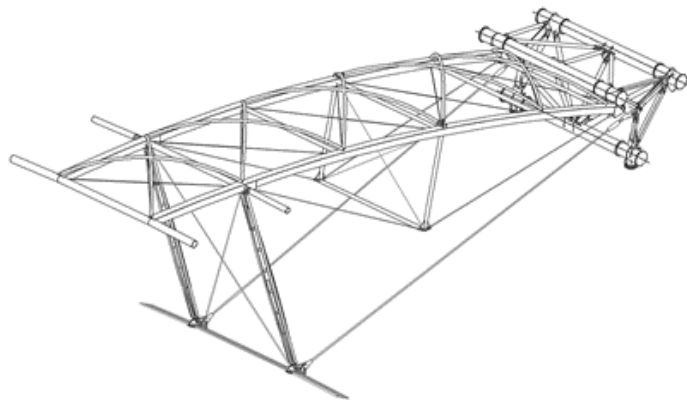
massimo.majowiecki@majowiecki.com

<sup>a</sup> DICAM, University of Bologna, Viale del Risorgimento 2, Bologna, Italy.

## Abstract

The design of the Paul Biya Stadium in Yaounde (Cameroon) was developed in the 2017 - 2018 and the construction of the roof and grandstands structure is now completed.

The roof has plan dimensions of about 300 m x 245 m and 46m height above ground. The main structural system of the roof is an upgrading of the “spoke wheel” structural scheme [1]: a tensile structure composed of two internal tension rings (an upper and a lower one) and an external compression ring. These rings are connected with radial bottom carrying cables and radial top secondary beams. Compressed sub-vertical flying masts connect top compression inner ring with lower cable groups. The perimeter compression ring is supported by the 68 heads of grand-stand columns. Typical support lies on horizontal slide to permit horizontal displacements due to initial tension ring lifting phase.



The aerodynamic behavior of the roof has been tested in London RWDI wind tunnel. Innovative and recently proposed techniques have been adopted to perform dynamic analyses under wind action. This allowed static corrections obtained from appropriate pressure distributions, called Proper Skin Modes (PSMs) [2]; thanks to this technique, it has been possible to easily obtain the structural response, without substantial overhead on the structural engineer.

The roof structures erection sequences adopted is remarkable and advanced: the tie down pre tensioning operation that allow an easy installation of the secondary beams and to apply a pretension in the upper internal ring.

## References

- [1] Majowiecki, M., Pinardi, S., Berti, G., Patruno, L.,: “Upgrading the spoke wheel stadium roof concept”, *I.A.S.S. International Congress*, Boston, USA, July 2018.
- [2] Patruno, L., Ricci, M., de Miranda, S., Ubertini, F. “An efficient approach to the evaluation of wind effects on structures based on recorded pressure fields”, *Engineering Structures*, vol. 124, pp. 207-220, 2016.