

UNUSUAL COMPOSITION AND LOAD-CARRYING CAPACITY OF A 100-YEAR OLD EARLY AGE STEEL EXPOSITION HALL

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SUMMARY

The Floraliahall in Ghent was built during 1912-1913 as part of a series of large infrastructure works for the world exposition of 1913. The main structure of the hall consists of 18 portal frames having 3 spans of 10.16, 40.18 and 10.16 m. The upper part of the structure is highly slender. Adversely to the customary concepts of 100 years ago, the lighter frames at 7.45 m distance, are hinged twice at the springs, whereas the more heavy frames, at 15 m distance, are completely clamped at their base. In addition, measurements show that cross-sections of compressed parts have larger area than the tensile parts. From the structural point of view, these frames sometimes have an unexpected composition. The aim was to determine whether this structure can comply with contemporary requirements and codes. From measurements and simulations follows that in limited areas high stresses appear, unacceptable even in serviceability state. This may be partly due to modifications of the roof that were made inappropriately, from the uncertainty to assess certain details with the model and from ineffective analysis at the time of construction.

Keywords: *Exposition hall, two hinged frame, analysis of frames, early age steel, inadequate roof modification.*

1. INTRODUCTION

On the initiative of a high school, a botanic garden has existed in Ghent (Belgium) since 1798. The garden was intended to support education and was visited often by schools, as well as by many citizens. Plant growers, gardeners and botanists have shared their knowledge to broaden the number of exposed plants. This garden was taken over by the university, founded in 1817. Apart from this, plant growers founded a society to promote their products and held expositions from 1809 [1]. As success grew, larger locations had to be found. After using a casino for this and as the 1913 world exposition of Ghent was approaching and new hall was built in the citadel park. This park originated after the demolition of army barracks, built during the Dutch period from 1815 to 1830. From 1830 the facility was further used by the Belgian army, till in 1870 the city acquired the premises, to transform it to a park for its citizens. The grounds were partly used during the world exposition but remained chiefly a green area. Hence, the location of the new hall at the park centre was an excellent choice.

The Floralia Hall consists of an early steel structure, the total cost at the time of its erection was around 1 million Belgian francs. The alternative of a stone structure was discussed with the city, as this would represent an additional cost of 50%. The city council agreed to provide additional funding, if they would take over the ownership after the exposition. Apparently this did not happen and the horticultural society thus acquired a new permanent location for the four-year event. However, from 1990, the Floralia moved to the larger venue of Flanders' Expo outside the town, offering a total space of 54000 m² in 8 halls. The last unsuccessful event was organized in 2016, bringing the exposition back to the town centre at 4 different locations. The next edition in 2020 will come back to the Floralia hall and the surrounding park.

Today, the hall is surrounded by 3 other buildings, the urban museum of contemporary art, the ICC international congress centre and the velodrome. On the outside, only the light strips in the roof and the