Silver Tower Brussels – Adaptative outriggers

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Abstract

Outrigger systems are commonly used in the design of tall buildings to increase their lateral stiffness and resistance capacity. Recently, new applications for outrigger systems have appeared, such as providing additional damping or acting as fuses under earthquake conditions. While their main purpose varies from one project to another, the problem related to differential displacements between the core and the peripheral columns remains a constant.

This paper aims at exploring various technical aspects considered in the design of the Silver Tower (Brussels) and, more specifically, the design of its outrigger system. It will show how the proposed system presents an effective and elegant solution to free the outrigger system of the lock-in forces due to differential settlements. Also, aspects related to the foundation system, the performed wind tunnel tests and the dynamic response of the tower will be discussed.

Keywords: high-rise building, outrigger system, "up and down", comfort, deformability, creep, damper.

Introduction

The Silver Tower, recently renamed Iris Tower, is an office building located in the northern financial district of Brussels. Developed by the real estate investor Ghelamco, it was architecturally designed by architects Accarain-Bouillot and Atelier de Genval. Bureau Greisch oversaw the structural preliminary design and final design.

The building has thirty-two levels above ground and seven basement levels for a total height of 137m. Located in a narrow site context, framed by public spaces and railway tracks, the geometry of the construction is an elliptical lens of 28m wide by 69m long. A typical upper floor (+/- 1300m²) consists of a cast in-situ central core that contains the vertical flows (stairs, elevators, building services), peripheral precast columns in high performance concrete (C90/105), precast beams and precast hollow-core slabs.

1 Foundation System

1.1 Diaphragm walls

The foundations of the main loadbearing elements (columns, core) are diaphragm wall panels or box piles sitting directly on a layer of loadbearing soil (Landenian) at a depth of 54m. Waterproofing of the seven-level basement is provided by a peripheral enclosure comprised of diaphragm wall panels (80cm thick) and a watertight raft (100cm thick).

1.2 "Up and Down" construction process

To reduce the duration of the construction works, a construction methodology was chosen whereby the superstructure and the substructure would be executed simultaneously ("up and down" construction method).

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