

488 University Avenue - Toronto: Redefining possible in the vertical expansion of buildings

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Abstract

488 University Avenue condominium is a unique, first-ever designed and constructed 55-story tower, where 37 stories of residential units were added above an existing 18-story office building. This was made possible by an innovative structural solution assisted by extensive wind tunnel testing and the implementation of a tuned sloshing damper (TSD) system to achieve the required strength and serviceability performance targets.

In this paper, a detailed description of the structural solution implemented for this building is first presented. Then, the wind tunnel testing considered for the evaluation of the wind performance of the building is discussed with a particular focus on the assessment of wind-induced motions and their acceptability for occupant comfort. Lastly, the implementation and the as-built performance verification of the TSD are demonstrated using full-scale measurement data obtained from a long-term structural monitoring program.

Keywords: vertical expansion; high-rise buildings; wind tunnel testing; motion comfort, tuned sloshing damper, serviceability performance; structural monitoring.

1 Introduction

488 University Avenue condominium is located in the downtown area of Toronto and is a unique, first-ever designed and constructed 55-story building, where 37 stories of residential units were added above an existing 18-story office building (Figure 1). The developer's vision for this project was to create a state-of-the-art mixed-use development by fully renovating the existing office building in a sustainable manner. The renovation plan included the expansion of the underground parking from two levels to six levels and the addition of 37 floors of residential condominiums

above the existing office building while keeping it fully operational throughout the entire construction period. The deteriorating precast façade of the existing office building and the aged single-pane glass offered poor insulation and energy efficiency. These, coupled with the restricted natural light penetration caused by the precast fins and the need for structural enhancements to support the addition of the residential units above the existing building were the key decision-making factors for this unique development. To the authors' knowledge, 488 University Avenue is the most daring vertical expansion of an existing high-rise building which