

## 35 Hudson Yards: Adapting to Urban Infrastructure with High Strength Concrete

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### 1 Abstract

The urban context provides unique challenges and opportunities for engineering. In New York, large blocks of land previously dedicated to railyard functions are being reclaimed as new urban centers. 35 Hudson Yards is a 72-story mixed-use building located entirely over railroad tracks in midtown Manhattan. To construct the highest residential tower at Hudson Yards, innovative solutions using high strength concrete are required to manage load path and structural integrity challenges. The 308 meter (1,010 feet) high reinforced concrete structure coordinates core wall and column placement with the constraints imposed by the existing infrastructure below. “Tuning” of the concrete system adapt the tower structure to the capacities of the foundations and platform structure designed before the superstructure. Lower levels of the supertall also act as bridging elements, spanning across tracks to channel tower loads to limited lines of support. Despite its impressive height and the structural challenges of the site, 35 Hudson Yards is a robust, stiff structure, designed to resist strong winds from the Hudson River and constructed with an aggressive schedule, utilizing two day cycles for the residential levels. It is a quintessential New York achievement—a bold statement of architecture and engineering, overcoming constraints and maintaining non-stop operation of critical infrastructure.

**Keywords:** High-rise buildings; supertall; high-strength concrete; building over tracks; infrastructure; wind engineering; wind tunnel; buttressed core; alignment; structural engineering

### 2 Introduction

The density of New York City, combined with extremely complex infrastructure and subsurface transit networks, provide for unique and challenging conditions for developers, as well as design and construction professionals. The constant innovation required to face these new challenges presents structural engineers with numerous ways to advance our field. 35 Hudson Yards is one project that epitomizes these challenges and innovations.

Located at the southeast corner of 33rd Street and 11th Avenue in Manhattan, 35 Hudson Yards (35HY) is a 72-story mixed-use tower built entirely over a railyard. 35 HY is part of the larger Hudson Yards Development—the largest recent development in NYC. The building is 308m (1,010ft) above the lobby level and an additional 10m (35ft) above the railroad tracks and foundations. The mixed-use program consists of several restaurants, a SoulCycle gym, an Equinox fitness center at the base, and Equinox office floors, hotel, and luxury residential condominiums above.