



## Bellezza e funzione

Design of New Government Seat Combines Beauty & Function

By Aine Brazil, P.E., LEED AP

*Thornton Tomasetti provided structural design services through design development for the Lombardia Regional Government's new headquarters complex in Milan, Italy, a project selected as one of the winners for the NCSEA 2011 Excellence in Structural Engineering Awards in the International Structures Over \$100 Million category.*

In 2004, an international competition was held for the design of the Lombardy Regional Government's new seat and civic square in Milan, Italy. Located in northwestern Italy, Lombardia is the most populous region in Italy and its capital, Milan, is one of Italy's most densely populated areas. The competition to design the new government seat and civic square required entrants to consider a visible symbolic and functional presence in their designs. Another factor that affected the site was the proximity to the Pirelli Tower, an existing icon in the local landscape.

The final Pei Cobb Freed and Partners Architects LLP design was chosen from 10 finalists who were selected from a larger group of 98 applicants. Their winning design was inspired by the region's interweaving mountain peaks, rivers and valleys. The open spaces created by the curved forms of the buildings encourage the community to gather, reinforcing themes of engagement and social interaction. Thornton Tomasetti provided structural design services through design development for the project.

Sited in the greater Garibaldi-Repubblica urban enhancement area, close to the heart of the city, its scale relates to the surrounding neighborhood, while the tower speaks to the Pirelli building and the city. Key design principles were: to create an urban passage that invites entry and is a significant destination; design a sequence of engaging spaces that promote social interaction; and add an emblematic vertical element that contributes to Milan's skyline.

This high-profile headquarters includes five nine-story wavelike buildings that total 1.05 million square feet (98,000 square meters), a 43-story tower that is 405,000 square feet (37,000 square meters), three parking/storage levels below grade and a plaza with an irregular footprint of 856 feet by 607 feet (261 meters by 185 meters). The major determining factors in the choice of structural materials and structural system for the project

were the curved building shapes and floor-to-floor heights.

Construction began in December of 2006 and was completed in March 2011. The completed government buildings include general assembly spaces, offices and areas for social functions and public debates.

A large enclosed piazza with a curved glass roof at the center of the site references Milan's Galleria, and links to two secondary open spaces and a linear landscaped spine. The piazza roof is covered by a tubular lamellar (skewed grid) structure spanning 459 feet by 148 feet (140 meters by 45 meters) and is clad in an extremely light, innovative Ethylene Tetrafluoroethylene pillow membrane system. The rim of the "eye" shaped roof structure is supported along the edges of the podium structures with slide bearings that accommodate building movement at expansion joints. The enclosure of the building is a highly innovative and efficient "climate wall" double layered glass curtainwall.

The project also includes an open roof garden with trees and landscaping, enclosed by an approximately 50-foot (15-meter) tall wall of glass supported by vertical cantilevered tube steel vierendeel trusses with no overhead beams. Grand entrances to the piazza are created by open double height ground floor areas and multiple column transfers.

The project is divided above grade into six building structures separated by expansion joints that accommodate thermal expansion and contraction. The maximum length of these structural units is approximately 361 feet (110 meters). Although in Italy expansion joints are commonly spaced more closely than 328 feet (100 meters), the architectural layout and the arrangement of the structural elements in these buildings facilitate the larger joint spacing.

The 525-foot (160-meter), 43-story tower structure has an efficient concrete form even with the curves presented, which made finding economical solutions to structural requirements possible. The major elevator,



Palazzo Lombardia. Courtesy of Simon Hsu.

service and stair core is enclosed by cast-in-situ concrete shear walls to create the lateral system for the building, to resist both wind and earthquake forces.

The curvilinear form of the building makes a cast-in-situ concrete system an appropriate and cost-effective structural solution for both the low-rise buildings and the tower. Concrete is the local material of choice, and Italian building codes required office spaces to have access to direct light.

Flat plate construction was possible because of the narrow building width, which addressed this constraint and eliminated the long spans that can make concrete an unsuitable material. The low-rise buildings follow a repetitive form, permitting multiple reuse of the formwork. Column formwork economy was provided by using uniform sizing and standard floor-to-floor heights. Once the project was passed on to the Italian design-build contractor Consorzio Torre, the construction team opted to substitute some of the cast-in-situ elements with precast elements in an effort to accelerate the schedule. This was most prevalent with the columns and flat plate slabs in the gravity system. ■

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