

**Department of Structural Engineering  
University of California, San Diego  
SE 290 Seminar**



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Associate Principal  
Thornton Tomasetti

**"Performance-Based Seismic Design of Transbay Transit Center in San Francisco"**

Monday, November 14, 2016  
1:00 pm - 1:50 pm, Center Hall, Room 212

<http://structures.ucsd.edu/node/2126>

**Abstract**

The Transbay Transit Center is a modern multimodal transit center, which will become a physical and symbolic gateway to downtown San Francisco. The three-level above grade steel superstructure accommodates five regional bus transit systems and one intercity bus operator, and the two-level below grade concrete train box serves two rail systems and future California High Speed Rail.

A performance based design approach is followed due to the unique structure of the building and customized performance expectations. This paper discusses several special design features that are developed for achieving the desired performance goals. In the transverse direction steel moment frames, the beams experience high tension forces due to raking columns at the building perimeter. A flared moment connection detail is developed and the performance of this connection is validated with full scale testing. The moment frames are supported by deep steel transfer girders at the ground level. To avoid weld fracture at the column base, a partially restrained (PR) base plate detail is developed. Where the columns have low axial force affecting the performance of the PR

base plate, post-tensioning is introduced into the connection and the performance of this connection is confirmed by ABAQUS analysis. In the longitudinal direction, a non-conventional Eccentrically Braced Frame (EBF) resists seismic forces, and a fragility study is performed to evaluate the link beam acceptance criteria. Full scale cyclic tests of the link beam are carried out to confirm there is sufficient margin of safety against the estimated rotation demands. Pipe sections are used for the diagonal members of the EBF system, connected by architecturally exposed cast nodes.

## **Biography**

Albert Chen has more than 30 years of experience in the design of more than 20 million square feet of structures for diverse building types, including commercial, education, healthcare, hospitality, mixed-use, parking and retail projects. His portfolio includes the design of new buildings as well as structural tenant improvements, investigations and seismic upgrades for existing structures. His responsibilities include project management, with technical involvement from concept design through construction, quality control and quality assurance, and business development.

His recent work includes project management for the Transbay Transit Center in San Francisco and the National Palace Museum in Taiwan as well as quality assurance and quality control for Shanghai Tower, which will be China's tallest building when it's completed in 2015.

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*Sponsored by Professor Chia-Ming Uang*

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