BURBANK REGIONAL INTERMODAL TRANSPORTATION CENTER (BRITC)

Owner: Glendale-Burbank-Pasadena Airport Authority
Design Build Team: McCarthy Building Companies / Saiful Bouquet
Architect: PGAL

2017 EXCELLENCE IN STRUCTURAL ENGINEERING AWARDS

PROJECT DESCRIPTION
- BRITC is the most advanced, high-tech transportation hub built in California
- 300,000 sf Consolidated Rental Car Facility & Customer Service Building
- Designed to withstand an earthquake larger than any California had ever experienced
- Provided FEMA and the State of California a new Disaster Command Center location to mobilize in the event of a major earthquake or other disaster

SEISMIC PERFORMANCE OBJECTIVES
Building Performance Level
- Immediate Occupancy
- Life Safety
- Collapse Prevention

Seismic Design Criteria (Set by Airport Authority)
- Creep, Shrinkage and Elastic Shortening per ACI 209R

Seismic Analysis
A three-dimensional commercial nonlinear analysis software package, SAP2000, was used to investigate the nonlinear seismic response of the BRITC structure utilizing base isolation. The base isolators were modeled using friction pendulum link elements available in the SAP2000 software package. Since SAP2000 does not include a specific element that can consider the complex behavior of the triple friction pendulum isolation, a two-component parallel model based on the work by Daniels and Constableness (2015) was used with properties derived from the actual physical properties of the isolator units from the isolator manufacturer.

Creep, Shrinkage & Thermal Analysis
- Nonlinear Static Analysis with isolators
- Equivalent temperature loading calculated to represent creep, shrinkage and elastic shortening
- Two-Stage Analysis
  - Stage 1: Creep, Shrinkage and Shortening from t = 0 to 4 months (Delay Strip Open)
  - Stage 2: Creep & Shrinkage from t = 4 months to 5 years (Delay Strip Closed)
- Thermal Analysis: 50 deg. F Temperature Change
- Creep, Shrinkage and Elastic Shortening per ACI 209R

“BRITC is essentially the safest place to be during an earthquake”

STRUCTURAL SYSTEM
- Gravity System
  - Post-Tensioned Reinforced Concrete One-Way Floor structure w/ 65' x 65' column bays and 19' Story Height
  - Steel Open Web Roof structure with capacity to support solar arrays
- Lateral Force Resisting System
  - Base-Isolation (82 Triple Friction Pendulum Isolator Bearings)
  - Above Isolators: Special Concrete Moment Frames
  - Below Isolators: Octagonal Cantilever Concrete Columns
  - Roof: Special Concentric Braced Frames
- Foundations: Pile Caps with Driven Steel H-Piles

DESIGN CHALLENGES
- Ultra fast-tracked project. The entire design and peer review process including nonlinear response history analysis completed in 4 months.
- Immediate Occupancy (IO) after a Maximum Considered Earthquake (MCE)
- Due to possible shrinkage, the project was built with a Delay Strip and connected 4 months after completion
- Long Span Frame Structures