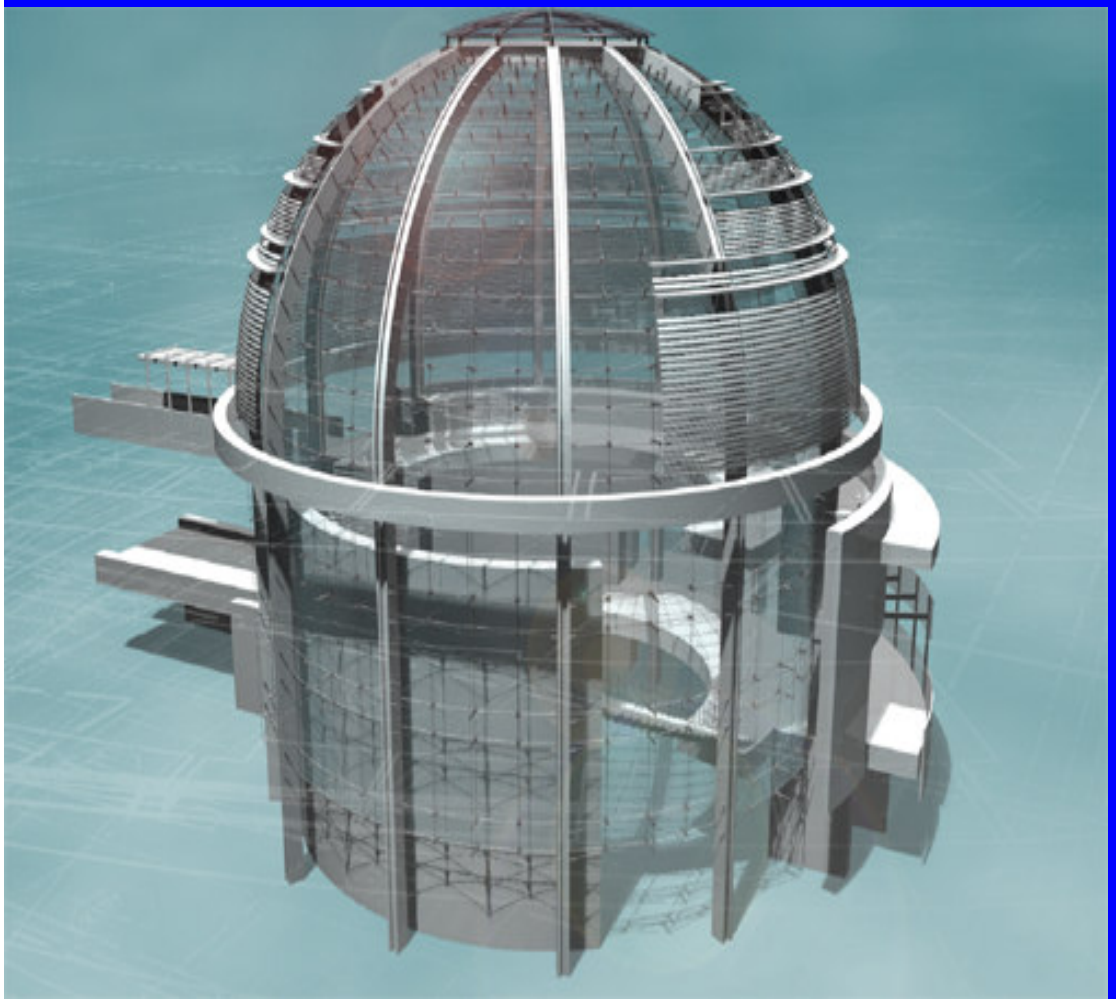
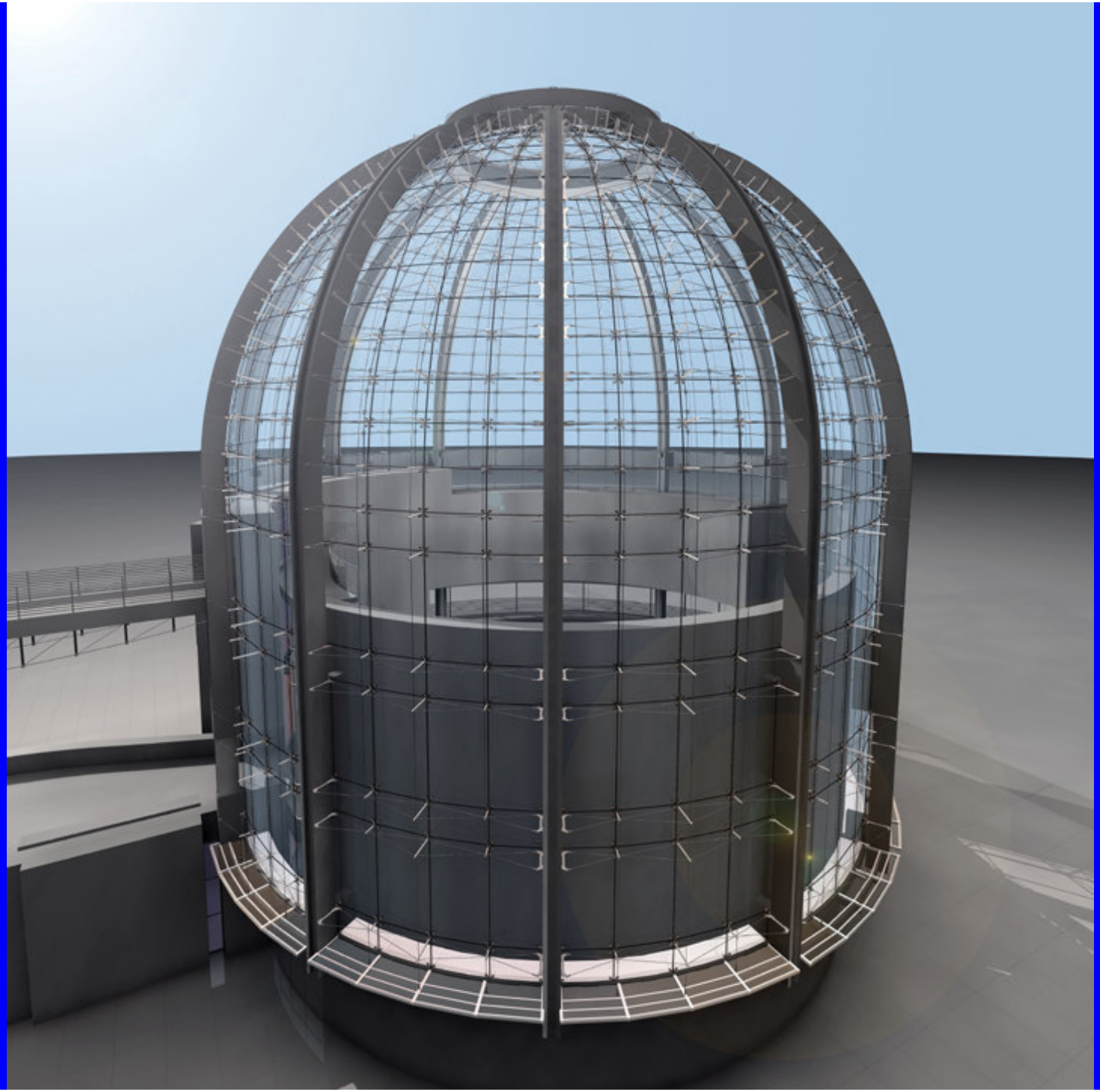
San Jose Civic Center ‘Rotunda’ San Jose, CA

Architects Richard Maier & Partners

San Jose Civic Center Rotunda



The Rotunda serves as the focal point of the new San Jose Civic Center. The Rotunda is a large cylindrical structure (90'Dia, 60' high) topped by a dome(90'dia, 50' high), clad mostly in glass. The primary structure consists of a set of steel ribs filled with concrete, which are arranged on a radial grid. Horizontal cable trusses span between the ribs to hold the point supported glazing system.



Design Criteria

Design Criteria is based on the California Building Code (CBC). The code requires that the cladding system be designed to withstand a maximum inelastic drift of 2 -2 ½ % of the height of the building. The code also requires that the cladding system for glass panels and glass panel joints accommodate movements of the structure based upon the elastic and inelastic displacement of the support structure.

CBC states that calculated story drifts using DeltaM shall not exceed 0.025 times the story height for structures having a fundamental period of less than 0.7 second. For structures having a fundamental period of 0.7 second or greater, the calculated story drift shall not exceed 0.020 times the story height. The maximum inelastic response displacement, Dm shall be computed as follows:

$$Dm=0.7\ R\ Ds$$

Where, R denotes the numerical coefficient representative of the inert over strength and global ductility of lateral force-resisting systems. Ds denotes Elastic Response Displacement

Current Code Philosophy and Implementation

The goal of the California Building Code is to Prevent

- **Non-structural damage in frequent, minor ground shaking**
- **Structural damage and minimize non-structural damage in occasional moderate ground shaking**
- **Collapse or serious damage in rare major ground shaking**

Above all, the code aims to preserve life safety under all but the worst cases. The elastic level seismic drift requirements correspond to demand due to frequent, minor ground motion. The inelastic seismic drift requirements establish a performance level corresponding to stronger and less frequent events.

The implementation of code philosophy in the design of cladding systems presents some issues particularly, the code's view that exterior panel and panel joints must accommodate movements of the support building structure based upon Dm of the support building structure. Note here that the code only states "accommodate" and it is left to the design team to use an appropriate definition of accommodate questions and concerns remain in the interpretation of accommodate and the specific performance required of the cladding system.

Code Limitations

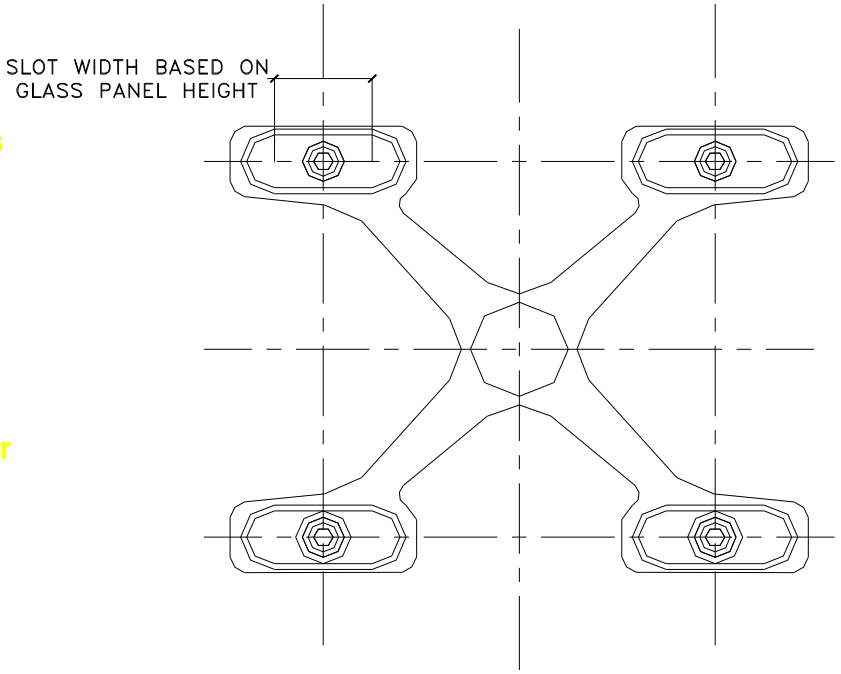
The code is not necessarily an accurate predictor of the forces and deformations that structures will experience during earthquakes. In general, the inelastic deformation limit of 0.025*h is considered to be a conservatively large displacement.

Structural System

Horizontal cable trusses span between the ribs to hold the point supported glazing system. Each truss consists of one pretension cable front and back, separated by spreaders. A set of pretension cables runs vertically to stabilize the trusses and carry gravity loads

Overview of the Structural System

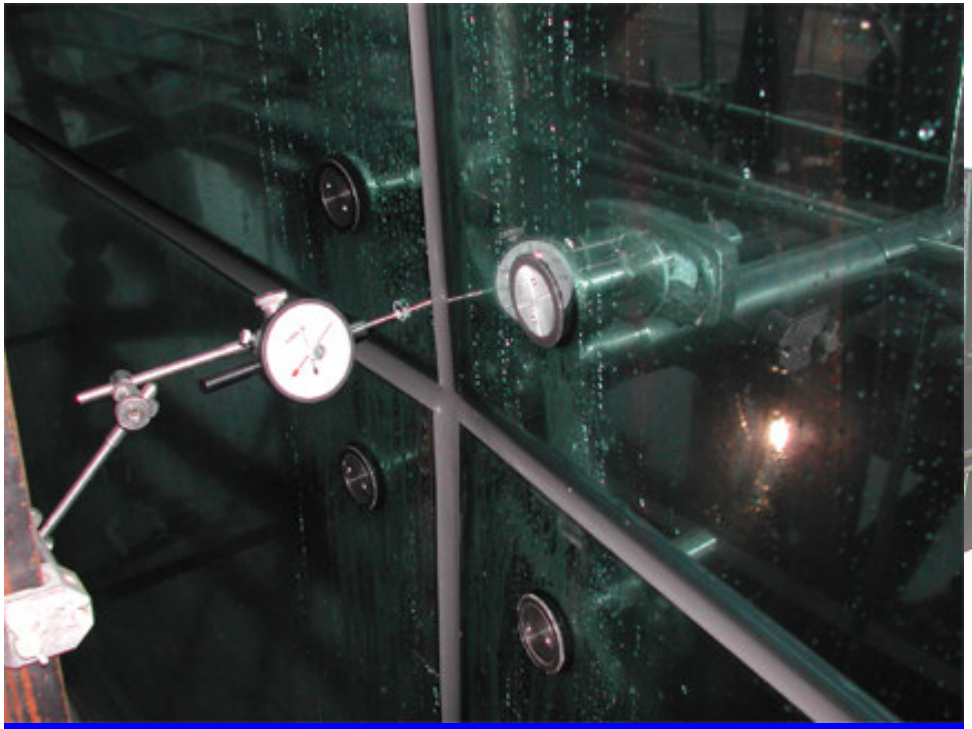
The function of this system is to isolate the glass from the primary building structure for in-plane deformations and loads while supporting it vertically and for out of plane loads. The system components include the slotted spiders, ball and socket glass bolts, glass, and silicone sealant. The slotted spiders are the central components of the system (Figure 1). Their purpose is to allow the glass to accommodate large interstory drift demand by horizontal translation. The size of the slot is based on the maximum panel height and the UBC maximum permissible inelastic drift limit of the structure under consideration, either 0.020*h or 0.025*h. This allows the system to be used in any building for which the inelastic drift has not been determined by analysis.



Mock-Up

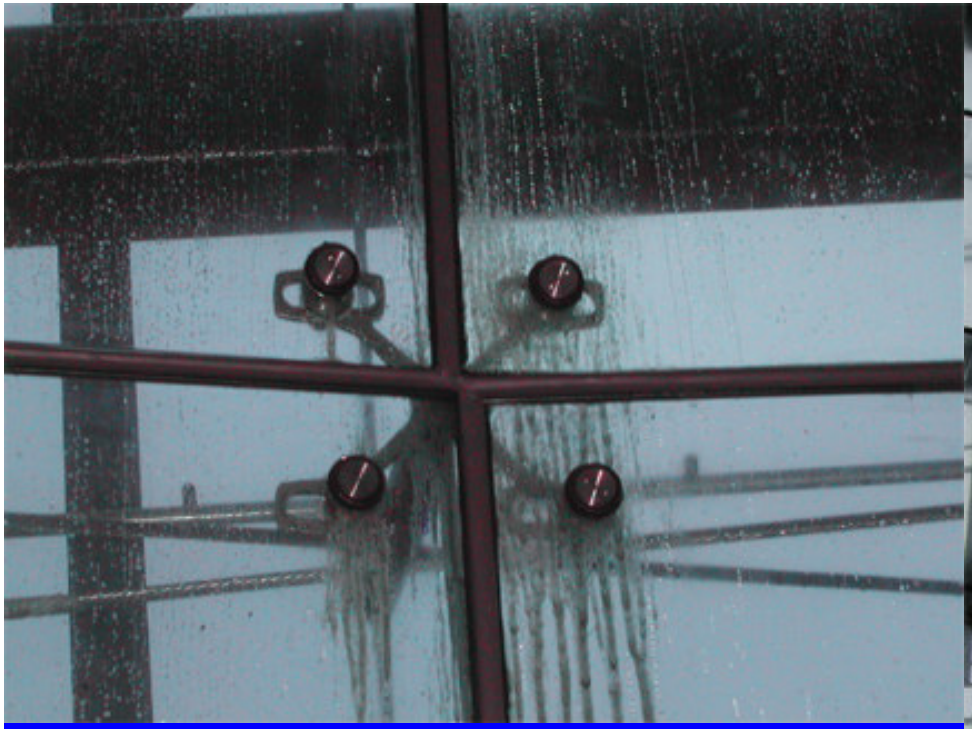
ASI performed mock-up tests on a full scale section of the building approximately 30 feet tall by 20 feet wide, taken from the domed portion of the structure.

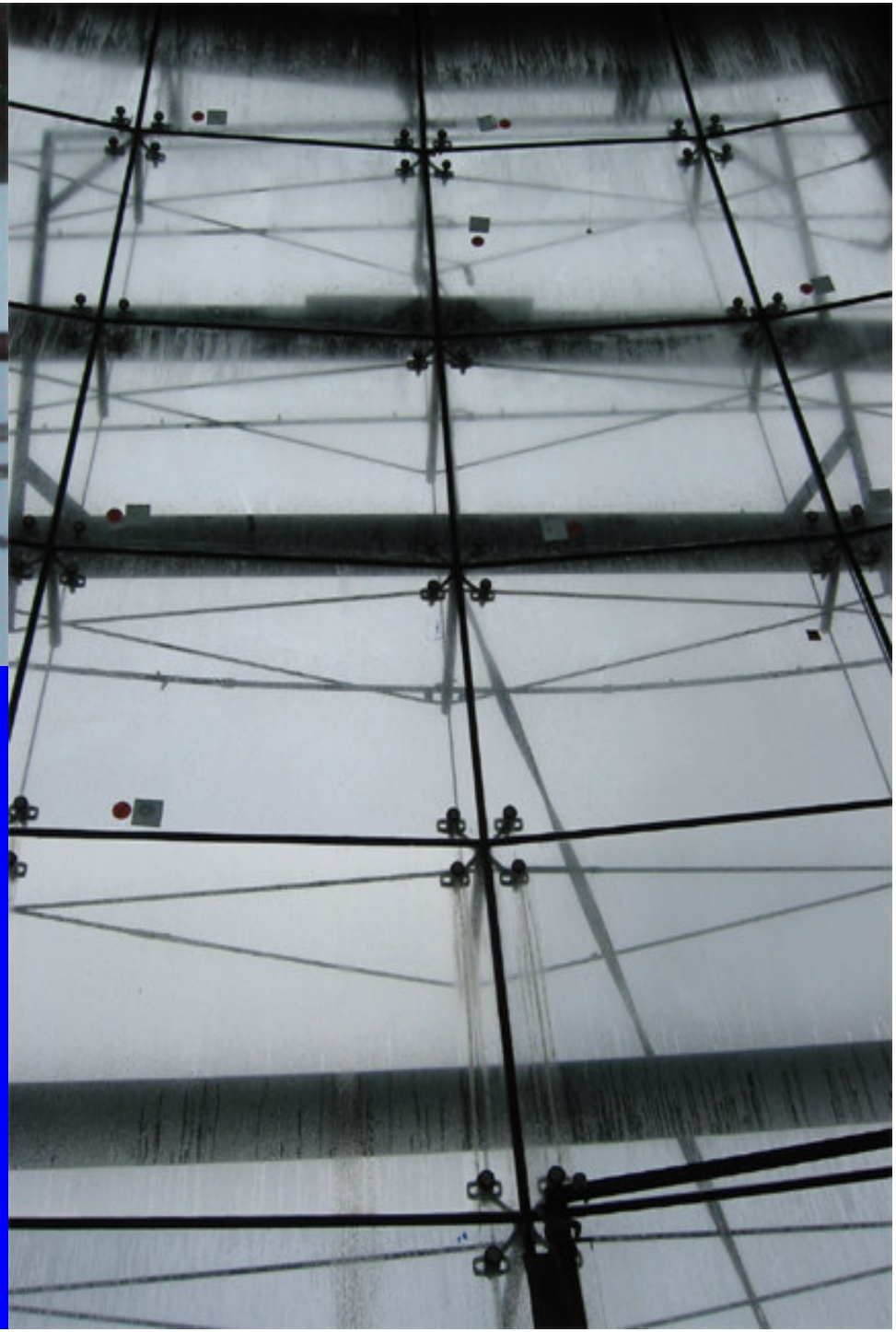
Mock-Up Fully Assembled



Mock-Up Equipment Instrumentation

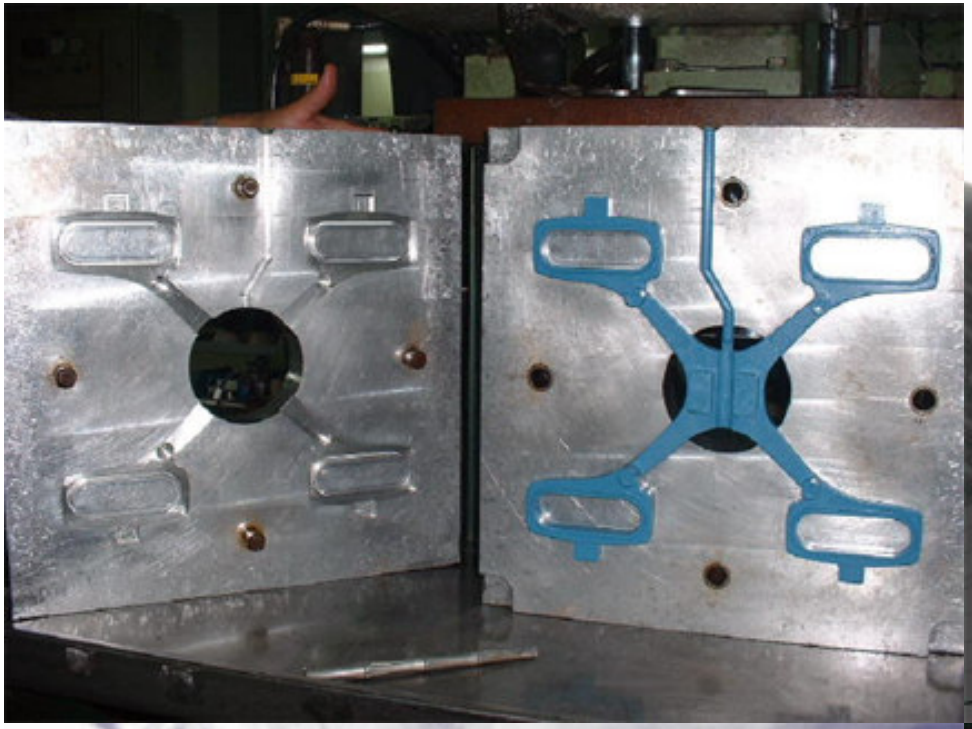
- Dial Gauge
- Jet Engine
- Hydraulic Jacks

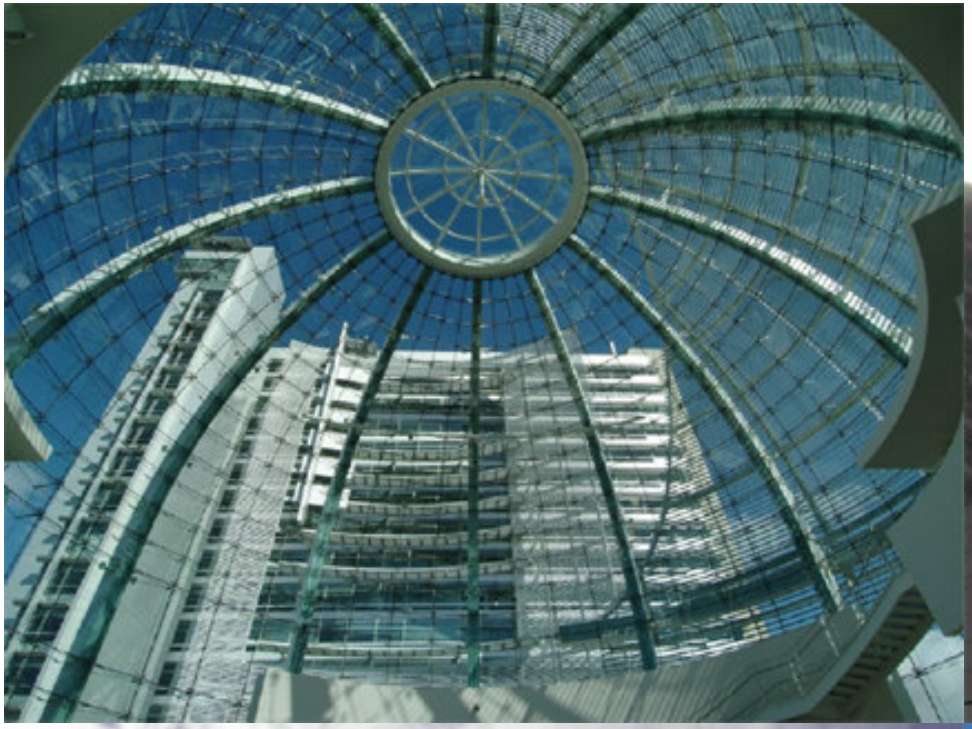


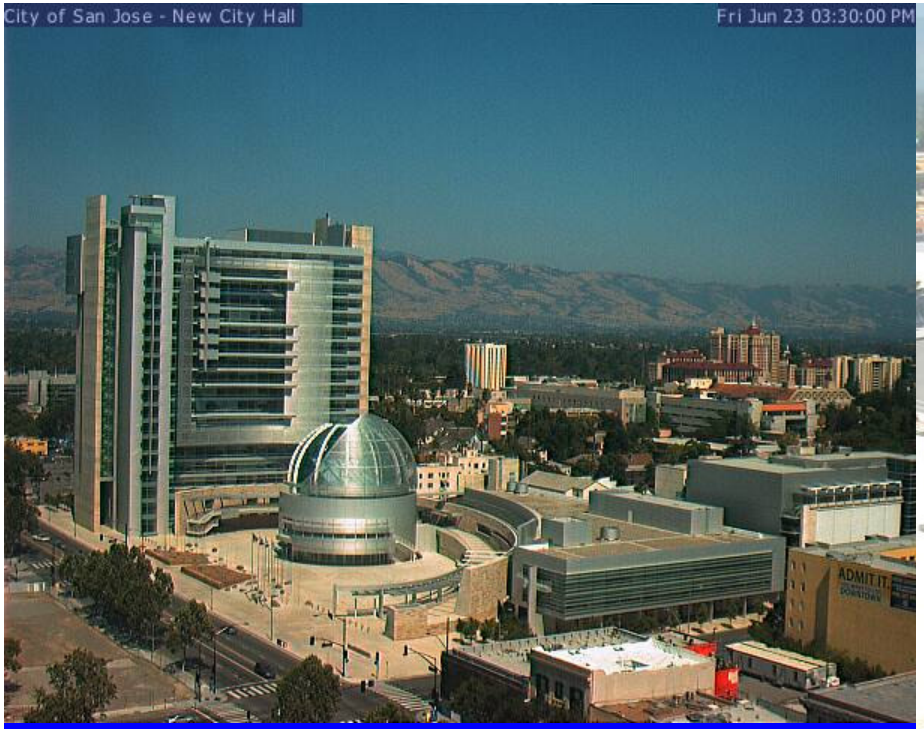


Mockup Conclusion

- Glazing system performed as intended in the test, validating its design
- Drift was accommodated incrementally at horizontal glass joints, and the panels themselves were minimally stressed
- Even after exceeding the inelastic drift limit no failures were observed in the glass or other system components





Site Activities

- Location
- Steel Erection

Project Completion

THANK YOU