

# JULES STEIN EYE INSTITUTE SEISMIC CORRECTIONS LOS ANGELES, CALIFORNIA

This five-story reinforced concrete building, built in 1967, was recently seismically retrofitted. The engineer-of-record was the Los Angeles office of Nabih Youssef Associates Structural Engineers (NYASE). The perimeter columns on the long sides of the buildings required confinement and shear strengthening over the entire height of the building, including within the column-spandrel joints. NYASE opted to use fiber reinforced polymers (FRP) to achieve this strengthening. The projecting wing walls on the sides of the columns and a desire to protect the inner finishes on the upper floors of the building meant that NYASE had to develop creative strengthening schemes to wrap the columns. On the first floor, the solution was to use FRP fabric on the exterior faces that was continued around the column on the interior using long FRP anchors or connectors. On the upper floors, the solution was to confine only a part of the column section so as to not impact the interior of the building at all. To validate this innovative use of FRP fabrics and anchors, an experimental test program was implemented. The testing showed that the proposed FRP configurations would adequately improve the seismic performance of the columns and the building. In addition to the columns, interior walls and beams were also strengthened with FRP.

KL Structures participated in the project as the specialty engineer for the FRP design. KL Structures prepared the final calculations and FRP installation drawings and assisted the construction team through the installation process. The project was completed in 2015.

This innovative approach developed by NYASE allowed the client to seismically improve the structure with minimum disruption to the interior of the building.

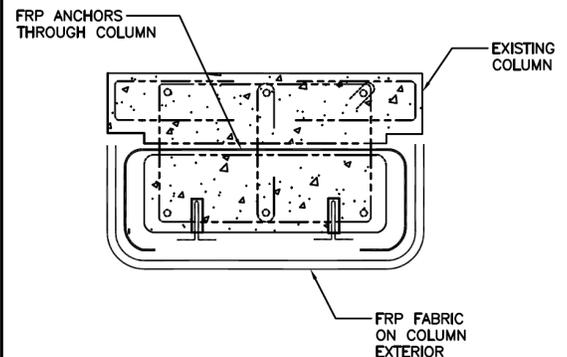
Structural Engineer: Nabih Youssef Structural Engineers  
Peer Review: Engelkirk Structural Engineers  
General Contractor: PCL Construction  
FRP Installer: Slater Waterproofing, Inc  
Specialty Engineer: KL Structures  
FRP Material Manufacturer: Milliken Infrastructure Solutions



FRP fabric on column exterior



FRP anchors on column interior at 1<sup>st</sup> floor



Partial column confinement at upper floors