A COMPARATIVE STUDY OF THE MODELLING OF CAST-IN-PLACE AND POST-TENSIONED PRECAST SHEAR WALLS IN A BUILDING FOR SEISMIC FORCES

A PROJECT REPORT

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in partial fulfillment of the requirements
for the award of the degree of

MASTER OF TECHNOLOGY
in
CIVIL ENGINEERING

STRUCTURAL ENGINEERING DIVISION

DEPARTMENT OF CIVIL ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY MADRAS
MAY 2015

ABSTRACT

The conventional concrete shear walls are a cost-effective way to provide acceptable life-safety and collapse prevention performances against earthquakes. A tall reinforced concrete wall primarily resists lateral forces generated by earthquakes through the formation of a flexural plastic hinge at the base of the wall. The economic impact of the associated structural damage and permanent drift can be significant. On the contrary, a precast concrete wall without any continuity with the foundation, but connected with a vertical unbonded post tensioned tendon placed centrally, can resist the lateral forces that are generated during an earthquake with minimal structural damage. The tendon remains elastic and provides a restoring force, minimizing residual drifts.

The present study analysed the lateral load response of a post-tensioned (PT) precast shear wall located centrally in a typical low-rise multi-storeyed building. A model was developed for the PT wall using non-linear multi-layered shell elements and gap elements. First, Monotonic pushover analysis and non-linear time history analysis were performed on stand-alone models of the wall. A comparative study was done with a reference cast-in-place (CIP) wall, monolithic with the foundation. Next, push over analysis was conducted on the building model with PT wall and the corresponding CIP wall.

It was observed from the pushover analysis of the stand-alone walls that, the initial lateral stiffness of CIP and PT walls were almost the same. However, after the initiation of gap at the base of the PT wall, there was a degradation in stiffness. Parametric study showed the increase in lateral stiffness of the PT wall, with increasing post-tension. The non-linear time history results showed that, the moment generated at the base of the PT wall was significantly less, implying reduced damage. However, the energy dissipation capacity of the PT wall was comparatively less than that of the CIP wall. The modelling of the post tension with a vertical compressive load was not suitable beyond a certain lateral drift. In the pushover analysis of the building, the difference in the behaviour of the walls was not reflected in the overall building behaviour.

Keywords: *Cast-in-place, Post-tensioned, Precast, Shear wall, Pushover analysis*