BEHAVIOR AND DESIGN OF PRECAST CONCRETE COLUMN FOR FAST BUILT AND SEISMIC RESISTANT HOUSE USING OPEN FRAME SYSTEM

By : Fathmah Mahmud
Student Identity Number : 3108202004
Supervisor : Tavio, S.T., M.T., Ph.D.
Co-Supervisor : Data Iranata, S.T., M.T., Ph.D.

ABSTRACT

Precast is more effective and efficient than in situ concrete in case of construction time. Precast houses that observed are non-multistoried house (RTB) with 66 m² area and multistoried house (RBT) with 36 m² area, with Open Frame and Infilled-Frame System which analyzed by teamwork. In this study, observation is focused to the behavior and design of precast concrete column of house using Open Frame system.

Before the dimension and reinforcement been determined, analysis was started with smaller dimension of column through trial process. Because the column should be designed with Strong Column Weak Beam requirement, so the design of column is related with the design of beam and effected by beam-column joint capacity. The optimum dimension and longitudinal reinforcement that have been determined for RTB (in WG 6 and 4) is 150x150 mm² (4D16), for RBT (in Seismic Zone 6 and 4) is 250x250 mm² (8D16). The result of XTRACT shows that the column element can be design with optimum stirrup spacing of 90 mm with curvature ductility more than 16. From XTRACT analysis for RTB: \( \mu_\varphi = 16,36 \), for RBT: \( \mu_\varphi = 19,36 \). Structure performance through Pushover Analysis using SAP2000 shows that the plastic hinge seems to appears at the first time on beam. Displacement ductility of structure is more than 5.3, for RTB = 8, RBT = 11,33. Analysis result of Lusas 13.5 shows that the column is very strong to resist the combination of dead load, life load and lateral load.

To accelerate construction time, it is used dry joint for the connection. The connection is designed by considering column capacity and analyzed using Lusas 13.5 and XTRACT. There are four type of connection of column-to-column or column to foundation that designed, they are short-steel column connection, connection using base plate with bolt, connection using welded-base plate, mechanical connection using FD Grip. From these four type of connection, it is recommended to use FD Grip because it has some advantages such as cheapest price, lightweight, and good workability.

Keywords : precast, column, open frame, XTRACT, pushover, Lusas.