Evaluation of Base Shear Absorption of Combined System; RC Frame & Precast 3d Panels with Irregularities in Vertical

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ABSTRACT

The current study investigates the base shear absorption of combined systems, RC frame pre-cast 3D wall sandwich panels in both linear and non-linear material properties. The seismic behavior of building constructed by 3D panels is studied using numerical approach finite element method. The obtained results are compared with regular bending RC frames, complete box type sandwich wall panels system, and present the differences of behavior and absorbance in each system and also the variation of vertical stiffness on structural response is examined. The material nonlinearities simulated with drucker-prager and von-misses failure criteria. The validation of FEM analysis is test with those obtained through experimental.

Keywords: panel structures, dynamic behavior, nonlinear analysis, base shear.

1. INTRODUCTION

3-D wall panels are used in construction of exterior and interior bearing and non-load bearing walls and floors of building of all types of construction. This system consists of a welded wire space frame integrated with a polystyrene insulation core. The wall panel is placed in position and Wythes of concrete are applied to both sides. Wall panel receives its strength and rigidity by the diagonal cross wires welded to the welded-wire fabric on each side. This combination produces a truss behavior, which provides rigidity and shear terms for full composite behavior, Salmon et al [1]. Speeds in construction, weight lightening and thermal insulation are the marked privileges for building built up with such innovative system.

Figure 1- Details of 3D panel

One of the most evident limitations of such box type system is in parking floor at lower level. Due to vehicle maneuver, some internal walls are replaced by RC frames and the bearing walls are discontinued. Such non-uniformity in vertical stiffness influences on structural performance under transient dynamic loads under earthquakes. The problem is described as to investigate the seismic behavior of up to five stories building including one parking floor combined with box type 3D system. The study may extend to any combination of 3D bearing wall system and RC framework. As a background of the subject, Moehle [2, 3], studied seismic response of four stories RC building. Wood [4] investigates dynamic performance of RC frame with variable stiffness. Lu et al [5] presented the results of the earthquake simulation tests on two of the frames with strength and stiffness irregularities.

2. DYNAMIC ANALYSIS

Non-linear Von-Misses and Drucker-Prager criterion as two elastic-perfect plastic model with bi-linear stress-strain curve are taken in dynamic analysis. The governing equilibrium equation of a finite element system for dynamic response is

$$M\ddot{U} + C\dot{U} + KU = R$$

Where M, C, and K are mass, dampers and stiffness matrices and R are exerted load vectors. $\ddot{U}$, $\dot{U}$ *and* U are acceleration, velocity and displacement system, respectively. The quasi-static time history method is used for