ABSTRACT

‘Earthquake’ which is arguably the most dreadful natural calamity is off late not so rare in Indian subcontinent. The vast extent of damage and the consequent loss of life associated with earthquakes reflect the poor construction practice in India. In order to build earthquake resistant structures, considerable research and dissemination of information is necessary in the design and detailing structural elements. In the present work, experimental and analytical investigations are carried out to study the performance of exterior shear wall–diaphragm joints of reinforced concrete multi storey buildings.

The connection between slab and shear wall is an essential link in the lateral load resisting mechanism of slab - wall systems. The performance of the connection can influence the pattern and distribution of lateral forces among the vertical elements of the structure. From the literature reviewed it is clear that paucity of information exists in the area of detailing of shear wall to diaphragm connection. Hence an attempt has been made to study the effect of detailing of shear wall - diaphragm connection and thereby evolve suggestions to be incorporated in relevant Indian Code of Practice (IS 13920).
In the present work, it is proposed to study the behaviour of the shear wall–slab connection for different detailing options such as (i) conventional reinforcements of U hooks connecting shear wall and diaphragm (DT1), (ii) slab bars bent 90° at the core region (DT2), (iii) slab bars bent 45° at the core region (DT3) and (iv) slab bars bent 90° at the core region along with the provision of slab shear reinforcement (DT4). Eighteen specimens were tested under axial load on the top of the shear wall and cyclic load at the end of the slab. Analytical modeling of the shear wall–diaphragm joint was carried out using finite element software package ANSYS and the analytical results were validated with experimental results. The best performance was exhibited by the joint with 45° bent slab bars at the shear wall–diaphragm joint (DT3) in respect to maximum ductility, energy dissipation, cracking and failure mode. A parametric study was also carried out for parameters like (i) the ratio of height of shear wall to effective width of the slab, (ii) the ratio of thickness of slab to the thickness of shear wall and (iii) the development length. From the parametric study it is found that the specimen has exhibited higher ultimate strength and deformation capacity when the confining U hooks are extended for an effective length of H/2.25 (PT2) when compared with H/2.8 (PT1). Empirical expressions already available in literature were also employed to compute the joint shear stress and it was compared with both analytical and experimental results. Good correlation was found between the theoretical and experimental results.