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INVESTIGATION ON COMPATIBILITY TORSION OF CONCRETE FLOOR SLABS

By

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BSc. 2014, Structural Division,

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No part of this thesis has been submitted for a degree or qualification at any other University or Institution.

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ABSTRACT

Many structural elements such as eccentrically loaded bridge girders, curved beam in plan, grids, beam-slab structural system and spandrel beams in buildings are subjected to significant torsional moments. Such members are subjected to twisting about its longitudinal axial, known as torsion, in addition to the shear force and bending moment, hence the external loads act far away from the vertical plane of bending. To design such members, it is essential to recognize whether the torsional moment is required to

maintain equilibrium or compatibility. These two cases are generally referred to as equilibrium torsion or compatibility torsion, respectively. Torsion in determinate structures is always equilibrium torsion, while that in indeterminate structures can be of compatibility torsion which happens in spandrel beams and it will be the matter of this study. Once the spandrel beam cracks in torsion, its torsional stiffness reduces substantially. The reduction causes a significant redistribution of torque to the framing element.

The presented thesis introduces an experimental and analytical study in order to investigate the compatibility torsion of spandrel beams taking into consideration the effect of cracking, torsional reinforcement for main beam (spandrel beam), degree of fixation, and reinforcement ratio. A total of four specimens were tested under concentrated load and the findings were reported, including capacity, serviceability limit states and failure mode. Analysis and prediction of the tested specimens are also presented in the light of recommendations of international codes.

Keywords: Compatibility, Grid slabs, RC, rotation, spandrel, torsion, T-shaped frame, torsional reinforcement.

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