World Journal of
Engineering

Wold Journal of Engineering 4(4) (2007) 82-92

Study of stiffened coupled shear walls supported on rigid foundations, under wind action

Ali Lahmar[1]*, Toufik Benmansour[2] and Lamri Bensmail[3]

1 *Department Civil Engineering, University of Oum–Bouaghi, Algeria.*
2 *Department of Mechanical engineering, University of Constantine, Algeria.*
3 *Department of Hydraulics, University of Batna, Algeria.*
* *Corresponding Author: E-mail: alilahmar2000@yahoo.fr.*

(Received 10 June 2007; accepted 11 November 2007)

Abstract

A particular analysis is presented for the particular case of a pair of laterally loaded coupled shear walls, supported on rigid foundations, with one or two stiffening beams at arbitrary positions on the height, based on the continuum approach for the particular case of a uniformly distributed load simulating wind action and equations for this particular case are presented.

Closed solutions are given. Numerical examples show that the structural performance can be improved considerably by the addition of two stiffening beams, the greatest benefits being achieved when the beams are located at roughly one-third and two-thirds of the height. The corresponding optimum position for a single stiffening beam is between 0.4 and 0.5 of the height of the structure.

Key words: *Coupled shear walls, Continuum, Uniformly distributed load, Rigid foundations, Stiffening beams, Wind*

1. Introduction

In a cross-wall residential building, the depth of a lintel beam connecting shear walls will usually be limited by the difference between the floor-to-floor height and the floor clear height. Restrictions on coupling stiffness may arise similarly with shear walls connected solely by floor slabs. As a result, the coupling effect of the connecting system may not be adequate to provide the required lateral stiffness, and the tensile bending stresses in the lower sections of the walls may become excessive.

One way of overcoming this problem without affecting the essential regularity of the structural system is to provide additional stiffening elements, such as a beam or truss, at one or more levels in the building, to enhance the coupling stiffness. Suitable architectural positions for such a stiffening beam would be at the top of the building, at a podium level, or at the base if the wall foundations are flexible (Miloud, 2005; Leila and Bouzidi, 2006).

Early papers (Coull 1974; Coull and Choo, 1984; Assadi *et al.*, 2004) showed that a relatively modest top or bottom stiffening beam could improve considerably the performance of a pair of coupled shear walls. Subsequently, Chan and Kuang (1989) considered the effect of an intermediate

ISSN:1708-5284