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STRUCTURAL BEHAVIOUR OF STEEL FABRIC REINFORCED CONCRETE WALL PANEL UNDER ECCENTRIC LOADING

RUZITAH BT. SUPINYEH

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ABSTRACT

Recently reinforced concrete walls have gained greater acceptance from many countries in conjunction with the Industrialized Building System (IBS). Essentially, the system gives an advantage in reducing the dependency of foreign labour and a better investment in technologies, techniques and processes of construction.

Steel fabric reinforced concrete wall panel has been used in Malaysia in the past few years and can still be considered as a new construction method. This type of wall may require sequential analysis in making an effective product that gives advantages in all aspects and gives better performance. This research involved laboratory experimental work and model by using a finite element computer program as comparison of the results.

Laboratory works tested eight wall samples with size of 1.0 m x 1.5 m and 0.75 m thick. (Length:Height:Width). The wall samples reinforced with double layer steel fabric size B7 with yield strength of 510 N/mm^2 and concrete Grade 30. The wall panel tested under axial load with the eccentric t/6 or 12.5 mm of wall thickness. Variations of support condition include of t/6 with pinned or fixed imposed at the top and bottom of the wall panel.

The analysis of the wall panel model yielded from the computer program PROKON of version 2.4 by using a 3-dimensional model of the wall panel. It was modeled as support condition pin on top and fixed at the bottom of the wall.

Experimental result shows due to eccentric loading that all of the wall panels failed in compression shear which the wall panels shown a single curvature pattern where it bends towards the rear side. There are no cracks seen on both front and rear surfaces of the wall panel unless it crushed at top and base of the wall. Maximum deflection recorded at ultimate load was located at the 375 mm (0.25H), 750 mm (0.5H) and 1050 mm (0.7H) from the base of wall panel. It is observed that the ultimate eccentric loads (P_{ult}) of 991.45 kN and maximum deflection 9.67 mm obtained from the experimental works.

The computer analysis shows that the wall panel failed by buckling. Higher stress concentration appears at the upper and bottom corner of the wall panel. The deflection of 11.44 mm obtained and the value over by 18.3% compared with the experimental results. Comparison with the experimental and the computer analysis results were found in good agreement.

Keyword: concrete wall panel, steel fabric, eccentric

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INTRODUCTION

1.0 INTRODUCTION

A changed in structural design from moment-resisting to flexible frames with stiff shear resisting elements has occurred in recent years. In Malaysia the changed starts in late 1990's when the Government plan for zero squatters in Kuala Lumpur. As such steel tunnel formwork system or Tunnel form had been used in replacement of conventional sawn timber formwork. They are a number of generic forms of shear wall structure or Industrial Building System (IBS) named as Steel Tunnel Formwork System, Steel Shear Wall Climbing Formwork System and Steel Wall Panel System

Shear wall offers efficient means of enclosing and utilizing space. Thinner walls reduce the cost of buildings as well as increase the net lettable space of a building. Shear wall did not require column and beam as structural members. It can act as column and could transfer load from roof to foundation. A combination of pile and raft foundation is practically and economical design when the shear wall floor started at ground floor.

Shear wall building is commonly built to consist 10 to 35 storey. This is the most suitable construction method to build apartment units in several blocks and within limited time frame. The construction speed of the shear wall is normally controlled by the concreting and subsequent depropping of the floor slabs. Props should be left in place until the slab has achieved adequate strength to resist further propping and construction loads.

Practically, the thickness of wall is varies from 100 mm to 225 mm. Loads on the wall are usually in plane axial loads and lateral load but often they