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Finite element analysis of slip-formed load bearing wall panels with different structural configurations

A system of wall construction by slip-forming a compacted mixture of a lean dry mix of crusher dust and cement in a slip-form specially developed for this purpose was introduced in mid 80's by A N S Kulasinghe. It was estimated that the cost of building could be reduced by about 50% using this method. As at present, the application of this technique is limited up to 5 storied buildings, the possibilities are being investigated to extending the same technique up to about 8-12 floors (i.e. medium rise buildings)

This paper presents the results of an analytical investigation carried out using finite element technique to understand the behavior of the slip-formed load bearing wall panel, which is the basic building block of the structure. In two distinct studies, solid panels and panel with openings were studied under vertical and lateral loading and the effects of material properties on analytical results were investigated, for the range of material properties found from experimental work.

The former investigation shows that, for the vertical load, the vertical compressive stress is dominant and for lateral load, the vertical tensile stress is dominant. It can be seen that the predicted compressive stress for the lower most panel of a 10 storeyed building is not within the strength limits of the solid panels made of mixture 1:12 cement to crusher dust (by volume). This indicates the necessity of strengthening the lower panels using rich mixtures such as 1:8 and 1:6 with higher compressive strength. Further, it can be seen that the maximum bending stress in the panel does not exceed the flexural strength of the mix 1:12.

During the latter investigation, It was observed that for 50-100% increment of Young's modulus, the maximum vertical and lateral compressive stress varies by 5 to 15 %, also

maximum vertical and lateral tensile stress varies by 1 to 5%. For 50-100% increment of Poisson's ratio all stress resultants varies form 1 to 4% except in variation of maximum lateral tensile stress, which varies from 50 to 110%. Hence, it can be concluded that the sensitivity of stresses for Young's modulus is relatively high and for Poisson's ratio is relatively low except in lateral tension.