

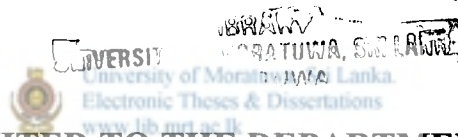
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**DEVELOPMENT OF NOMINAL MIXES SUITABLE  
FOR SMALL CONSTRUCTION SITES IN SRI  
LANKA**

BY  
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(MSc/C/14/2002)



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## DECLARATION

I, Parana Thanthirige Ranil Shanaka Sugathadasa, hereby declare that the content of this thesis is the output of original research work carried out over a period of 15 months at the Department of Civil Engineering, University of Moratuwa. Whenever others' work is included in this thesis, it is appropriately acknowledged as a reference.



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## Abstract

Both strength and durability of concrete are now considered as significant issues for concrete structures. In BS 8110: Part 1: 1985, the improved durability of concrete is achieved by using mixes with higher strength such as Grades 25 and 30. However, a recent survey has found that volume batched nominal mix of 1:2:4 (20 mm) is still used in many construction sites in Sri Lanka, especially in the outstation sites. Though this mix gives 28 days compressive strength of 20 N/mm<sup>2</sup>, the long term durability of this concrete specially when exposed to aggressive environment is questionable. This could be an undesirable situation which should be corrected with both short term and long term solutions. The concrete mixes such as 1: 1.5: 3 and 1: 1: 2 recommended for Grades 25 and 30 are also not often used since they are expensive. It is shown that these two mixes could contain about 375 kg/m<sup>3</sup> and 485 kg/m<sup>3</sup>, respectively. These are quite high cement contents and hence indicated the possibility for reduction to make them more cost effective. However, in all these mixes, the fine to coarse aggregate ratio was maintained at 1:2 so that the same gauge boxes could be used at the site.



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In this research, a cost effective short term solution is suggested to obtain Grades 25 and 30 concretes based on detailed experimental programme. It is shown that strengths of 25 N/mm<sup>2</sup> and 30 N/mm<sup>2</sup> could be obtained with volume batched 1:2:4 nominal mixes by adding extra cement. For Grade 25, 20% extra cement could be recommended. For Grade 30, it is 30%. This can be considered as a quite practical solution since an extra gauge box for the percentage increase in volume of cement could be used.

With the aid of sorptivity testing, it is shown that extra cement could give enhanced durability. This study was further extended to determine the effectiveness of silica fume with locally available fine and coarse aggregates. It is shown that silica fume could give strength enhancement with certain mix proportions. It could also give the same workability at a lower binder to water ratio. It could also reduce the sorptivity thus increasing the durability.

Key words: Nominal concrete mixes, compressive strength, sorptivity

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