

**STUDY ON IMPROVEMENTS TO THE STRUCTURAL
PERFORMANCES AND COST OPTIMIZATION OF
EXISTING TELECOMMUNICATION POLES**

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Master in Engineering
Structural Engineering Designs



Department of Civil Engineering

University of Moratuwa
Sri Lanka

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This thesis is submitted to the Department of Civil Engineering of the University of Moratuwa, Sri Lanka in partial fulfilment of the requirement of Degree of Master of Engineering in Structural Engineering Designs

Department of Civil Engineering

University of Moratuwa,

Sri Lanka

March 2016

DECLARATION

“The work included in this report was done by me, and only by me, and the work has not been submitted for any other academic qualification at any institution”.

Name: W.A.K Basil Kumara

Date: 26-02-2016

“I certify that the declaration above by the candidate is true to the best of my knowledge and that this dissertation is acceptable for evaluation for the Degree of Master of Engineering in structural engineering designs”



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Date: 26-02-2016

ABSTRACT

Presently SLT invests huge capital on production of RCC poles to draw various types of telecommunication cables and hence explores the possibilities of minimizing the investment on production of RCC poles by introducing economized pole design or modifying the existing RCC poles with less production cost.

There are numerous problems associated with conventional telecommunication posts currently being used in practice such as prone to corrosion in coastal belt areas. Much difficult to maintain uniform quality throughout the pole length due to manual practices of concrete mixing, bar bending, formwork etc., this will further aggravate due to lack of skilled personals for operation. In such a situation life span of the final products are doubtful. Manufacturing processes are often been carried out by sub-contracting labour groups so that they can produce maximum number of poles in very limited period to cater for the demand. At the same time they are trying their best to make maximum profit, result is sub standard products.

Sri Lanka Telecom currently invest huge sum of money for the production of telecommunication posts in an yearly basis as demands are high, therefore Sri Lanka Telecom is compelled to invest additional amount to investigate and overcome the above problems in sought of producing good quality products with optimum cost.

External forces encountered by the telecom poles are bending, axial forces, torsion forces or a combination of those three forces. These primary influences may be accompanied by shearing forces and sometimes by torsion. Effects due to changes in temperature, shrinkage, creep of the concrete, and the possibility of damage resulting from overloading, local damage, abrasion, vibration, chemical attack and similar causes may have also to be considered. An efficiently designed poles are one in which the weight, loads and forces are transmitted to the foundations by the economical means consistent with the intended use of the pole and the nature of the ground situation.

The objective of this research work is to study on current designs and their pros and cons, applicable standards, manufacturing process and simulation of structural performance of poles under recommended loading criteria by modern analytical tools.

At the initial stage of study variety of sections are analysed under applicable loading criteria to select most suitable one. Sections considered for analysis are square solid section with pre-stressed reinforcement, square hollow section with normal and pre-stressed reinforcement, circular section with normal and pre-stressed reinforcement, circular hollow section with normal and pre-stressed reinforcement. SAP2000 finite element programme was used to analyse the poles under different loading conditions as specified. Circular hollow section with pre-stressed reinforcements gave the best option and optimum results for the requirements with respect to structural performances, weight and cost.

As a result of this research study, most economical solution has been recommended to overcome the above difficulties. Usual casting practices are revised to spun casting technique with pre-stressed reinforcements and high grade concrete. This will result in finding the superior structural performances, high quality, comparatively low cost and less weight product. Few samples of the new designs are cast and been tested to witness their structural behaviours under the laboratory conditions.

Finally the current and proposed designs are compared to demonstrate the weight reduction. Structural details and specifications for new designs are prepared under different height category of poles to suit manufacturing facilities.



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