Optimum Design Of Plate Girders

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Declaration

I Arosha Narmadha Weeratunga, sincerely and truly declare that the work included in the thesis in part or whole, has not been submitted for any other academic qualification at any institution.

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06/06/2003

UOM Verified Signature

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06/06/2003.

Abstract

Steel plate girders are generally used to span long distances and support heavy loads. They consist of top and bottom flanges connected to a vertical web. The flanges are connected to the web by fillet welds. Plate girders could be custom designed to suit client's requirements. They are often used in situations where rolled steel sections of the required sizes are not available. The designer has the option of selecting suitable dimensions for the flanges and web from a vast range of possibilities. Smaller flange areas could be achieved with deep girders. However deep girders could suffer from shear buckling of the web; a problem that could be overcome by providing either a thick web or stiffening the web. Thick webs result in heavy sections while the thin web option though resulting in material savings could result in a more expensive solution due to high fabrication costs.

The objective of this study is to assist the structural designer achieve a cost effective steel plate girder by providing design guidelines. The study was limited to parallel flanged steel plate girders made of Grade 43 steel and used in buildings.

Optimum dimensions of flanges and webs have been obtained for both stiffened and un-stiffened steel girders of simply supported spans ranging from 3m to 25m, subject to uniformly distributed loads, and point loads of varying magnitudes. The design loads used are those for girders supporting a reinforced concrete slab and subject to office type imposed loads. The girders are designed non-compositely. The design checks for the plate girder were carried out using software developed in-house. The optimum design is selected on the basis of total cost (i.e. material and fabrication costs).

The variation of steel tonnage and the total cost of steel girders for the different parameters selected are presented in tabular and graphical format.

From the results obtained optimum span-to-depth ratios were selected under different girder types with their relevant spans.

This is of particular important to Sri Lanka where rolled steel sections need to be imported much in advance of construction and last minute modifications will thus prove to be difficult. This problem could be overcome by having a steel plate girder custom designed, and fabricated locally, which will be well cost effective.

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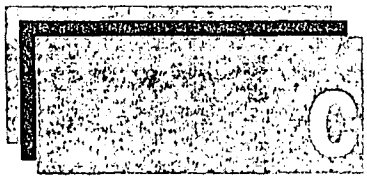
Contents at a Glance



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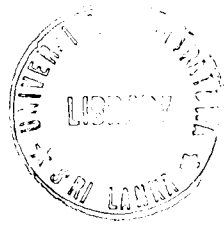

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