".THE PERFORMANCE OF CFRP STRENGTHENED CIRCULAR HOLLOW STEEL SECTIONS"

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Abstract-

Compared to conventional steel sections, the Steel Hollow Sections have better structural performance due to excellent properties of the tubular shape with regard to loading in compression, torsion and bending in all directions. In many structural engineering applications Hollow Sections are widely used such as airport terminal buildings, railway stations, industrial structures, etc. Carbon Fibre Reinforced Polymer (CFRP) strengthening of structures has been with success applied to concrete structures, and additionally it applied to steel structures recently. In hollow section, Steel-CFRP composite combine the benefits of the high strength to weight ratio and more ductile. This paper presents an experimental investigation carried out with two different matrix layouts of carbon fibres on the axial capacity and crushing behaviour of CFRP strengthened Circular Hollow Section (CHS). With and without CFRP wrapping the experiments were conducted on short steel columns

Key Words: Steel Hollow Sections, Carbon Fibre Reinforced Polymer, axial capacity.

1.INTRODUCTION

In the steel construction industry, Tubular structures became typically used due to of their structural efficiency and economical values. Compared to conventional steel sections, the surface and profile of hollow steel section are attractive and structural performance. Design is an interactive process between the functionaland architectura requirements and the strength and fabrication aspects. In a good design, all these aspectshave to be considered in a balanced way. Due to the special features of hollow sections and their connections it is even here of more importance than for steel structures of open sections. The designer should therefore be aware of the various aspects of hollow sections.

2.Material behaviour

Most materials of engineering interest initially respond elastically. If the load exceeds some limit, some part of the deformation will remain when the load is removed. Plasticity theories model the mechanical response of the material as it undergoes such nonrecoverable deformation in a ductile fashion. Most of the plasticity models in ABAQUS are “incremental” theories in which the mechanical strain rate is decomposed into an elastic part and a plastic part. This project considered different material properties in different analysis stages .The excellent properties of the tubular shape have been recognised for a long time; i.e. from ancient time nice examples are known. An outstanding example of bridge design is the Firth of Forth Bridge in Scotlan (1890) with a free span.This bridge has been built up from tubular members made of rolled plates which have been riveted together, because other fabrication methods were at that time no available for these sizes.

3. LITERATURE REVIEW

This paper presents a finite element investigation of the local buckling behaviour of the structural steel Elliptical Hollow SectionThe final stage was to investigate how geometric imperfection affected the buckling modes. The results are benchmarked against experimental results. It was found that the use of an equivalent CHS was a reasonably good predictor of capacity of slender sections and the deformation capacity of compact sections. However, further benchmarking against experimental results is recommended.

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