



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI  
SHORT ABSTRACT OF THESIS

Name of the Student : Ricky Lalthazuala

Roll Number : 166104042

Programme of Study : Ph.D.

Thesis Title:

Structural Behaviour of Hybrid Stainless Steel I-sections – a Finite Element Study

Name of Thesis Supervisor(s) : Prof. Konjengbam Darunkumar Singh

Thesis Submitted to the Department/ Center : Yes

Date of completion of Thesis Viva-Voce Exam : 13-01-2020

Key words for description of Thesis Work : Hybrid stainless steel, Lean duplex stainless steel, Duplex stainless steel, Direct strength method, shear capacity, flexural capacity.

---

**SHORT ABSTRACT**

Structural application of stainless steel members has been increased, especially when there is a demand for supreme aesthetic, high strength to weight ratio, good corrosion resistance, high ductility, low maintenance cost, impact and fire resistances etc. Despite its attractive advantages, its uses in the construction industry have been slow, owing to higher material cost as compared to carbon steel. However, it has become possible to present cost-effective stainless steel material, with the development of relatively newer grades of stainless steel such as Duplex stainless steel (DSS) and Lean duplex stainless steel (LDSS), which have lesser nickel content of ~ 4-5% and ~ 1.5% respectively. As compared with austenitic grades, DSS offers better corrosion resistances, higher strength and better wear resistances. In comparison to DSS, LDSS is relatively a newer breed of stainless steel alloy, with lesser nickel content, and hence resulted in considerably reduction in cost. Also, LDSS has better corrosion resistance, higher temperature properties, adequate weldability and fracture toughness properties, than the austenitic variety.

In steel structures having large spans and heavy loads, efficient and economic design is achieved by adopting hybrid girders. A hybrid steel girder/beam is basically a welded steel girder having higher strength steel grade in the flanges with relatively lower strength steel web. Thus, the aim of this research is to investigate the structural behaviour of hybrid stainless steel I-sections. Study is initiated on the flexural and shear behaviour of Hybrid stainless steel (HSS) adopting LDSS and DSS in the web and flanges respectively. In addition, study is further extended to cover the structural performance of hybrid stainless steel stub columns under axial compression load.