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Investigation on Static & Dynamic Behaviour of Stiffened Panels

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Abstract: ***Stiffeners are secondary plates or sections which are attached to beam webs or flanges to stiffen them against out of plane deformations .Almost all main bridge beams will have stiffeners. However, most will only have transverse web stiffeners, i.e. vertical stiffeners attached to the web. Deep beams sometimes also have longitudinal web stiffeners. It is this rigidity which engineer attempt to utilize when they design thin walled structure such as door, plate girders, box girders and so on. This restraint can be provided by folding the plate along parallel lines, which lie in the longitudinal direction, or restraining a plate is to provide longitudinal stiffener, which are additional plate elements whose planes are inclined to that of the plate. This paper aims to design and develop the light weight, high strength stiffened panels for shaper frames and Machine tool structures. A variety of simple analysis methods have been developed for the analysis of stiffened panels. These methods typically belong to one of the following classes: analysis based on smeared properties, simple plate analysis under simple supports, and accurate linked or segmented plate analysis or finite strip analysis. The more complicated or detailed modeling usually employs discredited models such as finite element and boundary element analysis.***

Abstract: Stiffeners, performances, structure

1. Introduction

The concept of a stiffened plate has been developed and now a stiffened plate panel forms the basic building block of many thin steel structures. The stiffened panel with closed cross section as shown in has considerably greater resistance to twisting moments than single connected or so called open sections.

1.1 Types of Stiffeners

There are two principal types of stiffener which is illustrated in the figure 1.1

- Longitudinal stiffeners, which are aligned in the span direction.
- Transverse stiffeners, which are aligned normal to the span direction of the beam.

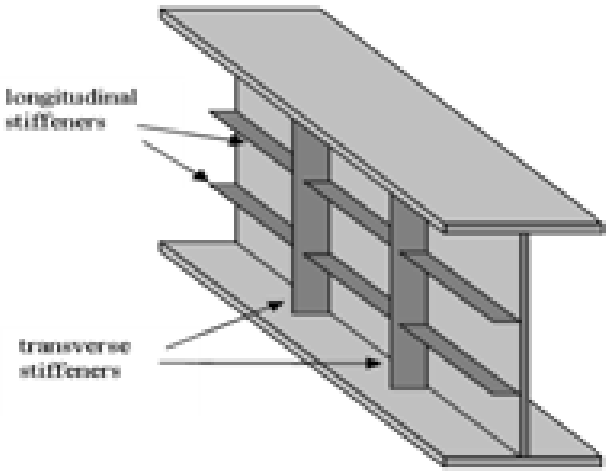

Figure 1.1: Stiffeners

1.2 Transverse Stiffeners

Transverse web stiffeners are usually provided at bearing positions and these are known as bearing stiffeners. For future maintenance it is good practice to provide bearing stiffeners at jacking points (for when girders have to be raised to free bearings for replacement). Other transverse stiffeners are called intermediate transverse web stiffeners.

It is usually necessary to provide intermediate stiffeners on main beam webs for the practical purpose of connecting torsional bracing between the beams. If so, the chosen bracing positions will determine the positions of at least some of the stiffeners. However, for beams with no bracing, such as transverse girders in a ladder deck bridge, or if plan bracing is being used, there may be no practical necessity for intermediate stiffeners at all. The requirement for intermediate transverse web stiffeners is determined by the verification of the shear resistance - this will indicate where stiffeners are needed, and where stiffeners extra to those for bracing are needed.

1.3 Longitudinal Stiffeners

Longitudinal stiffeners should not be necessary on any part of a section that is never in compression nor on any part of the section that is classified as class 1, 2 or 3 in accordance with EN 1993-1-1 clause. Even if the part of the section is classified as class 4, longitudinal stiffeners may still not be required. To determine if the beams have sufficient bending strength without longitudinal stiffeners, the procedure is to follow EN 1993-15.

To determine if longitudinal stiffeners are required on the web to give the main beams sufficient shear strength, the procedure is as for intermediate stiffeners, i.e. to verify the shear resistance of the beam to EN 1993. If longitudinal stiffeners are to be provided they are to be verified by checking the adequacy of the effective stiffener section to act as a column as required by EN 1993.