9. Detail Design

9.1. Detailing practices

Detail design of crane runways requires more care than usual in normal building construction, particularly where design of runways is governed by fatigue. In order to utilise the highest fatigue detail category, the welded details should be given a lot of attention as to the types of welded joints, dressing of welds and accessibility during welding and inspection. Poor detailing and workmanship are factors usually found in structures damaged by fatigue. For further reading on the subject the reader is referred to ref. 40, 41, 61, 67, 72 and 74.

The most attention should be placed on end posts, web stiffeners, web to top flange junction and bearing details as discussed in the following.

9.2. Bolted connections

Apart from the field bolted connections at the supports, bolting can also be used for connecting the web stiffeners and various fixtures, such as power cable brackets. Web stiffeners, high strength bolted in the workshop can be an advantage because drilled holes in the girder web have a relatively high fatigue resistance thus avoiding the necessity to adopt a reduced stress ranges in the tension zone of the girder (see Figure 30). Adoption of welded web stiffeners with unfavourable end terminations often results in a low fatigue detail category leading to uneconomical girder design.

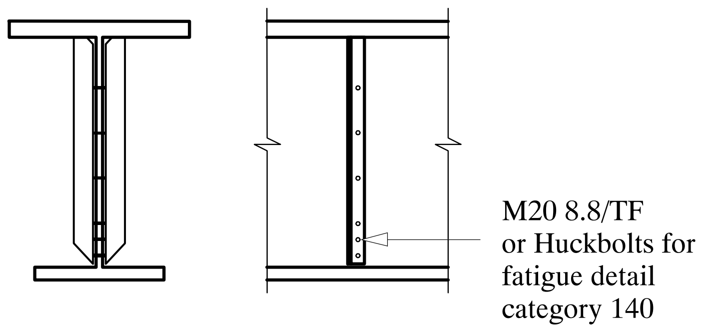

Fig 30. Bolted intermediate web stiffeners

9.3. Welded joints

The life of the runway depends entirely on the quality of welded joints and their type. Workmanship, materials and defect tolerances are specified in the welding code.in terms of category of welded joints: GP (general purpose) and SP (special purpose). The weld category GP is only used for statically loaded, low stressed parts and never for structures subject to fatigue. Australian welding code AS 1554.1 specifies the maximum weld defect tolerances for the particular category. The design engineer has to specify what welding category is to be used and what extent of welding inspection is to be carried out.

Flange to web welds for runway girders should be specified as follows:

- Top running crane girders: top flange:
  - double bevel, full penetration butt welds.
- Bottom flange,
  S8 and S9: Double bevel, full penetration butt welds.
  S1 to S7: Deep penetration fillet welds.
- Welded runway girders for underslung cranes -bottom flange:
  - Full penetration butt welds
- Top flange:
  - Deep penetration fillet welds.

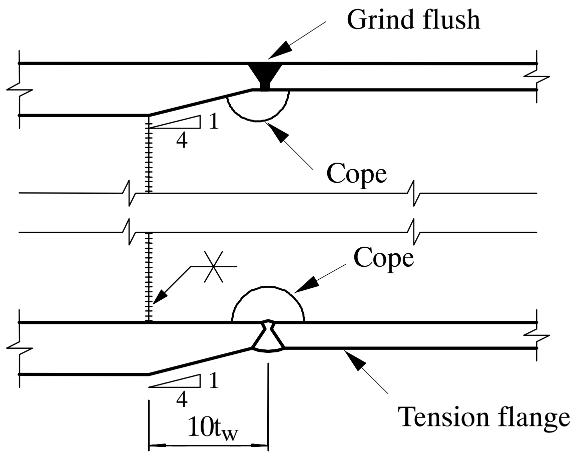

Fig 31. Welded girder splices

9.4. Splices in simply supported runways

Butt-welded shop splices in the flanges should always be butt-welded using double bevel, full penetration welds. To enable good finish at the ends use should be made of run-on and run-off tabs, At thickness changes, the thicker plate should be chamfered with a slope of 1 in 4 to meet the thinner flange, see Figure 31. This is a requirement for all Classes of runway girders for the purpose of increasing the fatigue life of splices. Locating the splices into the lower stressed regions of the girder is consistent with good practice but it is not essential if welds were fully inspected. The flange thicknesses should not be changed on spans up to 12 m because the saving in metal can be totally offset by high cost of the welded splices.

9.5. Avoidance of lamellar tearing

Plates thicker than 22 mm, highly stressed in the through thickness direction may be susceptible to lamellar tearing. Crane runway girders are seldom in this category but bearing details often pose problems. The details prone to lamellar tearing should be examined by ultrasonic testing. Testing should be carried out at least 8 hours after welding because lamellar tears occur after a time delay.

Crane Runway Girders

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