10. Rails and Accessories

The crane runway rails should be regarded as an important part of the crane installation because they can influences the operation of the crane(s). Refer to Part 1 of AS 1418 for the procedure in selecting the appropriate size and material for the crane rai, although the crane manufacturer should nominate the sizes. Crane rails are normally of a 'squat' design minimising the effects of torsion generated by lateral loads but they are not locally manufactured. Railway type rails are less advantageous because they are relatively high and this tends to increase the effect of torsion. Good thing about these rails is that they have a hardened running surface for longer service. Even so, rails for Heavy Duty cranes need to be replaced several times in the life of the runway.

The current practice of using rectangular bars welded directly to the top flange should be viewed as solving a part of the problem. The main idea put forward is that such bars can act compositely with the girder and thus save steel. They also reduce local torsion problem because their height is only a fraction of the rail height. The structural designer should be aware of their drawbacks: the rail joints occur at the supports giving hard knocks as the wheel passes over. In standard rails the splice in the rail would be positioned at least 1 m of the span distance away from the columns. Secondly, welded rectangular bars cannot be easily replaced when they are worn out. Thirdly such rails cannot be moved in service to obtain better alignment and therefore the whole girder must be able to be repositioned.

10.1. Rail splices and expansion joints

Ideally the rail should have flush joints for smooth running of the crane. Crane runways classified as S5 to S9 should be provided with welded rail splices so as to minimise the maintenance problems. Bolted rail splices can be used for lower class runway systems where impacts over the rail gaps are of little consequence. Continuously welded rails are preferable but they do require specialised welding process such as the 'narrow gap' process or Thermit welding

Where bolted splices are used they should be staggered on opposite runways in order to minimise the impact. The bolted joints should not coincide with the girder ends/splices. Figure 38 shows the main features of crane rail splices.

Rail expansion joints in the rails need only be provided at crane runway expansion joints, usually 150 to 200 m apart. Expansion joints are usually scarfed at 25 degree to the rail centreline. Scarfed joints provide a relatively smooth transition from one rail to the next, but they are not long lasting because the rail is weakened at the joint. To prevent the rail creep in the long direction, it is necessary to provide a shear key halfway between the rail joints.

10.2. Rail fixings

Rails must be restrained from lateral movement and uplift by clips or hook bolts. Lateral restraint is required to prevent sliding of the rail under lateral wheel reactions. Uplift restraint prevents the rail to raise ahead of the approaching wheel (bow wave effect). Some designers advocate longitudinal restraint. It is only required midway between the rail expansion joints.

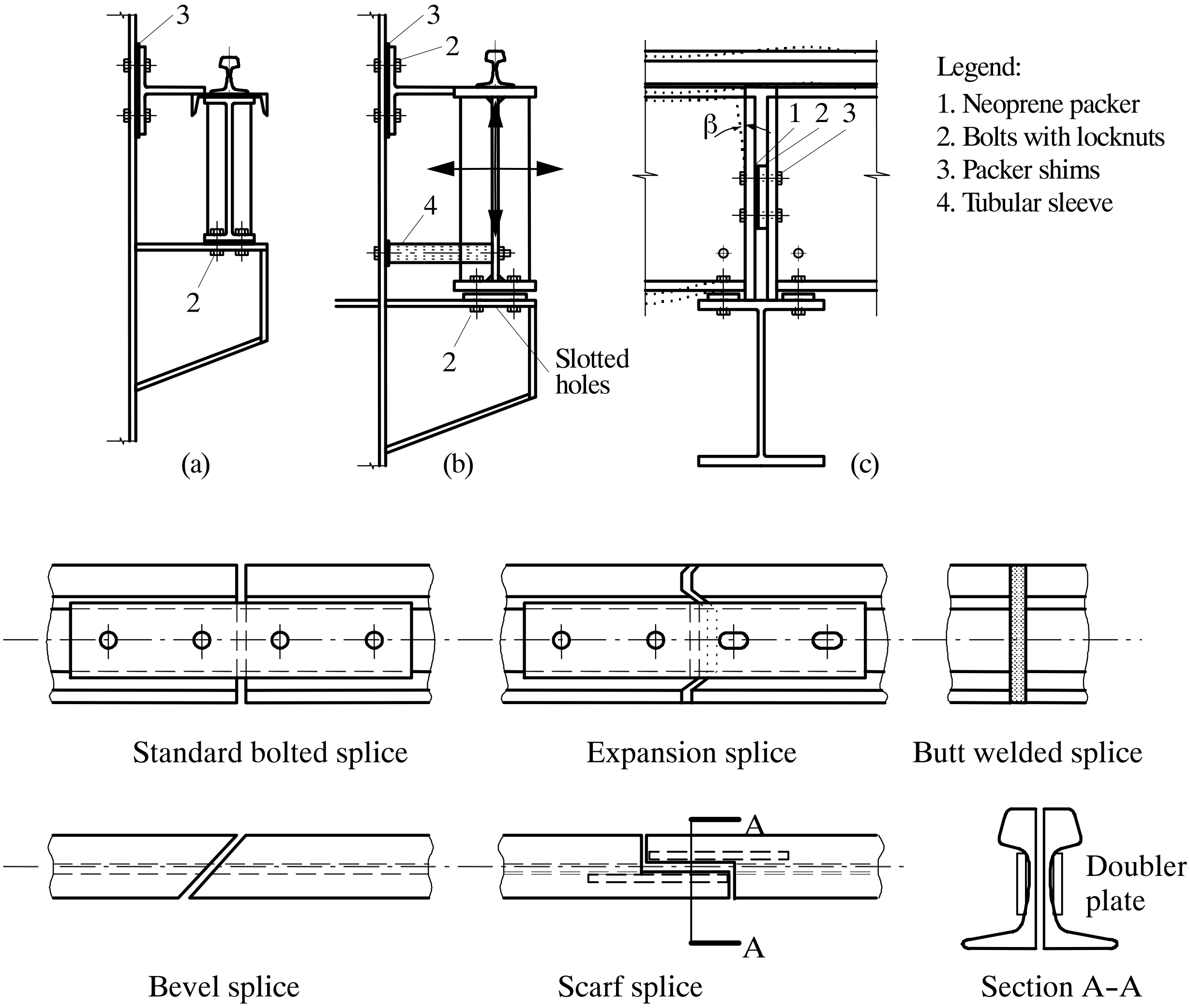

Fig 38. More bearings and crane rail splice details

The rail fixing clips should therefore be designed to provide a reliable lateral and uplift restraint to the rail. In addition, the clips should provide a means of adjusting the lateral rail alignment and permit ease of re-railing when the rails become worn out. With respect to the longitudinal restraint to the rail, there are two methods: longitudinally fixed, and floating. The longitudinally fixed type is obtained by clamping the rail down onto the top flange so as to prevent a situation where during breaking the crane causes the rail to slide and thus starts to travel obliquely. The floating type rail clips are used in conjunction with the proprietary resiliently bedded rail systems having sufficient friction resistance to avoid rail creep (reference 41, 65, 79). The most common type of rail fixings are illustrated in Figure 39.

Crane Runway Girders

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