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Research and Design of Construction of a Bearing Plate of a Counter Rail Attachment Fitting

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Abstract

While implementing the perspective programs of “RZhD”, JSC (high-speed movement, heavy-load movement, resource saving etc.) connected with efficiency increase of railway transport, it is necessary to provide the safe functioning and reliability of all elements of the high layer of the track.

The given article considers the research of the stress-deformed condition in a bearing plate of a counter rail attachment fitting of turnouts. The bearing plate gets out of order as a result of a multi-cycle endurance destruction. Based on developed methods of the experimental research, a scheme discrete model of a counter rail attachment fitting of the turnout was created. The article studies the influence of constructive parameters of a spacing lug and latches on the bearing plate load. The results of the experimental research are used for development and projecting of a new construction of a bearing plate for a counter rail attachment fitting, the patent of useful model 152367.

The authors conducted the comparative research of the stress-deformed condition of bearing plates with the model of a high way construction consisting of three sleepers with a base rail, counter rail and a base plate with two variants of plates: standard and new. An experimental layout of bearing plates was designed which is now being tested and exploited in the Southern Ural Railway.

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Turnouts are the most common constructions among all the junctions and crosses of the way. They serve to join and to fan out different ways and are meant for turning the rolling stock from one way to another. The regular turnout which make 97% [1-4] of all are the most spread on the ways and are frequently used on main and station tracks.

The simple (single) turnout consists of turnout itself, joint ways (straight and curved) and counter rail cross. Directing counter rails must provide the exact path of wheel movements while covering the dead space in turnout, to prevent the strike of wheel tread rim against the tongue piece and the movement of the wheel pair off the rail track.

Figure 1(a, b, c) show the fragments of turnout, its basic scheme and view of counter rail with bearing plates.

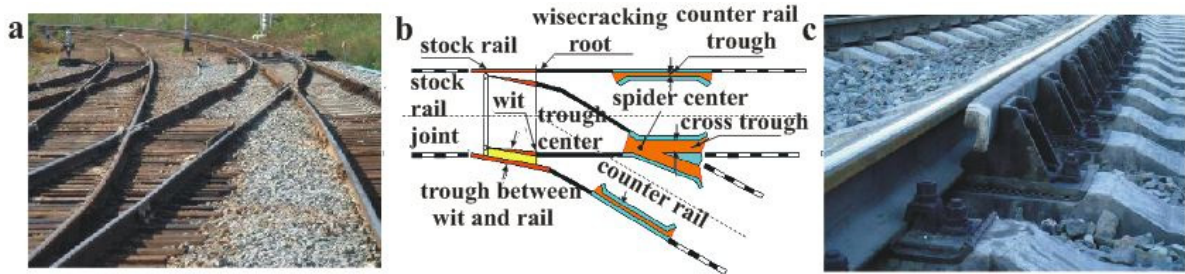


Fig.1. Basic elements of turnout: (a) main view; (b) scheme; (c) counter rail with bearing plates.

While serving these elements face intensive cycle influence from crew cart [5-8]. Some works on research and improvement of turnouts and counter rails are well-known. Problems and perspectives of turnout improvements are considered in the article [11].

The object of this research is the bearing plate of counter rail attachment fitting of turnouts (further on, bearing plate) as the weakest element of turnout.

Analyses of exploitation data shows that bearing plates of counter rails are frequently destroyed from multi-cycle endurance. Figure 2 shows the examples of bearing plate destruction.



Fig. 2. Typical picture of destruction of counter rail bearing plates.

When counter rail bearing plate gets out of order it may cause quite serious accidents and breaks in train time-schedule. The destruction of bearing plate means the change of prescribed distance between counter rail and check rail of turnout; as a result the wheel pair may go with one wheel over the head of check rail or counter rail and then off the rail track or it may cause locking of the wheel pair between counter rail and check rail. Besides the increased deformations of counter rail due to the destruction of bearing plate cause the strike of wheel tread rim against the tongue piece.

According to the instructions on train time-schedule the speed is strictly limited or the movement is completely stopped when bearing plates are destroyed even partially.

Table 1 shows time-schedule of rolling stock over the turnout depending upon the defects in bearing plates of counter rail brake shoe [12].

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