Safety recommendation no. 139

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Safety deficit	On 22 March 2017 at 13:57 two mid-train carriages of a Eurocity train derailed when departing from Lucerne station, so that when the train came to rest one of the carriages was leaning at an angle against an overhead line support. Seven train passengers sustained minor injuries. There was considerable damage to the infrastructure and the carriages. Lucerne station had to be closed to all normal-gauge rail traffic for four days for the infrastructure repairs. The derailment of a Eurocity train on 22 March 2017 at a set of points at Lucerne was due to the wheel flange mounting the top surface of the switch rail. The interaction of different factors resulted in the wheel flange tip running on the top edge of the switch rail at a critical area: The wear shape of the wheel flange resulted in the wheel flange tip moving closer to the switch rail tip. Since the gap at the switch rail was greater than the known values, the switch rail tip was also near to the critical area at the wheel flange tip. The absence of a lubricant film between the wheel flange face and the rail flank led to an increase of friction coefficient, and together with an increased lateral force caused by the fault at the transverse springs of the first bogie to derail, an increased wheel lift occurred while the bogie was travelling. All these factors contributed to the wheel flange tip becoming positioned in such a way that the wheel could rise up on to the top of the switch rail. In addition, the wheel flange tip was somewhat flatter due to rolling, which made rising up on to the switch rail without any counterforce easier. The function dimension qWz at the switch rail tip is checked by means of static measurements with a form gauge, and it can be deduced from this in accordance with the general rules of engineering that the gap dimension qe does not exceed an acceptable value. As part of the investigation it was recognised that with dynamic measuring, the gap dimension qe can turn out to be larger than previously assumed. Under dynamic loading a geometric contact situation arises in which even a wheel profile with no wear can mount the switch rail and derail. This happens when the gap between the stock rail and switch rail is too large.
Safety recommendation	The Federal Office of Transport (FOT) should examine measures and specifications for the gap between stock rails and switch rail and ensure that the gap dimension qe remains restricted under a running train so that a critical situation for derailment does not arise.
Addressees	Bundesamt für Verkehr
Stage of the implementation	The safety recommendation is implemented mutatis mutandis. In the FOT's opinion, the risk of the gap at the switch rail tip of a

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	curved single-slip point/double-slip point causing the wheel to lift (the main cause of derailment due to infrastructure) can be considerably reduced with the measures introduced. This can be done by eliminating the critical curved slip points as far as possible, installing the stronger rail profile 54E2 in order to reduce the likelihood of a gap forming, using switchblades and generally reinforcing the switch rail tip of curved single-slip/double-slip points. Conclusion: The FOT is confident that the safety recommendation objective will be met by these measures
Investigation report concerning the safety recommendation	Vorbericht Médias Medien Schlussbericht Media

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