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RECONSTRUCTION OF CROSS-OVERS WITHIN MODERNIZATION OF RAILWAY STATIONS

Summary. Reconstructions of railway stations within the modernization of railway networks are much more difficult than reconstructions of railway tracks, because these are situated in the town agglomerations and interference with them is very difficult. Bigger problems can come if the curve is continuationing straight behind the gridiron of the station or if the station is even situated in one or in more curves. In these cases there is necessary to design track ramifications and cross-overs from the curve points. Even bigger problems can come if these curves are in the superelevation, which is a frequent instance. The paper contains the possibilities of construction of cross-overs between curved tracks which are inserted into curve in the superelevation.

REKONSTRUKCJA POŁĄCZEŃ TOROWYCH PODCZAS MODERNIZACJI STACJI KOLEJOWYCH

Streszczenie. Przebudowa stacji kolejowych, której konieczność jest konsekwencją modernizowania sieci linii kolejowych, należy do inwestycji bardziej złożonych niż sama rekonstrukcja dróg kolejowych, szczególnie wtedy, gdy stacja usytuowana jest w aglomeracjach miejskich. Trudność sprawia przebudowa podejść do stacji, gdy łuk rozpoczyna się tuż za głowicą lub gdy stacja położona jest na łuku albo na kilku łukach poziomych. W tych przypadkach istnieje potrzeba wykonania połączeń torów za pomocą rozjazdów łukowych. Na większości łuków stosowana jest przechyłka, co stanowi dodatkowe utrudnienie. Artykuł prezentuje możliwości stosowania rozwiązań konstrukcyjnych przy budowie połączeń torowych na łuku z przechyłką.

1. INTRODUCTION

At the present time Železnice Slovenskej republiky (ŽSR) are performing expansive modernization of their railway networks on the railway transit corridors. Modernization is defined as a reconstruction of a railway transportation track on the qualitatively higher standard in the given measure. The modernization is necessary within the frame of integration with EU.

At the present time modernization is concerning these corridors:
IV: state border (Czechia), Kúty - Bratislava - Štúrovo, state border (Hungary)
V : Bratislava - Žilina - Košice - Čierna nad Tisou, state border (Ukraine)

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VI: Žilina - Čadca - Skalité, state border (Poland)

Realization employments on the modernization of these corridor railway tracks in Slovakia were opened in the year 1999.

The main parameters for modernization of railway tracks and stations include:

- *acceleration of speed into 160km/h*
- *construction of permanent way from the rails UIC 60 in the main track*
- *flexible rail fastening on the sleeper*
- *aplication switches of the new generation on the railway tracks and railways stations for designed cross-overs and track ramifications (station gridiron)*
- *in front of station gridiron to install two cross-overs for higher speed*

2. BASIC DATA OF THE SWITCHES IN THE SYSTEM UIC 60 OF THE NEW GENERATION

For the construction of the switches in the system UIC 60 and for the switches in the system S 49 of the new generation it is necessary to follow these conventions:

- Main geometrical disposition is identical with disposition of the existing switches in the system R 65 and S 49. Only at the switches 1:12-500 and 1:18,5-1200 of both systems and at the switch 1:7,5-190 in the system S 49 there are derived other types, in which there is possible to weld in all rail joints in the switch. Thereby it is possible to weld the switch to the continuosly welded rail.
- The switches can be located on the wood sleepers alternatively on the concrete sleepers.
- The switches are constructed for fan layout to sleepers, which makes possible application of the same concrete or wood sleepers for the right and left switch.

The fan layout to sleepers is one of the conditions for transformation of the simple switches into the curve points.

3. DESIGNS OF CROSS-OVERS BETWEEN CURVED TRACKS

On the basis of investigation in existing track joints and ramifications up to now there was found that within modernization our railway network they have to be exchanged.During the modernization of railway tracks and stations it is necessary to respect the new statutes and normes. So far there has been such a practice on ŽSR, that the two-sided flexure turnouts have been used for constructions of curved track joints and ramifications in the curves without superelevations and in the curves in superelevations the similar flexure turnouts have been used for constructions of curved track joints and ramifications. Then the whole track joint and ramification lies on one inclined plane. This solution is very good, but in the case of modernization of railway stations, that is connected with increasing of speed in main tracks and passing tracks it isn´t sufficient. As a result it appears that it is necessary to consider also in our country the possible construction of curved track joints and ramifications from the two-sided flexure turnouts in the curves in superelevations.

Solving the grant project 1/1140/04 at our department there were elaborated the specific designs at which were certified the possibilities of such constructions.

At these designs there was necessary :

- *observe the designed values for side acceleration*
- *calculate and examine possible knot of the curves of the same direction but first of all of the reverse direction*
- *calculate and examine absence of track superelevation I, or overplus of track superelava-tion E*

- *determinate maximum permissible speed for given curve radius according to the suggested relatios for railway tracks with freight-passenger transport*

According to the valid norm STN 73 6360 "Geometrical position and arrangement of 1 435mm gauge railways" the maximum design merit of track superelevation [p] in the similar flexure turnout is permited 120mm, in the two-sided flexure 100mm. Maximum merit of absence track superelevation is I = 100mm (exceptionally till 130).

Because this norm STN 73 6360 will have to synchronize with European norms in the near future, it was necessary to verify the basic parameters of geometrical position and arrangement also in applications of the European norms, namely in ENN13803-1,2,3 especially in ENN13803-1(Railway applications. Track alignment design parameters. Track gauges 1435 mm and wider. Part 1: Plain line.). In these norms there is recommended limit merit of absence track superelevation I in the turnouts for speed $V \leq 160$km/h max. I = 130mm, for speed $160 < V \leq 200$km/h max. I = 160mm.

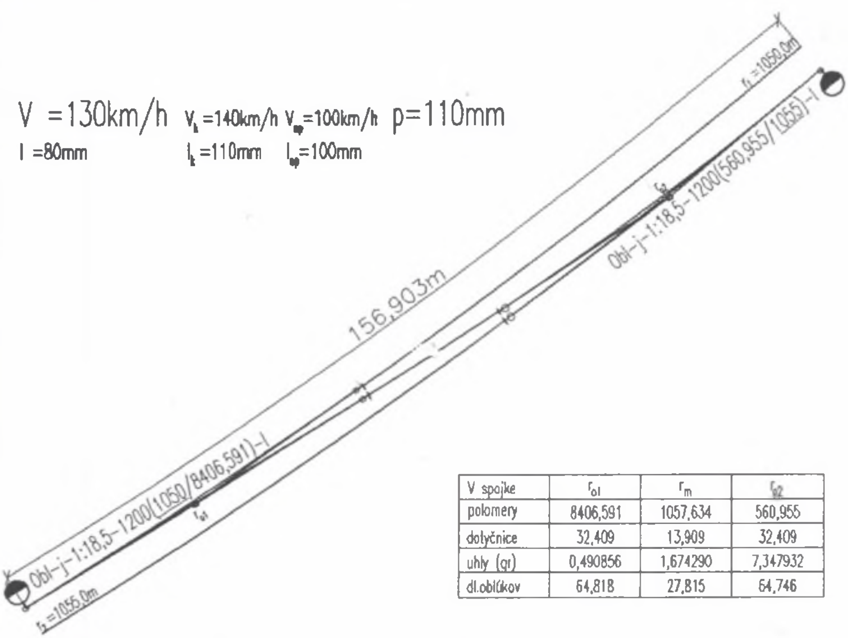
After all check ups in the norms and statutes (and in public notice UIC 703R, and statute DB DS 800.01) there was possible to accede to construction of designs of curved track joints and ramifications of the switches in the system UIC 60 and S 49 of the new generation.

In the figure 1. there is a demonstration of construction one of such curved track joints cross-over between curved tracks running in the same direction

Design speed in the main track V = 130km/h, (Vk = 140km/h) speed in the turning V = 100km/h - used switches 1 : 18,5 – 1200, the similar flexure turnouts, absence track superelevation I = 80mm, in the cross-over I = 100mm.

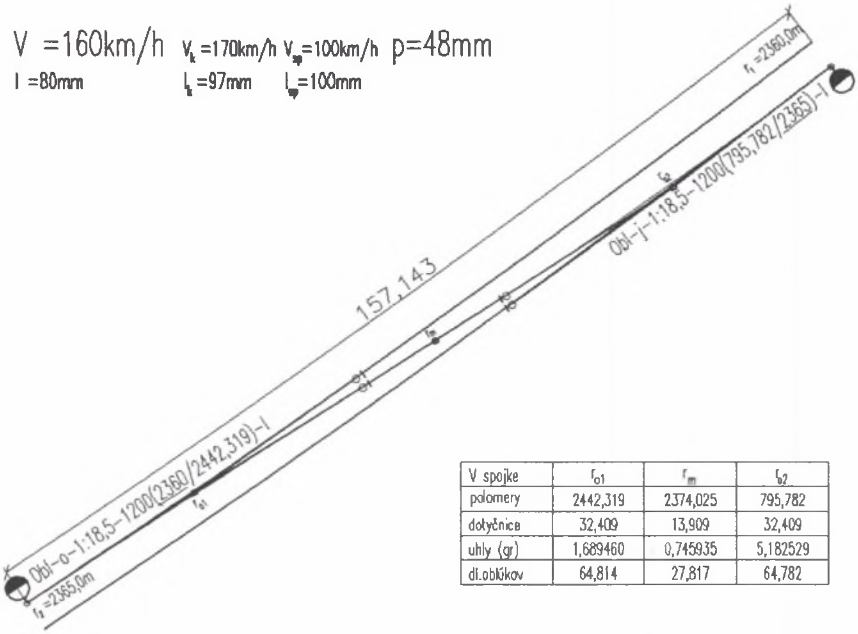
In the figure 2. there is a demonstration of construction one of such curved track joints –cross-over between curved tracks running in the opposite direction

Design speed in the main track V = 160km/h, (Vk = 170km/h) speed in the turning V = 100km/h - used switches 1 : 18,5 – 1200, the similar flexure turnout and the two-sided flexure turnout, absence track superelevation I = 80mm, in the cross-over I = 100mm.



V spojke	r_{o1}	r_m	r_{o2}
polomery	8406,591	1057,634	560,955
dolyčnice	32,409	13,909	32,409
uhly (gr)	0,490856	1,674290	7,347932
dl.oblúkov	64,818	27,815	64,746

Fig. 1. The cross-over between curved tracks running in the same direction
Rys. 1. Połączenie torowe pomiędzy zakrzywionymi torami biegnącymi w tym samym kierunku



V spojke	r_{o1}	r_m	r_{o2}
polomery	2442,319	2374,025	795,782
dotyčnice	32,409	13,909	32,409
uhly (gr)	1,689460	0,745935	5,182529
dl.oblúkov	64,814	27,817	64,782

Fig. 2. The cross-over between curved tracks running in the opposite direction
Rys. 2. Połączenie torowe pomiędzy zakrzywionymi torami biegnącymi w przeciwnym kierunku

4. CONCLUSIONS

Elaborated designs show apparently, that it is possible to use the similar_flexure turnouts in conjunction with the two-sided flexure into constructions of curved track joints and ramifications that lies in the curves with superelevation, with observance of regulations, rules and normes valid today and also in the future.

In this way it is possible to save investible funds, total length of the railway station, to lower cut area in location, these constructions can be designed into existing direction rations , they can be designed of the switches for less speed into bigger speeds and moreover.

References

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2. STN 73 6360: Geometrická poloha a usporiadanie koľaje železničných dráh normálneho rozchodu.
3. ENN 13803-1,2: Railway applications. Track alignment design parameters. Track gauges 1435 mm and wider. Part 1: Plain line, Part 2: Switches and crossing and comparable alignment design situations with abrupt changes of curvature.