Transferium Chomutov

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Abstract: *This paper deals with passenger railway transport accessibility of the city of Chomutov, Czech Republic. The paper presents a conceptual study of a new transportation hub – the Transferium. Based on the unsuitable accessibility of the existing railway station, the location of a new railway station is proposed. The paper addresses the transport and transit demands of the new railway station in the context of current and future traffic. Furthermore, the urban integration of the new station and the surrounding urban space is proposed, and last but not least, the construction and technical context is presented.*

Keywords*: RAILWAY TRANSPORT, PASSENGER TRANSPORT, RAILWAY STATION, SUSTAINABLE TRANSPORT, URBANISM*

1. Introduction

Many cities connected to rail transport do not have a well-located station with regard to current passenger transport needs. The railway station is often located at an unsuitable walking distance from most journey sources and destinations in the city, therefore the use of rail transport also means the use of another mode or system of transport (city public transport, car). Thus another transfer occurs on the entire transport chain and the total travel time is extended. The city of Chomutov in the Czech Republic is such a case.

The city of Chomutov (50,000 inhabitants) in Ústí nad Labem Region lies on the double-track electrified line Ústí n.L. - Cheb. The city is accessible by rail through two access points (Chomutov railway station, Chomutov město stop). Chomutov is currently served by both regional connections and the long-distance line R15 Prague - Ústí n.L. - Chomutov - Cheb and long-distance line R25 Most - Chomutov - Pilsen. Despite the fact that the city is connected to the railway by two access points and both of these points are served by all passenger trains, the overall accessibility of the city by rail is unsatisfactory. None of the existing access points is located in a place with suitable walking distance to the center or to the largest residential areas of the city. At the same time, neither Chomutov railway station nor Chomutov město stop can be effectively (without unnecessary detours) connected to public bus transport and city public transport, and for none of these access points a P + R car park can be built for spatial reasons.

It can be assumed that the importance of the railway transport will increase in the coming years for the city of Chomutov. The expected growth factor is not only the planned reconstruction of the arterial railroad Ústí n.L. - Chomutov - Cheb, which after completion will bring reduction in travel times along the whole axis, but especially the planned connection to the future high-speed line Prague - Most (this is a branch line of the high-speed line Prague - Dresden, which is in intensive design preparation). After the completion of both constructions, the accessibility of Chomutov and Prague by rail will be a completely full-fledged alternative to individual transport and will fundamentally change the existing Modal-Split [2].

For these transport challenges, it is necessary to have an appropriate transport terminal in Chomutov, which can only be created by modifying or rebuilding the existing railway junction. As part of the reconstruction of the railway junction, the current possibilities are very limited: the area of the Chomutov město stop cannot be further expanded, and the Chomutov railway station with possibly suitable area is contrarily located in an unsatisfactory and inappropriately accessible position.

The solution for the reconstruction of the railway junction is a new station located centrally in the city, the *Transferium Chomutov*, working title Chomutov centrum railway station, which would serve as a replacement of the existing Chomutov railway station [5].

The authors of this paper conceived a conceptual transportation-urban design study, which deals with finding a location suitable for a "new station" with a complex function of a "transport terminal" - with better access to the city center and in an area where it will be possible to design technically and technologically functional, urbanistically and spatially functional and architecturally attractive solution of this terminal.

2. Transit and transport demands for the Chomutov railway junction

Transit demands

In the last year before the COVID-19 pandemic, the Chomutov railway station has been used by about 2,500 passengers a day, of which approximately 1,600 passengers fell into regional transport trains [7].

	2015	2016	2017	2018	2019
Departures into other regions	1734,0	1871,1	1746,2	1832,7	1944,0
Arrivals from other regions	1784,0	1841,7	1729,7	1819,0	1990,8
Transport within the region	8040,4	9869,8	10562,6	12585,5	11200,6
Total sum of rail passengers	**11558,4**	**13582,6**	**14038,5**	**16237,2**	**15135,4**

Table 1: *Passenger transport related to Ústecký region by rail (thous. Passengers) Source: Transport Yearbook 2019*

The number of passengers naturally depends on the transport relations that go to / from Chomutov. Based on the 2011 census, the total commute to Chomutov for work and education from the area is 5,751 people, the total commute from Chomutov to the surrounding cities, including the capital city of Prague, is 4,561 people [4].

In Czech realities, regular commuting and rides usually accounts for about 1/3 of the daily realized trips. From the available data, it is clear that improving infrastructure parameters will lead to an increase in regular daily commuting, as was the case in other cities. Commuter data have no informative value about Modal-Split in individual sessions. It is true that more attractive public transport will mean a higher share in the overall transport relationship [1].

While in the near future it is not reasonable to expect a dramatic change in commuting, in the medium-term period it can be expected that - together with the high-quality infrastructure - commuting to Prague will dramatically strengthen.

This reinforcement can take place in 2 levels:

1) the number of departing from Chomutov will not change, but Prague will fundamentally dominate the departure at the expense of other centers; ie a trip to Prague can be approached by up to 1000 people

2) the number of commuters will increase (ie it will be more attractive for the citizens of Chomutov, with regard to the time availability, to commute to work than to look for it in the place itself); ie a trip to Prague could exceed the limit of 1000 people

At the same time, it is necessary to take into account the fact that similarly, transport relations to Chomutov may change from cities in the vicinity (typically eg. Kadaň, Klášterec), which again

partially reorient themselves to the dominance of Prague. Part of these transport flows will also be transferred to the railway and will be loaded to Chomutov junction (either by transfer passengers or in the form of P + R).

If, with a comparable travel time by individual / public transport, we estimate the division of public transport to be 50%, then after the construction of new connections we must realistically count on 500-600 regular commuters on the Chomutov - Prague rail route, which can be reflected in the level of approx. 1500 passengers on this route daily (including irregular journeys).

Compared to the current situation, the passenger load will increase by this value in the Chomutov junction. In the rush hour, in terms of boarding / alighting for a train to / from Prague, the turnover of passengers on one train in the number of 200–300 people can be considered. Both the widths of the platforms and the capacity of the escalators, etc. are dimensioned for these values in the newly designed Chomutov centrum station.

An estimate of the number of parking spaces in the P+R and K+R modes is also based on these values. Parking areas in the P+R mode are designed in the form of a multi-storey parking house so that, if necessary, it is possible to increase its projected capacity, without the need to intervene in the concept of the entire transport hub Chomutov.

In terms of transit function, the current Chomutov railway station will be replaced by the new Chomutov centrum railway station.

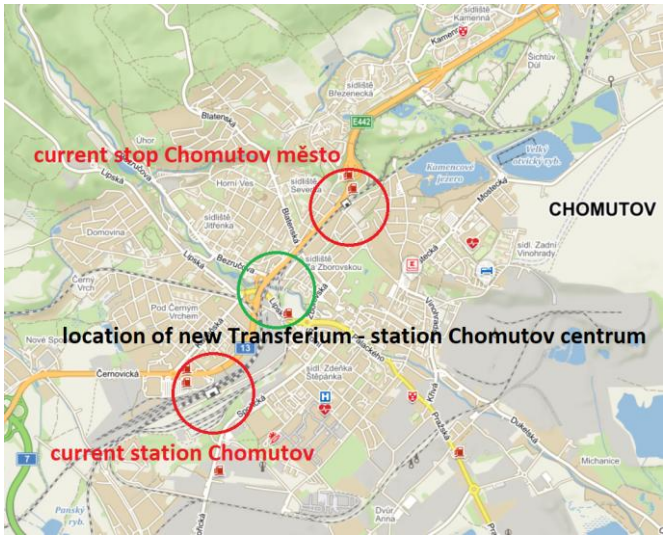

Fig. 1 *Situation of Chomutov service by rail*

We propose that passenger trains then pass through the current railway station unattended. At the same time, we propose the Chomutov město stop to be newly served only by regional transport trains, while long-distance trains will serve Chomutov only at one central point - at the new Chomutov centrum railway station.

Transport demands

Existing conceptual documents of the Ministry of Transport of the Czech Republic [6] and the Ústí nad Labem Region [7] were taken into account in order to specify the prospective scope of passenger transport in determining the required number of transport tracks. The proposed design of the new Chomutov centrum railway station meets both the needs of the short- and medium-term conceptual operating horizon and the strategic outlook.

There are 4 transport tracks with platforms designed in the station (in a new position on the relocated line), while the platform is also situated at the existing connecting track 90 leading to the freight station.

This number of tracks corresponds to transfer ties which can be realized in Chomutov even in the case of a complex tact group.

The maximum occupancy scheme is the following combination:

- Track 1: train direction Klášterec – Most.
- Track 2: train direction Most – Klášterec.
- Track 3: train direction Jirkov – Žatec.
- Track 4: train direction from/to Vejprty.
- Track 90: train direction Žatec – Jirkov.

All alternative ways of creating a complex tact group (without overtaking trains in the same direction) are less demanding in terms of track occupancy.

The considered track 4 is the only one from which it is possible to operate the Vejprty route (in the form of a dead end in the current Chomutov railway station) without collision train paths.

The considered platform at track 90 can generally be used either in the above mentioned case or in case of need of parallel train entries from Klášterec and Žatec to Chomutov centrum railway station and, last but not least, during construction and partial commissioning of Chomutov centrum railway station, and during emergencies.

After completion of the new Chomutov centrum station, the existing Chomutov railway station will remain unattended by passenger transport. From the point of view of the requirements on the functionality of this station [3] in the horizon of the operation of the Chomutov centrum railway station, the preservation of the following needs and functionalities can be defined:

1) Passing of passenger trains in the direction of Chomutov centrum - Vejprty and back (ideally a dead end track approx. 70 m long).
2) Reversal of trains Prague / Ústí n.L. / Most ending in Chomutov (ie an ideally overtaking track situated between the main tracks).
3) Parking and overnighting of trainsets (ie at least 2 tracks), or for cleaning, armament with water (or toilet).
4) Maintaining the connection to the district of the former depot (refueling of motor-units).
5) Connection of the NTM (National Technical Museum) complex
6) Preservation of at least one track for trains from Vejprty (special passenger trains, which would have to go around or reset at the Chomutov railway station, freight trains with the need to reset to the freight yard).

The total track requirements for the new Chomutov railway station thus represent 2 main tracks + 4 secondary tracks + 1 dead end track. The actual implementation of the Chomutov centrum railway station does not produce any additional demands on the Chomutov railway trackage. On the contrary, these demands are significantly lower than the extent of the current trackage. After the completion of the Chomutov centrum railway station, the current Chomutov railway station can either be left in its current state and used up to the end of its life, or reconstructed with a reduction of the tracks.

Connection to bus and city public transport

One of the main goals of creating a central transport hub in Chomutov is to concentrate all means of public transport at one spot in order to enable transfer connections (both to city public transport and regional bus transport). All means of public transport must be arranged in one node so that their interconnections can be efficient, short and fast.

We propose the abolition of the existing bus station and the transfer of bus and public transport stations to the new transport terminal of the Chomutov centrum railway station.

The current bus station has 12 stands for regular transport, 2 stands for city public transport and an exit parking space. The new proposal maintains this scope in principle (or the number of stands is increased by 1) and handling / parking stands are added. According to the Transport Service Plan of the Ústí nad Labem Region, bus transport in the Ústí nad Labem Region is stabilized and we do not anticipate any major turbulence in the order that would cause a lack of bus stops. In the proposal, the individual stands should be suitable for buses with a length of 13 m, in the case of city public transport for articulated trolleybuses with a length of 18 m. For short-term parking, the boarding stand can also be used as a handling parking; for longer shutdowns beyond the scope of the proposed 5 parking spaces, transitions to suitable premises would be necessary (eg garages of the DPCHJ transport company).

3. Urban design proposal

The basis of the urban design proposal is the transfer of the train station to the given locality and the creation of a Station square. The station building is oriented towards the city center and forms the compositional opposite of the municipality building. The station also defines the front of the Station square. The main access to the station is from the city center along a wide pedestrian / cycle promenade. On the north side, the promenade is lined with commercial spaces, which form the northern north front of the square. From the south side, the promenade is followed by the tree alley and the new bus station (transferred here from its current location). The bus station ends with a block of shops, delimiting the south side of the square. The Station square thus acquires the site plan of a rectangular horseshoe opened towards the city center. Inside the horseshoe is a bus station. The access road to the square leads from the roundabout at the intersection Lipská / Zborovská / Školní / Wolkerova. The access road serves the bus station, P+R parking house, K+R parking and shop supply road.

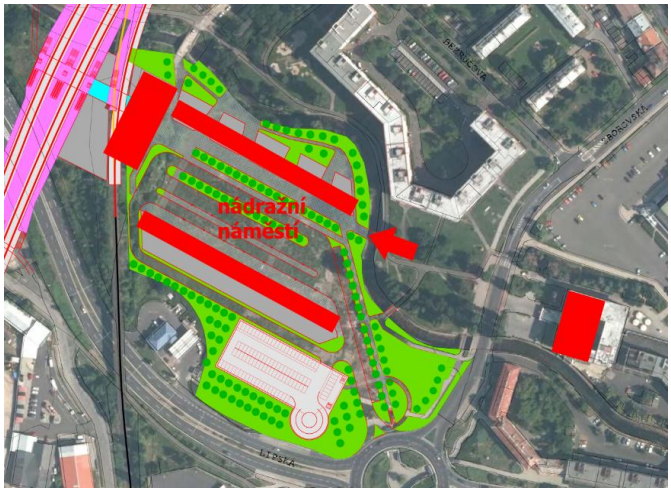

Fig. 2 *Station square - delimited by the railway station and commercial buildings, opens towards the center, inside the bus station*

In addition to the urban composition of the square oriented to the center, an important aspect is the connection of the station with the surrounding districts of the city. This is achieved despite the unfavorable conditions (isolation of the site by the river and the main roads) thanks to the platforms that bridge-span the area from Bezručova Street over Chomutovka river and Lipská Street.

Access to the platform is possible from three places:

- on the north side by stairs directly from Bezručova Street
- on the south side from the upper level of Lipská Street from the pedestrian underpass (platforms are here on the ground level) from the directions of Št. Kpt. Kouby and from the city center
- in the middle of the platforms access directly from the station underpass - the underpass is on the ground, the exit is stairs, escalators and barrier-free elevators. The underpass behind the station leads to the Chomutovka river.

Fig. 3 *CONNECTOR – pedestrian access and permeability of the site - connecting the new station and the adjacent neighborhoods of Chomutov*

3. Track construction proposal

The existing railway station is located in a historical position from 1870. The main line from the direction Ústí nad Labem approaches the station with opposite curves at a maximum speed of 60 km/h, while the station itself has a maximum speed of 80 km/h. The new passenger station is designed on the relocation of the line at km 63,350 - 64,160 (810 m) between the bridge at km 63,336 above Blatenská Street and turnout No. 6 of the Ústí nad Labem head of the existing passenger station.

The track modifications are designed without the need to rebuild the adjoining sections. The rail connectors of the Chomutov město branch can be left unmodified. The track modifications begin with a directional shift of the connecting track No. 90 to the freight yard, which frees up space for the construction of a four-track station. The connecting track will be modified by a compound curve of two radii for a speed of 60 km/h. The total length of the modification of the connecting track is 455 m.

The trackage of the new station is arranged with an island platform between the main tracks with a length of 400 m. The passing tracks are equipped with platforms with a length of 190 and 197 m. Their length is determined by the location of the stairs from Bezručova Street and on the opposite side by the bridge over Lipská Street. It is followed by a walking route to Št.kpt. Kouby. There will be stairs to these walking routes from the ends of the side platforms and from the island platform.

The cheapest possible construction solution was proposed for the mouth of the regional line from Vejprty, which is only seasonally operated today. The dead end track is assumed in the existing station and the possibility of entering the track No. 4 of the new station.

The switching of traffic to the new station does not cause any other provisional conditions in the trackage, nor the need for alternative bus transport. The construction of the new station is designed on the line relocation, so the only restriction of traffic would occur when connecting the existing line tracks to the new station tracks. Temporary single-track operations in adjacent inter-station sections should be sufficient for this technological process. The configuration of the rail couplings in the adjacent sections will currently and also in future conditions allow arriving to the two platform edges and the possibility of using the platform at the connecting track No. 90.

The new station Chomutov centrum does not cause interference with the current station. The condition of the original station can therefore be left unchanged at the very end of its service life.

The aim of the modifications is the complete removal of curved switches from the main tracks of the existing station and the elimination of the speed drop. The station will use the overtaking tracks Chomutov centrum and the arch head will be canceled. On the main tracks, from the new station Chomutov center, including the entrance to the current station, it will be possible to increase the speed to 90 km/h.

4. Implementation of the proposal

From the planning point of view, the implementation of the proposal of the new Chomutov centrum station construction encounters obstacles that need to be mentioned. It is the relationship to the valid and also new (under preparation) zoning plan of the city of Chomutov and property rights.

Although the zoning plan envisages the straightening of the railway line in the proposed section (solved by the area of the reserve for railway infrastructure), it doesn't count with the relocation of the train and bus station. The area addressed by our proposal is included in the current zoning plan as an area of trade and services, in the new plan then as an area for large commercial and administrative structures, which must be verified by a zoning study. However, placing the road and rail transport terminals is not allowed by the new zoning plan. The best solution seems to be to enter the process of elaborating a new plan and make coordinated changes that will enable the relocation of the station and the creation of a Transport Transferium. In the route of the considered relocation of the railway, some plots of land are defined as public greenery in the zoning plan - even here the prepared plan would have to be modified.

As for property rights, most of the area is owned by Chomutov invest s.r.o. It is conceivable, for example, to offer the interchange of the areas of the current (owned by the city of Chomutov) and the new bus station. In the place of the current BS, a suitable content would be, for example, residential development. Even for a commercial investor, it might be interesting to participate in the Transferium project, for example in the form of a PPP project.

In addition to state entities (ČD – Czech Railways, Správa železnic – Railways Infrastructure Manager, Povodí Ohře – Ohře Riverbasin) and the town of Chomutov, there are two private landowners in the route under consideration. It would be necessary to enter into land purchase negotiations with these owners. Here it is decisive that the land is included in the zoning plan as the railway reserve and therefore their owners had to and must take into account the possible use of this reserve.

The current development of negotiations on the purchase of land between the city and the individual owners prefigures that no agreement will be reached. However, the city of Chomutov fully supports the intention to build the Chomutov center station, and at the same time the infrastructure manager of the Railway (SŽ) took it over into its plans. The current state of project preparation thus leads to the conclusion that the new station will be built closer to the existing station than suggested by the conceptual study of the authors of this paper.

5. Conclusion

The paper presented a conceptual study of the proposed solution of the Chomutov transport hub. The authors tried to find a solution that would improve the environment of public transport and its accessibility in the city of Chomutov. The main benefits of the new solution include:

- improving the accessibility of Chomutov by rail,
- concentrating all elements of public transport in one place,
- associations of travel and transfer ties,
- significant profit for the city and the region in terms of organization of public transport,
- creation of adequate and adequately dimensioned spaces for public transport passengers,
- "cultivation" of the public transport environment in Chomutov
- the need to reconstruct vast areas and large spaces of the current Chomutov railway station, including the construction of island platforms and the like, will be eliminated
- This is a unique urban and architectural opportunity for the city of Chomutov.

Sustainable transport is a big topic today. If we focus not only on the issue of innovation in the field of operational concepts and transport telematics, then the search for new transport and urban solutions is a natural development within the Smart-Cities trend. Every journey that can be made on foot, because the service point - in our case the railway station - moves closer to a large part of the sources and destinations of the journeys, reduces the energy demands of transport and the burden of secondary transport in the cities.

The presented ideological intention served to open a public discussion in the town of Chomutov and in the Ústí nad Labem region on the topic of the new location of the railway station in Chomutov. At present, the new station is already a serious issue. The construction of a new station, albeit in a different form than the one presented in this paper, is expected around the horizon of 2030.

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