

NOT IN-SERVICE RAILWAY ARCHED BRIDGES AND THEIR FUTURE

Artur JUSZCZYK¹, Marek DANKOWSKI², Adam WYSOKOWSKI³
University of Zielona Gora, Institute of Building Engineering, Poland

Abstract

At the turn of the 19th and 20th century, on the areas of today northern and western Poland, the railway infrastructure was developing rapidly. In the late 80's of the previous century many of the railway lines, together with the whole infrastructure including bridges, were being closed down. The example of such practices can be the brick bridge located near Nojewo, Voivodeship wielkopolskie. This article presents the technical parameters of these bridges and their damages as well as ideas for the future development of the railway facilities.

Keywords: bridge structure, viaduct, revitalisation of bridges

1. INTRODUCTION

At the turn of nineteenth and twentieth centuries in what is now western and northern Poland, railway infrastructure was intensively developed. As a result of these actions a network of roads was created with a high concentration of iron. At the end of the 80s of the last century, many of these lines were gradually closed, originally for passenger traffic, with time also for freight runs. As a result of these changes many lines and related facilities, including bridges, have been left to adverse influences of time.

Examples of such excluded from the operation objects are bridges and viaducts located near the village of Nojewo over the railway line No. 368 connecting Szamotuły and Międzychód. These engineering objects are brick vaulted

1 Corresponding author: University of Zielona Gora, Institute of Building Engineering,
Szafrana st 1, 65-516 Zielona Gora, Poland, e-mail: arturjuszczyk@o2.pl, tel.+48683282931
2 email: m.dankowski@ib.uz.zgora.pl, tel.+48683284786
3 email: awysokowski@infra-kom.eu, tel.+48683282256

structures, built at the beginning of the last century and put into service in 1908 [7]. After nearly 90 years of exploitation, the movement of trains was suspended in 2001. Since then, the entire infrastructure of the railway line has been gradually degraded.

2. LOCALISATION

Nojewo is located in the municipality of Pniewy, in the district of Szamotuły belonging to the Wielkopolska region. The village is situated on the attractive tourist area with various shape, on the border of Sierakowski Landscape Park and the area of Natura 2000 - Notecka Wilderness. Nojewo is on the 21.429 km of single-track, non-electric railway line No. 368, connection Szamotuły - Międzychód. These bridges were determined by contractual letters A, B, C and D in the direction from Szamotuły to Międzychód, as shown along with the course of the railway line on the orientation map (Fig. 1).

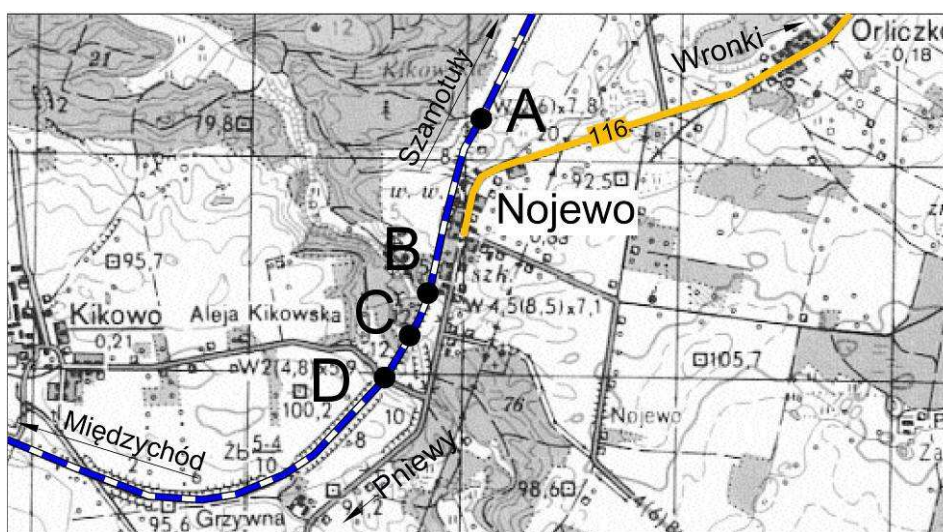


Fig. 1. Orientational plan of the location of these bridges

Inside the village, railway route runs almost parallel to the provincial road No. 116, which, on the northern tip of Nojewo forks off to an easter direction, and further leads to Wronki.

3. DESCRIPTION OF BRIDGES IN NOJEWÓ

As already mentioned in point. 2, there are four railway bridges of arched structure in Nojewie. The distance between the extreme viaducts A and D is approx. 1200 m. Among the objects A and B are the buildings of the former railway station. Table 1 summarizes the main characteristics of the bridges on the basis of the made inventory.

Table 1. Approximate dimensions of the bridges in Nojewó

Lp.	Parameter of bridge	Bridge object			
		A	B	C	D
1	Maximum horizontal light	8,0 m	7,7 m	9,2 m	6,0 m
2	Maximum vertical light	6,0 m	8,8 m	15,0 m	4,9 m
3	Overall height	7,8 m	10,6 m	17,0 m	6,7 m
4	Overall length	42 m	32 m	39 m	7 m
5	The width of the base of the supports	5,7 m	5,7 m	6,5 m	4,7 m
6	The thickness of the base of the pillars	1,9 m	2,2 m	2,8 m	-

All arched bridges were made of full ceramic brick. The object marked with A is a viaduct, it composes of four arched spans up to approx. 8 m each (Fig. 2). Under the second span is a dirt road and under the third runs a small stream.



Fig. 2. General view of the bridge structure A

The object marked B consists of three arched spans (fig. 3), whose basic dimensions were shown on the side view and a cross-sectional span (Fig. 4). Under the middle arch runs a paved road.



Rys. 3. General view of the viaduct B

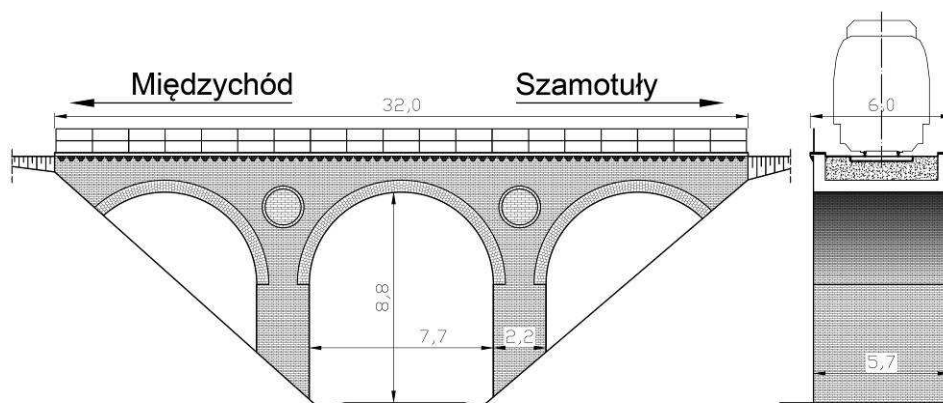


Fig. 4. Side view and a cross-sectional view of the viaduct B

Object C, the highest of the described, is a bridge composed of three arched spans (Fig. 4). A few years ago, under the middle span flowed the small-sized watercourse - Oszczynica. Because on the west side one made the damming the stream, now the space between the pillars is completely filled with standing water. Due to the presence of water under the object and marshy areas on both sides of the bridge access is difficult.



Fig. 4. General view of the bridge C

The object D is a one-span viaduct, the smallest of the described (Fig. 5). Under the object runs westwards the local paved road from the village of Nojewa to Kikowo. On both sides of the bridge, parallel to the road, on the length of more than 8 m, there are retaining walls restricting the ground scarps. In the early 60's building was undergoing a complete renovation during which fragments of vaultings, clinker bricks on the edges of the arches were renewed and one made a reinforced concrete bridging slab with a thickness of approx. 25 cm.



Fig. 5. General view of the bridge D

Objects A, B and C have a distinctive decorative elements, for example in the upper part of the pillars there are recesses on the similarity of spherical ceilings. The edges of viaducts crowns are decorated with specific theme brick. Identical decorating occur on the unused by the rail, but renovated, viaduct in Łagów Lubuski. And since the construction period of the Łagów viaduct was similar, it can be assumed that in Łagów and Nojewo bridge projects came from the hand of the same constructor or ornaments type were in the canon of typical solutions.

4. CURRENT TECHNICAL CONDITION OF BRIDGES

Railway line No. 368 ceased to be in operation over 13 years ago, by which engineering objects present in the string, ceased to be subject to mandatory inspections of the technical condition. One ceased to carry out repairs and maintenance work related to the current maintenance of the entire infrastructure.

In spite of this, as shown by a detailed examination of these objects carried out in autumn 2014, their overall condition, especially in terms of construction could be considered satisfactory, taking into consideration both the age of the structure, as well as life span and the elapsed time from the decommissioning of the railway.

However, the described bridges and viaducts have visible and at the same time typical damages for unmaintained wall structures. The most obvious are, present in many places, white efflorescence on the surface of the walls. This applies particularly to the objects A and B. Efflorescence is always the result of water penetration, usually derived from the ground, adjoined to the structures. For these objects, most stains and associated efflorescence start at the top of the structure, often from the same crown (Fig. 6). Tracks are in fact covered with a thick layer of rich greenery-clad soil, which is rich reservoir of water. One can also notice a visible numerous defects on large surfaces, flaking and cracking of the outer layer of bricks. This phenomenon occurs especially in the upper part of the arches (key) and on the walls and pillars. The cause of the destruction of the bricks are frost damages and disintegrating action of crystalized salt. On one of the pillars of object B, on the west side, detachment was found from the outside section of the wall of a depth of two bricks (Fig. 7). The lack of proper protection of this section of the wall can cause landslide on the extending road there.

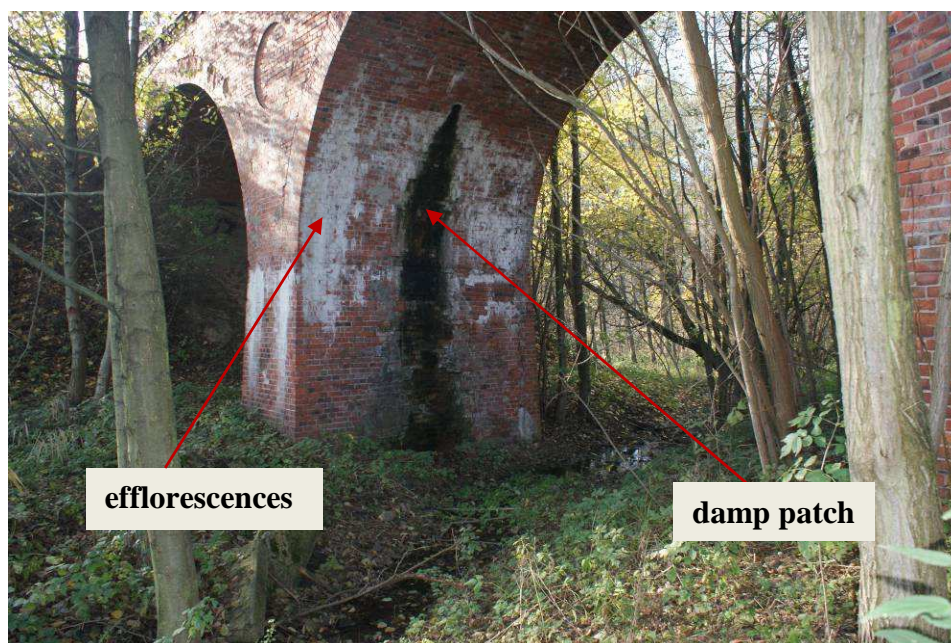


Fig. 6. View of the degradation of bridge object "A"



Fig. 7. View of viaduct pillar B. Visible cutting of the outer layer of bricks

Additional degradation of described bridge structures will result in more aggressive development of vegetation. For example, the tracks are already covered by several-years-old trees and shrubs.

5. FUTURE OF OBJECTS

Currently, PKP Polish Railway Lines Inc. began the process of liquidation of this line, which is unlikely to be a return to the original function of the railway. In Poland in recent years, many objects of communication have undergone revitalization [eg. 3, 6], so that the landscapes are regaining beauty in the renewed form. Attempts of such actions are made in relation to the line 368. For several years, the concept of regeneration has been considered as a trail bike path, as in Lower Silesia in the Sowie Mountains [1]. An alternative solution is to use the line for the needs of railway tourist crossings, but due to the technical condition, it is not currently possible over the entire route from Szamotuły to Międzychód. To carry out restoration with maintaining appropriate technical conditions [7], as it is often done in case of the bridges [2] is an expensive process. Both approaches require significant financial investment. In addition, the proposal to create a tourist trail met with sharp objections from residents of neighboring Szamotuły. On the other hand, such bike paths in the region already exist, such as along the provincial road no. 187 between Szamotuły and Oborniki Wlkp., which combines a number of villages. In this case, a tourist walking-cycling route can be connected to the area in the lake in Orliczko by the units of flyovers in Nojewo, with the tunnel-valley lake situated on the south, nearby the town of Białokosz.

Revitalization of the bridges in the form of parks, as was done with the facility in New York [4] probably would not be attractive, but the use of the pillars, as artificial climbing walls could attract tourists who enjoy an active holiday. Additionally, undulating surrounding area is ideal for the creation of a rope park with recreational small architectural elements.

Changing the current function of these objects should not deprive them of their own history. On the contrary, it can be an opportunity to place tables of historical and technical information, as it often happens in the world [5].

6. CONCLUSION

In the vicinity of the village of Nojewo, there are four bridges, whereas over the railway line No. 368 Szamotuły - Międzychód, for a length of over 57 km, there are approx. 50 of them.

The lack of any action leads to progressive degradation and consequently contributes to the higher cost of any possible management of infrastructure in the future.

Today, no one builds a brick arched bridges. One should think about whether they, eventually technical engineering work of our ancestors, are to be forgotten

by our enlightened generation, and intended for utter technical degradation? At the moment it looks like that's what happens. And these bridges are really beautiful! Now their future depends only on us. The decision is really pushed for time.

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NIEUŻYTKOWANE KOLEJOWE MOSTY SKLEPIONE I ICH PRZYSZŁOŚĆ

Streszczenie

Na przełomie XIX i XX wieku na terenie dzisiejszej Polski zachodniej i północnej bardzo intensywnie rozwijana była infrastruktura kolejowa. W efekcie tych działań powstała sieć dróg żelaznych o dużym zagęszczeniu. Pod koniec lat 80-tych ubiegłego stulecia wiele z tych linii było stopniowo zamykanych. Na skutek tych przemian wiele

linii oraz obiektów z nimi związanych, w tym obiekty mostowe, zostały pozostawione niekorzystnemu działaniu czasu.

Przykładem takich wyłączonych z eksploatacji obiektów są mosty i wiadukty położone w okolicy miejscowości Nojewo. Wspomniane obiekty inżynierskie to ceglane konstrukcje sklepione znajdujące się w ciągu linii kolejowej nr 368 łączącej Szamotuły i Międzychód.

W artykule zaprezentowano problem rewitalizacji nieużytkowanych mostów kolejowych na przykładzie obiektów w miejscowości Nojewo w województwie wielkopolskim. Opisano podstawowe parametry techniczne mostów oraz ich uszkodzenia. Przedstawiono propozycje zagospodarowania obiektów.

Słowa kluczowe: obiekt mostowy, wiadukt, rewitalizacja mostów

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