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Research on the Bridge in Jestřebí, Česká Lípa District, Czech Republic

Abstract

Martyčák S. 2023. Research on the Bridge in Jestřebí, Česká Lípa District, Czech Republic. *Analecta Archaeologica Ressoviensia* 18, 217–233

The aim of this article is to present to the reader with the results of the watching brief of the defunct historical bridge in Jestřebí, Česká Lípa district. The research brought new knowledge about the construction technology and dating of the bridge. The new findings are then placed in context with the information gathered to date about other bridges in the Česká Lípa region in North Bohemia.

Keywords: bridges, transportation, industrial structures, Jestřebí, Provodín, Česká Lípa region

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Introduction

In 2021 the demolition of the historical bridge ev. no. 26832-6 in Jestřebí took place due to its state of disrepair. The bridge was located in the district of Česká Lípa between the villages of Jestřebí and Provodín on the road III/26832 over the Robeč Stream (Fig. 1). The bridge was replaced by a new reinforced concrete structure with a higher load capacity. The watching brief during the demolition was carried out by the Regional Museum and Gallery in Česká Lípa (Czech: Vlastivědné muzeum a galerie v České Lípě – further as VMG) and the demolition process was conducted accordingly to allow the gradual documentation of individual parts of the bridge.

Brief overview of previous research

The current extent of archaeological knowledge of bridges in the Česká Lípa region is determined by the amount of reconstruction work carried out. Bridges had never previously been of specific interest for archaeologists in the region. Until the year 2009, only bridges in medieval mansions were researched, with the exception of two bridges from the early modern period at Lipý Castle in Česká Lípa. In 2009 a watching brief was carried out during the reconstruction of the Zámecký (Lázeňský) bridge. However, in August 2010 there were floods in northern Bohemia which damaged or even almost destroyed several bridges. For this reason, in the following years there have been many reconstructions on a smaller or larger scale. Furthermore, the problem of poor, inappropriate, or insufficient maintenance of some bridges or their expansion became apparent. This had the effect of increasing interest in the state of bridges, which led to greater control and the suspension of traffic for some. An entire range of bridge types and their construction methods were then identified, with bridges from the 19th century being a widely represented group. The current development and scope of investigation of bridge constructions in the Česká Lípa region corresponds to the development of post-medieval and industrial archeology in the country as a whole (Blažková and Matoušek 2013).

Environmental context

The bridge is located in a swampy lowland floodplain of the Robeč Stream. The Robeč Stream (Neuschlosser Bach in German), locally at its source

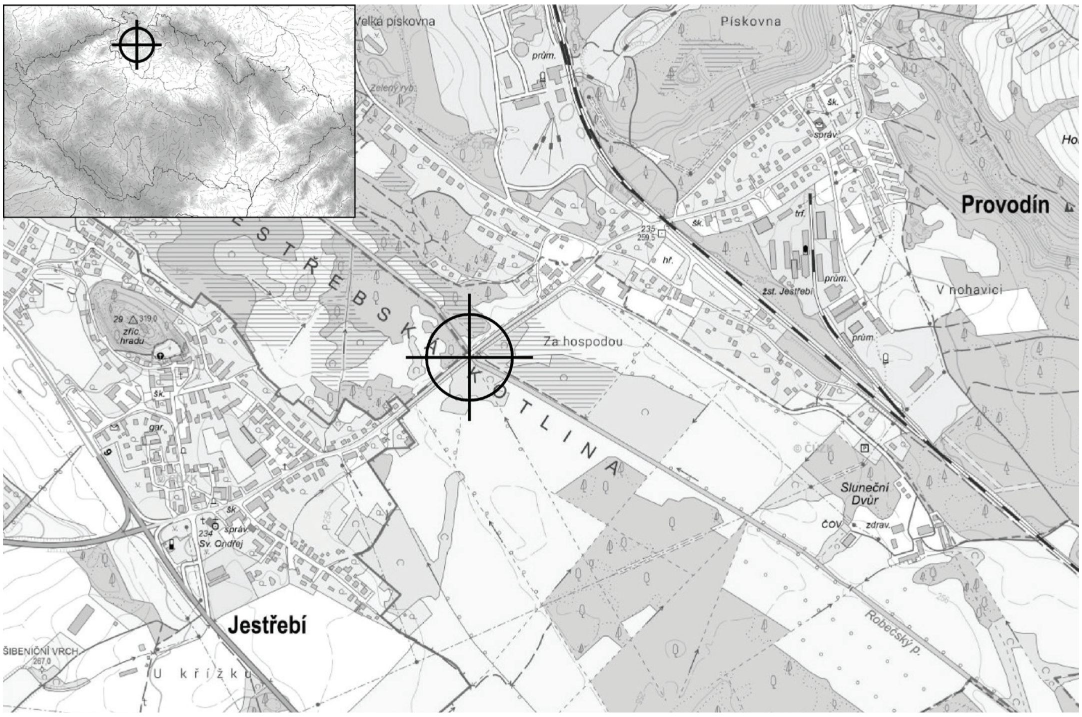

Fig. 1. Surroundings of Jestřebí and Provodín with the location of the bridge on the 1:10 000 scale basic topographic map of the Czech Republic (source: Český úřad zeměměřický a katastrální, modified).

also called Okna Stream (Kolka 2003, 54), is a left-hand branch of the Ploučnice River and belongs to its most important ones. It springs south of the village of Okna, Česká Lípa district, and in the course of its total 25.2 km it gradually feeds a number of ponds, while the bridge itself is located between Mácha Lake (which, despite its name, is also a pond) and Novozámecký Pond.

Historical context

The first known settlements in the Jestřebí area reach back to prehistoric times. The latest archaeological excavations under the castle overhang proved that there were two settlement horizons, the older one being dated from the 2nd half of the 13th century to the 1st half of the 14th century (Peša *et al.* 2015, 363–365). The first written source confirming the existence of a church is an entry of a levy of the papal tithe from 1352 (Kracíková and Smetana 2000, 77), the church was located below the castle plateau. Provodín belonged to the Jestřebí parish at least since 1786 (Kracíková and Smetana 2000, 77–79), the situation in the medieval period is unfortunately unclear. An expansion of the settlement occurred in the 18th century and in 1780 St. Andrew´s Church was built. Further development occurred in the 19th century, mostly in connection with the construction of the railway.

Provodín is first mentioned in 1376 (Peša and Meduna 2013, 235). However, it was a less significant and apparently much smaller village, originally located in a different place, and Provodín in its current location is only documented between 1536 and 1545 (Peša and Meduna 2013, 227–238). In the early modern period the village suffered greatly as result of various war events. In particular the Prussian-Austrian wars led to the construction of field fortifications, for example on Dlouhý vrch, built no later than 1778.

The Imperial road (*Reichsstraße*) from Prague to Rumburk led from Stvolínky through Zahrádky to Česká Lípa and was constructed between 1796 and 1806. It was followed by the road from Zahrádky via Jestřebí to Mladá Boleslav (Smejkal 2018, 176) completed between 1837 and 1842 (Ringes 1958, 40).

In 1867 the railway from Bakov nad Jizerou to Česká Lípa started operating and a railway station was built in Provodín, however, it was called Jestřebí throughout its whole existence (Šindlauer 2018, 418). The railway also contributed to the further development of the village.

The only known historical documents directly related to the bridge are maps. Müller's oldest map of Bohemia from 1720 is rather inaccurate and simplistic and all the roads captured on it completely avoided Jestřebí. The road and the bridge are depicted for the first time on the map of the first military (Josephinian) land survey from 1764 to 1768 and its rectification from 1780 to 1783 (Fig. 2). At that time, the road from Jestřebí to Provodín already seems to be located on its current route, probably on the embankment still preserved today. The map also shows the extent of the Novozámecký Pond at that time, as well as the course of the flow of the Robeč Stream, which was partly diverted further north through Provodín to the mill race and then back to the current flow, just beyond the bridge downstream. A more accurate depiction of the flow is later captured on the maps of the stable land survey. According to the imperial imprint of the stable land survey from 1843 (Fig. 3), which is much more detailed, it is clearly visible that at the time the road from Jestřebí to Provodín went along the current route. The Robeč Stream and other smaller unnamed watercourses are depicted as parallel and perpendicular, indicating the use of the area on both sides of the embankment agriculturally as meadows or for the extraction of raw materials such as peat, which is

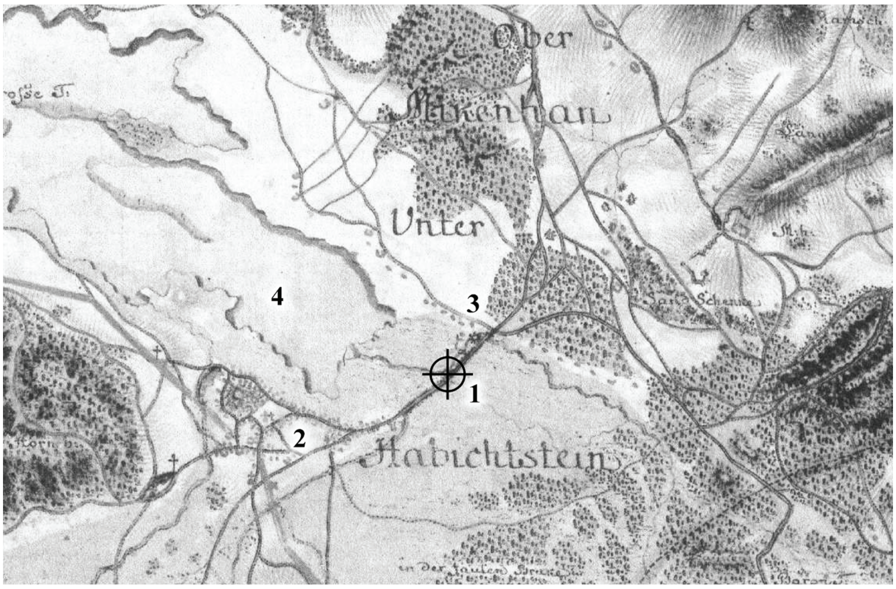

Fig. 2. Section of the map from the first military land survey, map sheet no. 28.
1 – bridge, 2 – Jestřebí, 3 – Provodín, 4 – Novozámecký pond (source: Český úřad zeměměřický a katastrální, modified).

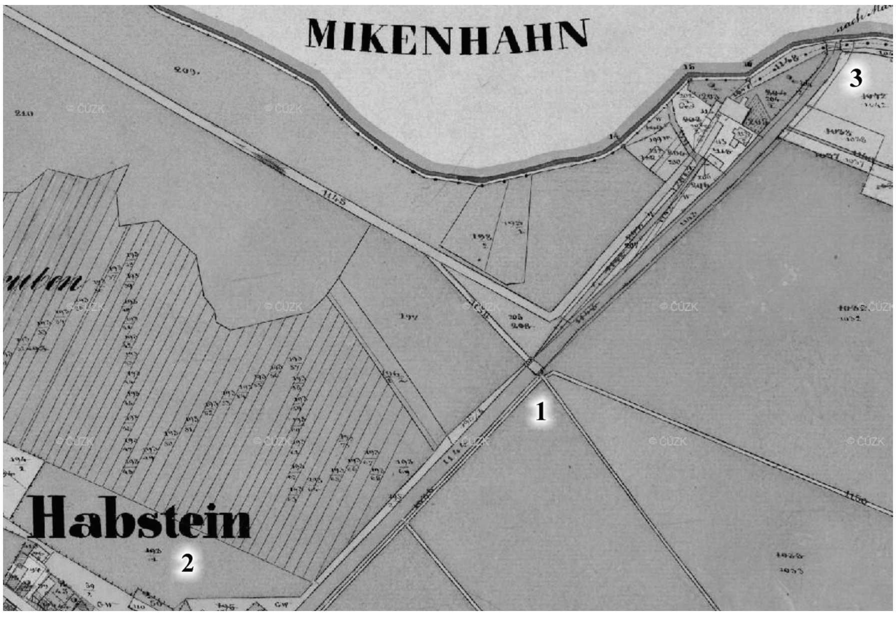

Fig. 3. Section of the original map of the stable land survey.
1 – bridge, 2 – Jestřebí, 3 – Provodín (source: Český úřad zeměměřický a katastrální, modified).

suggested by the German names "in pits" and some traces of peat extraction are still preserved southeast of Jestřebí. On the maps of the stable land survey, the bridge is more precisely depicted as a permanent structure, but we cannot say for sure whether it was wooden or brick. In comparison, a second bridge across the mill race in Provodín at the end of the road embankment is depicted as a lighter, probably rather wooden structure. The mill is already captured on the maps of the first military land survey. This bridge is still preserved, however, the surrounding terrain was covered up to the level of the road, so only some elements of its structure are present.

The second and third military land surveys do not provide better information. Another, younger source is aerial photography, especially from the years 1938, 1946 and 1953. From these images we can deduce that the mill race ceased to be used after 1938 and had disappeared by 1946. In later aerial images the existence of parapets on the bridge is apparent, together with an extension added no later than the 1970s when a footbridge was built on the downstream side.

The condition of the bridge before its removal

The single-arch stone bridge (Fig. 4, 5) had its foundations placed in the flat, wide floodplain of the Robeč Stream, which creates an approximately 60 to 80 cm deep notch in the sediments here. The bridge was part of an embankment, up to 12 m wide at the base and up to 8 m at the crown, and with a maximal height of 2.3 m and it was formed by one unit of barrel vault made of sandstone blocks supported on both banks of the stream by terraced walls, also from sandstone blocks. The carriageway was widened on both sides by approximately 0.5 m in the 2nd half of the 20th century by adding concrete lintels in front of the voussoir. On the upstream side, in front of the voussoir there were masonry buttresses with grooves (Fig. 6) that were used to insert planks to regulate the waterflow or to retain water and spill it onto the meadows as a form of flood prevention. These grooves were later repaired using cement mortar or concrete. On the downstream side, the buttresses in the form of ter-

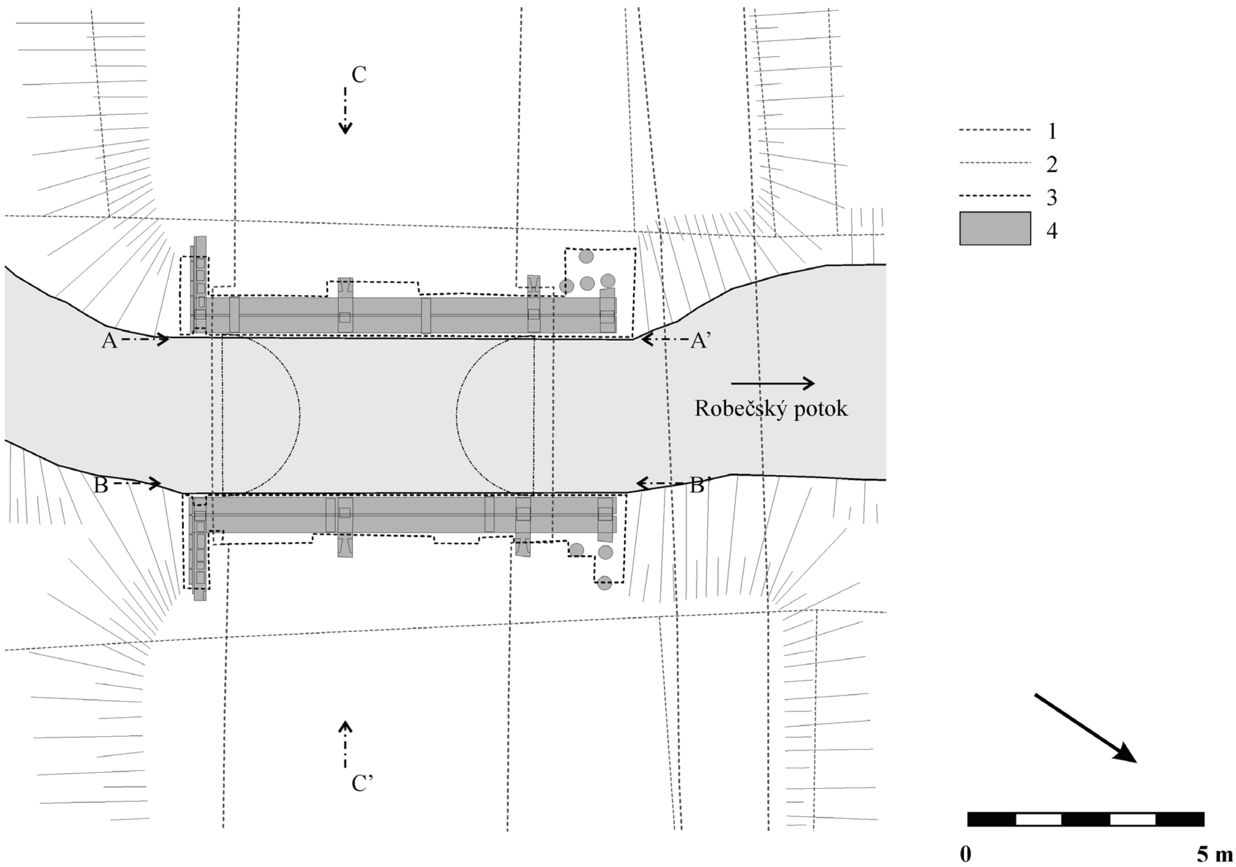

Fig. 4. Floor plan of the wooden grid forming the foundations of the bridge.
1 – road outline, 2 – cadastral outline, 3 – masonry from sandstone blocks, 4 – wooden structure of the bridge foundations (source: VMG archive).

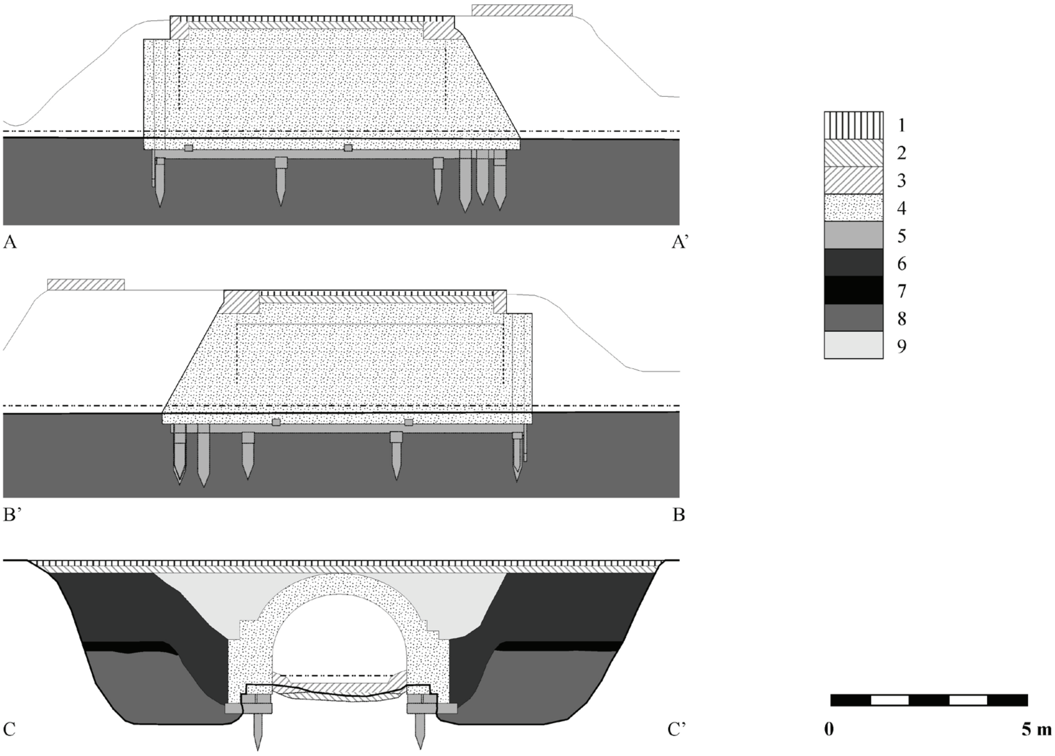

Fig. 5. Front view of the right (A–A‘) and left (B–B‘) abutments and on the transverse cross-section (C–C‘) of the bridge. 1 – asphalt road surface, 2 – gravel road base, 3 – concrete, 4 – masonry from sandstone blocks, 5 – wooden structure of the bridge foundations, 6 – brown–ochre sandy soil, 7 – brown to black humus soil, 8 – subsoil, sandy soil to sand, 9 – sandy soil with sandstone stones (source: VMG archive).

Fig. 6. Front view of the bridge vault on the upstream side with a groove used for waterflow regulation (source: VMG archive).

raced walls were extended and tilted and their top was damaged by adding a concrete lintel. On the upstream side, the wing of the terraced wall on the left bank was significantly extended in the form of a terrace reinforcing the embankment with the road.

Bridge construction and technology

After the removal of road layers consisting of the asphalt surface and gravel base, the reverse side of the bridge vault and its fill consisting of sandy soil with sandstone stones were exposed. This layer slightly expands to the sides from the level of the lower part of the arches, but interferes only minimally with the structure of the embankment. The fill material could be related to the extraction and subsequent processing of sandstone used in the construction of the bridge. It is interesting that between this layer and the construction layers of the road there were no older road levels exposed, such as paving or its base, which indicates that there must have been a significant intervention in the road layers and modification of the bridge sometime during the 20th century, consisting at least of the removal of the original pavement and its base. Most likely the bottom of the stream bed in the area under the bridge and its immediate surroundings was also strengthened at this time.

Subsequently, the fill from the bridge body and the embankment was gradually removed. For the construction of the road embankment, brown ocher sandy soil captured in profiles on both sides of the bridge was used. This layer, which is up to 2 m thick, lies on a layer of brown to black humus soil, which can be assumed to be the original ground level, as indicated by the same height level of the surroundings. Below this layer there is gray sandy soil to sand forming the geological subsoil.

The masonry structure of the bridge itself, made of worked sandstone blocks, consisted of left (northwest) (Fig. 7) and right (southeast) bridge abutment, which supported a semicircular bridge vault. The foundations of the abutments were laid on wooden fir edged beams parallel to the bridge abutments, two

Fig. 7. View of the uncovered individual piles and grid beams under the abutment on the left bank of the stream. In the front right, a short transverse beam with mortises that were not used in the bridge construction (source: VMG archive).

Fig. 8. The pilot originally placed under the foundation grid (source: VMG archive).

Fig. 9. A wooden plank with a groove, that was part of the formwork on the upstream side of the bridge (source: VMG archive).

next to each other on both sides of the bridge. To solidify the structure, these beams were connected to each other by inserting shorter beams into the grooves over them, again two on each side of the bridge. Under these beams, shorter beams with unused mortises were then placed again in the grooves, four pieces on each side (two in the middle and one at the edges). These shorter beams were supported by wooden piles (Fig. 8), one under each beam except for the extreme ones on the upstream side, where there were six stakes on the right bank and five stakes on the left bank. There was also probably additional foundation fortification at this place in the form of tongue and groove wooden planks fitted into the wooden formwork (Fig. 9), where any gap was filled by adding slats. An atypical situation was also on the downstream side, where the load-bearing beams with piles were supplemented with loosely rammed stakes with a diameter of up to 35 cm, on which was built directly the masonry abutments. This method of laying the foundation on an incomplete grid is less common than a regular grid below the entire bridge structure, such as in Stará Lípa, Česká Lípa district.

The well-preserved state of the wooden structure made it possible to take samples for dendrochronological analyses. Of the 12 samples taken, 6 were successfully determined, namely 4 beams and 2 piles. Interestingly, while the beams were dated between 1662+ and 1684 to 1685, the piles placed under the beams were dated between 1873+ and 1878+ (Unger and Kyncl 2021). It is therefore obvious that the grid structure itself is made of older wood than the piles supporting the structure.

Evaluation of the findings

With regard to the construction of the bridge structure and the determined age of its wooden structure, we can assume that the stone bridge documented by the watching brief was built in 1878 or not long after that date. However, we cannot rule out that its predecessor could also have been a stone bridge of a similar structure, which would be indicated by the way the bridge was captured on the stable land survey maps as a non-flammable, permanent structure. The beams could have been used from the previous bridge, whether stone or wooden, but they could also have come from other buildings from the villages of Jestřebí or Provodín, where there was rapid construction activity related to the establishment of the railway, mainly consisting of the replacement of older wooden houses. The use of an irregular grid, which was formed only of beams under the masonry without overlaps, is also recorded in other single-arched bridges, mainly from the 19th century in the Česká Lípa region, for example in Žandov, Česká Lípa district or Kněžice, Liberec district. Also, the recycling of wooden elements in a rural environment is not exceptional and we encounter it quite often, for example in the fencing of the Dlaska homestead in Dolánky, Semily district (Jakouběová and Marek 2016, 6). This practice needs to be taken into account when dating structures based on the dendrochronology of its individual elements. The imbalance of the wooden foundations of the bridge, with a significant accumulation of elements on the upstream side and individual stakes under the buttresses on the opposite side, may indicate possible changes or problems during the construction due to static factors or a lack of material. In other archaeologically uncovered bridges from the same period in the Česká Lípa region, for example in Stará Lípa and Ploužnice, Česká Lípa district, we have evidence of more massive and regular grid constructions (Jenč 2017).

The placing of the wooden grid directly on the bottom of the stream bed is another example of the already observed common practice of founding bridges dating roughly to the 19th century almost without any excavations, with the piles essentially driven into the stream bed and the beams laid on the previously adjusted surface. The most extreme example of this practice was documented in the case of the bridge in Žandov, where the masonry was built directly on a beam laid on the bottom of the stream without piles (unpublished research conducted by VMG in 2023). When compared with the oldest archaeologically uncovered bridge in the Česká Lípa region, the castle bridge in Mimoň, Česká Lípa district from the 1st half of the 17th century, where the foundations were laid on a wooden grid, the main difference is mainly in the massiveness of the beams used, the complexity and the connection of the beams into the form of a real grid (Jenč *et al.* 2011, 55–61; Panáček 2011, 22–23).

The watching brief of the demolition of the historical bridge in Jestřebí captured the method of construction and the technologies used and raised new questions about the actual age and location of roads in the monitored area, the recycling of building materials and the possibilities of dendrochronological dating. The example of the bridge in Jestřebí shows that even a situation so clear at first glance can be significantly more complicated after revealing all the elements and proceeding with the careful use of the available dating methods.

The Jestřebí bridge in the broader context of archaeologically excavated bridges in the Česká Lípa region

Most single arched bridges have a similar masonry surface construction and an almost archaic appaearance. It can be discussed if the constructors in the case of village bridges were locals using current knowledge with the help of local craftsman. This would certainly not be the case of larger bridge construction. The Jestřebí bridge is completely different on the upstream side, where the grooves for stream regulation were placed. On the other hand, slopes on the flood side of the bridge also occur at the bridge over the outlet of Holany Pond, which was founded on bedrock (unpublished research conducted by VMG in 2023). The bridge ev. no. 26219-1 over the Vrbový Stream in Žandov was specific with its distinctly segmental arch, another point of interest was its visible secondary connection to the sandstone masonry of the stream's fortifications, while the bridge itself is made of neovulcanite, from which it can be concluded that the bridge was inserted additionally (Fig. 10). Another noticeable recent modification was a concrete slab laid across this bridge, widening it on both sides (unpublished research conducted by VMG in 2012). Another bridge, ev. no. 26219-3, located further down the stream was arched and neovulcanite was mainly used in its construction (Chochulová 2019b). The last examined bridge, ev. no. 26219-2 in Žandov across the Vrbový Stream, was built of neovulcanic slabs, and in the 20th century it was expanded on the sides with a concrete lintel (unpublished research conducted by VMG in 2023). In Dubnice, Česká Lípa district during the reconstruction of the original bridge, ev. no. 27241-6 across the Dubnický Stream, a pine beam was uncovered under the remains of the masonry of hewn sandstone, which was dated to the years 1867 to 1868, placing the bridge at this time or not long after. In the 20th century, the bridge was widened with concrete panels on its western side (Chochulová 2020).

In contrast, in the case of the bridge ev. no. 26844-2 in Dolní Světlá, Česká Lípa district, a load-bearing wall of sandstone blocks was preserved on its western

Fig. 10. Bridge in the city of Žandov (source: VMG archive).

side up to the height of the arch, the connection of the three rows was made with low-quality lime mortar with a high content of clay. These were placed on a dry sandstone row, which rested dry on flat neovolcanic stones deposited on coarse neovolcanic gravel. Dry stone structures were sunk into the clay subsoil. The prepared bottom of the stream under the bridge was made of smooth neovolcanic stones, and on the southern flood side of the bridge there was a transversely placed wooden beam with a length of 250 cm, which was edged on one side (Chochulová 2019a). The sandstone bridge ev. no. 9-044 had a complicated development (Fig. 11). The bridge which is part of the 1st class road in Zahrádky, Česká Lípa district, and it is led across the Novozámecký gap (Fig. 12), which drains water from the Novozámecký Pond through the Robeč Stream. The bridge, built on sandstone, is supposed to have a baroque barrel vault preserved in its core and it gradually underwent at least two expansions. The first was most likely related to the construction of the imperial road in the 19th century and the second expansion with a concrete part in 1967. Another bridge structure also having at least three stages of development, with the oldest being baroque and the youngest concrete, is situated in the masonry of the dam of the Novozámecký Pond itself (unpublished research conducted by VMG in 2018). A similar situation was found during the research of the bridge ev. no. 9-043 over the Munich gap (Fig. 13) of the extinct Munich Pond. There are probably three phases here again, the original, another walled extension noticeable only in the form of a joint, and the last in the form of an extension with a concrete part, which most likely took place around 1967. The nearby bridge over the emergency spillway of the same pond was practically identical (unpublished research conducted by VMG in 2020).

The double-arched bridge ev. no. M-014 in Velenice, Česká Lípa district over the River Svitávka is one of the oldest preserved bridges, dating back to 1677 (Fig. 14). Archaeological research only confirmed the already visible construction of the bridge and did not bring any further findings (Jenč 2016).

The bridge in Stvolínky, Česká Lípa district (Fig. 15) over the Bobří Stream is already shown on the maps of the first military mapping and its older age can be assumed, it should also be older than the wall delimiting the castle area. It is a double-arched structure made of sandstone, in the lower part there were blocks of different sizes and therefore flat neovulcanic stones were used to level the unevenness. The grouting was of poor quality or absent, but it cannot be said with certainty that it might not have been there before. The foundation of the bridge was most likely in three excavated pits located significantly below the water level, which were filled with coarse and subsequently finer neovolcanic gravel. Clay was laid on both sides for insulating functions. Abutments from

Fig. 11. Revealed construction of the oldest part of the bridge over Novozámecký gap in the village of Zahrádky (source: VMG archive).

Fig. 12. Bridge over the Novozámecký gap in the village of Zahrádky (source: VMG archive).

Fig. 13. Bridge over the Munich gap in the village of Zahrádky
(source: VMG archive).

Fig. 14. Dating "1677" on the bridge in village of Velenice
(source: VMG archive).

Fig. 15. Bridge in the village of Stvolínky (source: VMG archive).

sandstone blocks were built on them reaching to the water level. The middle pillar has no clay insulation and the sandstone blocks are laid on gravel. At water level, all sides that were in direct contact with water are made of dry-stacked neovulcanic blocks. The bridge itself was then constructed on these foundations (Jenč *et al*. 2017, 97–102).

The sandstone block bridge in Lvová, Liberec district over the Panenský Stream is dated to 1803 on the basis of an oval cartouche with the date cut into the stone, located above the pillar on the upstream side of the bridge. It connects to the path leading over the dam of the Pivovarský pond and on its northern side it connects to the main outlet of the pond, which is anchored to the bridge on its upstream side. Both arches have the shape of a slightly compressed barrel vault. They lean against the side embankment walls on the sides and the bridge pillar in the middle. In front of the bridge, the bottom is reinforced with a wooden beam structure (Kolka and Peřina 2016, 71). The excavation uncovered that the terrain on the bridge was raised and a new road was laid, underneath the pavement made of rounded neovulcanic stones was revealed, under the pavement was the backfill of the bridge structure (unpublished research conducted by VMG in 2020).

The bridge ev. no. 26846-2 over the Dobranov Stream in Sloup v Čechách, Česká Lípa district dated to between 1851 and 1853, was part of the Pihel -Sloup-Cvikov road being built at the time, while this road connected the older state road. Other similar bridges were built on that occasion. It is a regionally typical bridge with carefully worked sandstone blocks and two segmental arches (Freiwillig and Kolka 2015, 89). Later in the 20th century, the parapet walls were demolished and the bridge was widened with concrete panels (Fig. 16), with some of the original paving preserved under it. On the southeast side of the bridge, a grid structure made of spruce logs with a diameter of 10 cm was discovered, but it was not possible to determine the time of their felling (Peša *et al*. 2020, 3–4).

Near the village of Žizníkov, Česká Lípa district, the inundation bridge ev. no. 2623-2 with about ten pillars across the Ploučnice River was reconstructed. Its foundations were made of well-worked sandstone blocks, which in places bore traces of younger repairs with concrete. This structure rested on a well-made wooden grid (Fig. 17–19) made of pine. Dendrochronological analysis failed to determine the age of the wood. A study of the map documents revealed that the bridge is only shown on the third military map, for which reason it can roughly be dated to the period between the end of the 1840s and the end of the 1870s (Jenč 2017).

In the case of the four-arched Zámecký (Castle) bridge in Mimoň (Fig. 20), structures related to its rebuilding in 1805 and after 1832 were captured (Fig. 21, 22), when a fir beam was found from the foundation part of the third pillar from the west, on its western

Fig. 16. Bridge in the village of Sloup v Čechách (source: VMG archive).

Fig. 17. Foundations of the bridge near the village of Žizníkov (source: VMG archive).

Fig. 18. Foundations of the bridge near the village of Žizníkov (source: VMG archive).

Fig. 19. Foundations of the bridge near the village of Žizníkov (source: VMG archive).

Fig. 20. View of the central part of the Zámecký (Castle) bridge in a prereconstruction state, city of Mimoň (source: VMG archive).

Fig. 21. The foundation of the 3rd bridge pillar of the Zámecký (Castle) bridge (source: VMG archive).

Fig. 22. The foundation of the 3rd bridge pillar of the Zámecký (Castle) bridge (source: VMG archive).

side, this beam was connected to another beam with a pin. Next to this beam, three more beams were laid. It was also possible to detect several levels of pavement through soundings, which proves the gradual increase in communication in the surface of the bridge. The findings date the top layer examined by detection technique to the turn of the 19th and 20th centuries. On the other hand, the modern pottery obtained from deeper layers can only generally be dated in the range of the 17th to 19th centuries. The research thus verified the assumption that the eastern and apparently also the central part of the bridge underwent major reconstruction during the 1st half of the 19th century, apparently in several stages caused by particularly serious damage after floods (Jenč *et al.* 2011, 60–61).

In general, it can be summarized that in the case of both single arch and multi-arch bridges, different foundations of these bridges are manifested, given in some cases by the properties of the subsoil, while in the case of larger bridges, their foundations can be more elaborate (Žíznikov, Stvolínky), but this is not necessarily the rule. Where a wooden grid is part of the foundation, the use of fir, pine and spruce has so far been found, while in the case of the Jestřebí bridge, the recycling of older wood is also documented. The construction of the grid differs both in its construction and in the quality of its execution, and the most abundantly recorded so far is the construction of masonry on a beam (Žandov, Dubnice). It was not possible in all cases to determine the dating using dendrochronology. There is also evidence of the use of wood in the construction at the riverbed, either under the bridge (Dolní Světlá) or even before it (Lvová). The main building material is processed sandstone blocks, although in some cases their processing is of better quality. We have also documented the use of neovolcanic stone, both unworked and worked, on the bridges in Žandov. To a lesser extent we can also see it in some foundations (Stvolínky, Dolní Svetlá). However, where the pavement is preserved, neovulcanite is common in various forms, while granite is used in younger constructions. In the course of the 20th century, generally in the 2nd half, concrete additions were made on some bridges, which expanded the existing capacity of the bridge, while most often taking the original bridge parapet walls as their own. The extension of the bridge slab, which widened the bridge slightly to both sides, is known apart from Jestřebí, for example also from Žandov or Sloup in Bohemia, while lateral expansion is known to a lesser extent, for example from Dubnice. In contrast, during the expansion of the bridges in Zákupy, these structures were larger. Concrete was also often used in unprofessional and harmful bridge repairs (Stvolínky, Mimoň).

The dating of bridges can be done on the basis of documented written sources, which are, for example, very well prepared for Česká Lípa (Panáček 2018), or for the Castle bridge in Mimoň (Panáček 2011). Date inscription on bridges was also commonly used in the 19th and 20th century (Lvová, Zákupy), while the oldest one we have is from 1677. It is possible to date bridges, even only approximately, using maps (Žíznikov) or possibly historical images, however, especially here, various errors cannot be ruled out. A relatively accurate method which may not always work, however, is the use of dendrochronology. The dating according to some construction elements is significantly less accurate, and sometimes cannot be used at all, especially on single arch bridges. The various archaeological findings, especially the fill of the bridge structure, are rather recent and, additionally, they often have a lower chronological sensitivity.

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