İSTANBUL UNIVERSITY PRESS

Anadolu Araştırmaları
Anatolian Research

Anadolu Araştırmaları
Anatolian Research,
ANAR 2025, (33): 255–262

https://doi.org/10.26650/anar.33.1823114
Submitted 13.11.2025
Revision Requested 26.11.2025

Research Article

Open Access

Kurtdere Bridge: An Unpreserved Structure from the Roman Period

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Abstract

During the Roman Imperial Period, three main road routes connected Eastern Thrace to the newly founded capital, Constantinopolis. The *Via Egnatia* and the *Via Traiana* (also known as the *Militaris* or *Diagonalis*) are recorded in detail on the ancient map known as the *Tabula Peutingeriana*. In contrast, only a section of the northern coastal route, which follows the Black Sea, appears on this itinerary. Since the Byzantine and Ottoman periods, the two southern routes have remained as key transportation corridors, with only minor changes. However, the Northern Road was less frequently used and eventually became isolated. This relative isolation contributed to the preservation of several ancient road structures, including the Kurtdere Bridge, located between the districts of Pınarhisar and the Kırklareli city center. Originally documented in 2014, the bridge remained standing despite structural issues noted at that time. In 2022, a new on-site inspection determined that the structure had completely collapsed. This study combines the data from the initial 2014 investigation with the findings from 2022 to analyze the typological and architectural characteristics of the Kurtdere Bridge and explore its historical connection to the Northern Road.

Keywords Roman Roads · Northern Route · Kurtdere Bridge · Eastern Thrace

Citation: Kaya, D. (2025). Kurtdere Bridge: An unpreserved structure from the Roman period. *Anadolu Araştırmaları–Anatolian Research*, (33), 255-262. https://doi.org/10.26650/anar.33.1823114

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2025. Kaya, D.

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Introduction

Bridges are structures constructed in various forms and with different materials and techniques, ranging from simple crossings created by placing a single stone or wooden beam across a gap to monumental constructions composed of multiple arches capable of carrying immense loads. Each bridge was designed to meet specific functional and topographical needs.

Bridges can be analyzed through their typological and structural characteristics, including the form and number of arches, their relationship to the riverbed, the materials used, and the inclination of the deck, as independent architectural works. Such analyses provide valuable insights into local architectural traditions, ancient engineering technologies, and regional topography. For example, the shape of an arch can reveal the discharge rate, channel width, climatic conditions, and surface characteristics of a river, as well as whether the bridge served public, commercial, or military purposes and whether it allowed river traffic. Similarly, the construction materials and overall scale of a bridge can shed light on the building practices of the period, the available resources, the structure's potential symbolic or propagandistic function, and the organization of labor. Features such as the bridge deck slope or the height difference between the arch spandrels and the tympanum walls are also significant indicators for dating these structures.

When examined within the context of a specific route, settlement, or region, bridges can also contribute to broader discussions of daily life and the time's sociocultural, religious, and political dynamics.

Only a limited number of bridges constructed with durable materials during and after the Roman Imperial Period have survived to this day. Many remained in use for centuries, maintained through successive repairs, while others were demolished and replaced by new constructions in later periods. Even those that have been preserved are often damaged by modern infrastructure projects, riverbed rehabilitation, dam construction, illegal excavations, and environmental or climatic factors. The Kurtdere Bridge, located in the village of Hacıfaklı in the district of Üsküp, Kırklareli Province, is a recent example of such destruction.

An Overview of Stone Bridge Construction During the Imperial Period

Until the late Roman Republic, the city boundaries were generally defined by natural features such as topography and watercourses. When it became necessary to cross long distances, wooden or pontoon bridges were most often used. However, with the expansion of Rome's territories during the Imperial Period, the demand for extensive and standardized road networks led to the construction of numerous stone bridges. During this time, the use of the arch became increasingly widespread and practical, and it was applied across the empire, particularly in relation to the legions' movement and infrastructure (Gazzola, 1963, pp. 14-15; O'Connor, 1993, p. 42; Comfort, 2008, p. 46; Leyerle, 2009, p. 111; Favro, 2019, p. 176).

The foundation, pier, arch, spandrel wall, deck (*tabula*), roadway (*via*), and parapet are the main architectural components of Roman stone bridges.

Several factors were considered in laying foundations, including the hardness of the bedrock, the permeability of the soil, and the width of the riverbed. Direct foundations were commonly used in riverbeds with firm ground, built directly onto the substrate or with minimal leveling. In wet or permeable terrain, pile foundations were preferred. In such cases, wooden piles were stripped and fitted with iron conical shoes when necessary (Galliazzo, 1994, p. 338; Heinz, 1989, p. 56). Hydraulic foundations were employed when piling was required in running water. In these instances, piles were driven into the riverbed using cofferdams, known as cassoni, filled with hydraulic mortar or other stabilizing materials (Galliazzo, 1994, p. 342).

The piers were constructed wide enough to support the load of the superstructure and narrow enough to minimize disruption to the river's flow. Factors such as the riverbed's geological composition, the clearance between the arches

and the water level, and the selected construction materials' water resistance were all carefully considered. For this reason, no fixed architectural standards were established for pier design.

The arch is the most distinctive and essential element of a Roman bridge. Wedge-shaped voussoirs, often cut in a truncated pyramid form, were placed side by side beginning from the springing point and meeting at the apex of a keystone. Circular arches were most frequently used during the Imperial Period. These arches typically comprised a single ring and were structurally strong (O'Connor, 1993, p. 172; Horst, 2013, p. 77). When designed according to hydrological calculations, they allowed boats to pass through and were therefore well-suited for river traffic. In Late Antiquity, segmental and pointed arches also appeared in bridge construction (Galliazzo, 1994, p. 96; Horst, 2013, p. 80; Fingarova, 2020, p. 154; Halifeoğlu et. al. 2013, p. 90).

The spandrel wall, located between the arch and the deck, encloses the bridge structure on the upstream and downstream sides. Like the piers, spandrels were not constructed according to a fixed standard. Their design depended on several factors, including the bridge width, the number and span of arches, the expected load from the superstructure, and the type of materials used. Lighter materials were often preferred in this section to reduce the piers' weight. In some bridges, relieving techniques or blind arches were incorporated to decrease structural stress (Tunç, 1978, p. 6; Galliazzo, 1994, p. 462; Fingarova, 2020, pp. 155-157).

The deck, or *tabula*, and the roadway known as the *via*, lie above the spandrel walls. Bridge decks were often constructed using lightweight and porous materials, as with the spandrels (Gazzola, 1963, p. 147; Galliazzo, 1994, p. 96; Fingarova, 2014, p. 243). Although the *via* is generally assumed to be paved with well-cut stones, this was not always the case. In some examples, the roadway was built of wooden planks or compacted earth, creating a solid and durable surface.

Parapets, which served as railings on either side of the *via*, functioned as boundary elements and provided travelers with safety. These were constructed from various materials, including stone, wood, and metal, and appeared in different dimensions. Parapets are the most easily dismantled components of a bridge and rarely preserved *in situ* (Tunç, 1978, p. 5; Galliazzo, 1994, pp. 485–488; Horst, 2013, p. 88).

The *opus quadratum* masonry technique was widely employed in the construction of Roman Imperial bridges (Galliazzo, 1994, pp. 233–234; Horst, 2013, p. 22). In this method, rectangular stone blocks were laid in horizontal courses, with larger blocks typically placed in the lower sections and smaller ones in the upper levels (Galliazzo, 1994, p. 236). During Late Antiquity, the use of smaller blocks became increasingly common.

In earlier periods, the *opus quadratum* blocks were assembled using dry masonry. Metal clamps and dowels were frequently employed to stabilize these large stones. Fine mortar started to be used as a binding material in the fourth century AD. Mortar became more widespread in later centuries and was occasionally applied decoratively, sometimes in combination with brick fragments (Tunç, 1978, p. 7; Galliazzo, 1994, pp. 94–98; Fingarova, 2014, p. 242).

The Northern Route

Three principal routes extended into Eastern Thrace during the Roman Imperial Period. From south to north, these roads were the *Via Egnatia*, the *Via Traiana*, also known as the *Via Militaris* or *Diagonalis*, and the Northern Road. Among these, the Northern Road is the least well-attested archaeologically, although it is represented by 21 locations on the *Tabula Peutingeriana*. The section extending from Salsovia, modern Mahmudia, to Constantinopolis in the *Itinerarium Antonini* includes 25 locations (Miller, 1916, p. 510; Löhberg, 2006, pp. 191–192; Avramea, 2002, p. 67; Talbert, 2010, p. 234; Karaca, 2020, p. 32).

The route consists of two main branches: the Coastal Road and the Northern Road proper (Figure 1). The Coastal Road follows the course of the Danube and reaches the western shores of the Pontus Euxinus, or Black Sea, roughly along the line from Salsovia (Mahmudia) to Ad Stoma (Halmyris), Histria, Tomis (Constanța), Stratonis (Tuzla), Callatis (Mangalia), Trissa (possibly Shabla or Kaliakra), Bisone (Kavarna), Dionysopolis (Balçık), Odessos (Varna), Marcianopolis

(Reka Devnya), Erite, Templum Iovis (Obzor), and Mesembria (Nessebar), finally reaching Ankhialis (Pomorie) (Jireček, 1990, pp. 137–138; Soustal, 1991, pp. 145–146; Avramea, 2002, p. 67; Băjenaru, 2010, p. 27; Külzer, 2011, p. 197).

Figure 1

Northern and Coastal Road Routes (Google Earth)



Ankhialis served as a major junction point in the regional road network. From there, the Coastal Road continued through Apollonia Pontica/ Sozopolis (Sozopol), and Buatico (Ahtopol), eventually reaching Tinias (Cape İğneada). It then turned inland through Bezirgân Tepe, Kokmuş Tepe, Kışlacık, and Hamidiye before rejoining the coast near Salmydessos (Kıyıköy/Midye) (Soustal, 1991, p. 146; Külzer, 2008, p. 196). From this point, the road continued through Scyllam (Yalıköy), Philias (Karaburun), Thimea (Rumelikavağı) and Sycas (Galata), ultimately reaching Constantinopolis (Miller, 1916, pp. 514–515; Külzer, 2011, p. 204).

In contrast, the Northern Road runs roughly parallel to and south of the Coastal Road. Although it is generally believed to have originated at Skopelos (modern Yoğuntaş), it was likely a continuation of another branch originating from Ankhialis and passing through Kabyle (Kabile) (Madzharov, 2009, p. 184). From Skopelos, the route continued through Petra (Kayalı), Sarantaekklesiai (Kırklareli), Gehenna (Kaynarca), and Brysis (Pınarhisar) (Külzer, 2008, p. 195). Following the southern foothills of the Strandzha Mountains, it passed through Bizye (Vize), Saray, and Strantza (Binkılıç), ultimately reaching Makra Teikhe, or the Anastasian Wall, Gümüşpınar. From Gümüşpınar, the route joined the earlier course of the *Via Egnatia* to the south and continued toward the capital (Madzharov, 2009, pp. 198–200; Külzer, 2008, p. 183; Külzer 2011; Karaca, 2020, pp. 34–35).

Kurtdere Bridge

The Kurtdere Bridge, located in the village of Hacıfaklı in the town of Üsküp, Kırklareli Province, lies near the border between the districts of Pınarhisar and the Kırklareli city center. It once spanned the Kurt Stream, or Kurt Deresi, approximately 3.5 kilometers southwest of Hacıfaklı village (Figure 2). In the 1960s and 1970s, the Village Services Directorate poured concrete around the bridge piers to protect the structure from seasonal flooding. Although the bridge remained in pedestrian use until the 1990s, it was later damaged by illegal excavations. The structure was first documented in detail by Assoc. Prof. Dr. Ergün Karaca in 2014 (Figure 3). At that time, the bridge was no longer safe for crossing due to its deteriorated condition, yet it was still standing. Today, however, the bridge has completely collapsed. This situation necessitated a reexamination of the site and evaluation of the bridge in its current state.

Figure 2

Location of the Kurtdere Bridge (Google Earth)



Figure 3

Condition of the bridge in 2014 (Assoc. Prof. Dr. E. Karaca)



According to Karaca's study, the east–west–oriented bridge featured a single circular arch with a span of 3.60 m, a total length of 10 m, a width of 4.90 m, and a height of 3.45 m. (Karaca, 2020, pp. 35–36). The core of the structure consisted of the *opus caementicium*. The voussoirs used in the single-span ribbed arch were reported to have dimensions similar to those of wedge stones.

During a site visit conducted in 2022, under the supervision of the Kırklareli Museum and with permissions granted by the Ministry of Culture and Tourism and the General Directorate of Highways, it was determined that the bridge had completely collapsed, except for the eastern pier, which still stood to a height of 2.10 m. Moreover, numerous illegal excavation pits were observed in the surrounding area (Figure 4). Only a few stone blocks remained in place. The preserved section consisted of 30-cm-wide limestone blocks arranged in *opus quadratum* masonry. A thin layer of mortar was used as a binding agent. There was no evidence of water erosion or scour on the pier.

Figure 4

Bridge's status as of 2022



The eastern pier was constructed directly on the ground after minimal leveling of the natural terrain. In contrast, the now-missing western pier was founded by cutting terraces into the bedrock that forms the narrow canyon in this area (Figure 5). These terraces featured steps measuring 2.85 by 0.4 m and 4 by 0.69 m. On either side of the steps were beam holes measuring 16 by 12 cm. This section measured 3.5 m in width.

Figure 5

Main rock arranged in a stepped manner for the western buttress



The bridge was situated between the Sarantaekklesiai and Gehenna stations. Three significant defensive structures have survived to the present day: the Büyük Kale and Küçük Kale fortresses at Yündalan, and the Hasarcık Fortress at Üsküp. These fortifications suggest that both the road and the bridge crossing were strategically controlled during Late Antiquity (Kurtuluş, 1997, pp. 31–54). A road with a rubble-paved foundation, measuring between 3 and 3.5 m in width, which can be traced continuously for approximately one kilometer, lies to the east of the bridge. The uppermost layer, originally composed of large, flat blocks, is no longer preserved in situ.

Evaluation

Since many ancient road routes are still in active use today, they often lie buried beneath modern roadbeds. In such cases, surviving bridges may constitute the only remaining evidence of the original route's course and characteristics. The route to which the Kurtdere Bridge once belonged is not clearly identified in ancient itineraries or modern reconstructions. Therefore, the bridge serves as one of the most significant archaeological indicators confirming the existence of this route.

The width of ancient roads varied depending on factors such as topography, climate, frequency of use, and the types of vehicles and travelers they accommodated. According to the *Duodecim Tabularum Leges* (VII.6), which was in force during the Roman Republican period, roads intended for one-way cart traffic were required to be at least 2.4 m wide. Given that carts in use rarely exceeded 2 m in width, this regulation would have remained sufficient throughout the Imperial Period and later centuries (Binnebeke, 1997, pp. 27-31; Tilburg, 2007, p. 27; Horst, 2013, p. 40). The bridges constructed along these routes generally followed similar measurements. With a deck width of 4.90 m, the Kurtdere Bridge appears to have served as a secondary route, possibly accommodating two-way cart traffic or a combination of single-lane cart and pedestrian use. This route likely functioned either as an alternative to the Northern Road or as a local connector associated with nearby military fortifications.

The bridge's circular, single-span ribbed arch and *opus quadratum* masonry make it a characteristic example of Roman construction. The use of medium-sized stone blocks, approximately 30 cm in height, together with thin layers of mortar, suggests that the structure was built sometime after the Imperial Period but before the sixth century AD. Because the bridge has now completely collapsed, a more detailed assessment of its materials and construction techniques is no longer possible.

Bridges have remained in use throughout history as long as they fulfilled the practical needs of their time. However, once abandoned, such structures become increasingly vulnerable to both natural and human-induced deterioration in the absence of systematic preservation efforts. The Kurtdere Bridge, which remained standing until recently but has now entirely disappeared, is a striking example of this process.

The ancient bridges that continue to serve active routes today face a different kind of degradation. These structures, originally not designed to withstand the weight and frequency of modern motorized traffic, are now exposed to loads far exceeding their original static calculations. Bridge decks are often covered with asphalt or altered by the addition of sidewalks to improve the comfort for vehicles and pedestrians, resulting in significant changes to the original architectural form. To protect these structures from the pressures of urban development, infrastructure expansion, and tourism, experts in archaeology, art history, and architectural conservation must work in close cooperation with institutions such as museums, the General Directorate of Highways, and the Ministry of Culture and Tourism. Such collaboration is essential for conducting proper conservation and restoration practices, ensuring legal protection, and developing comprehensive inventories.

Peer Review Externally peer-reviewed.
Conflict of Interest The author has no conflict of interest to declare.
Grant Support The author declared that this study has received no financial support.

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