



Tunnels in the Hittite Kingdom: A Study in Hittite Military Architecture

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ARTICLE INFO

Article history

Received 1 September 2025

Received in revised form 1 November 2025

Accepted 10 November 2025

Available 12 November 2025

KEYWORDS

Hittite, Tunnels, Posterns, Fortifications, Architecture.

ABSTRACT

Tunnels—both defensive and offensive—represent a prominent military strategy in antiquity, serving multiple functions that range from strengthening the defenses of fortified settlements to enabling surprise attacks against adversaries. Archaeological evidence underscores the significant role these constructions played within Hittite military thought. The Hittite state relied on advanced fortification systems—massive curtain walls and fortified citadels—that frequently incorporated subterranean passages designed to serve both defensive and offensive purposes. Ḫattuša (Boğazköy), the Hittite capital and one of the major archaeological sites in Anatolia, provides a striking example of such engineering and military sophistication; its tunnels formed an integral component of the city's defensive fabric. The functions of these passages varied widely: securing water supplies, facilitating counter-attacks, and in some instances hosting religious and ritual activities. These tunnels are distributed across different urban zones (Upper City, Lower City) and across several Hittite settlements. This study examines the architecture, typology, functions, and regional diffusion of Hittite tunnels, and places them within the broader strategic and symbolic context of Late Bronze Age fortifications.

1. INTRODUCTION

The Hittite imperial defensive strategy was shaped directly by the character of its neighbours. The political organization and military capacity of adjacent polities determined the form and distribution of Hittite fortifications. In the north, for example, where unstable groups such as the Kaška—never fully subdued by Hittite control—posed recurrent threats, the Hittites constructed networks of fortified settlements (including strongpoints such as Alacahöyük) to protect vital routes leading to the capital, Ḫattuša. Conversely, where neighbours were larger and more organized political entities—Egypt to the southeast or Arzawa to the west—the Hittites favoured the creation of vassal principalities that served as buffer states, thereby reducing the need for immediate, material fortifications on the imperial frontier (Abdel Azem 2024a, 20-21, Nossov and Delf 2012, 8).

The Hittite polity is characterized by an advanced defensive infrastructure: a variety of fortification types, diverse building materials and techniques, and complex architectural solutions that reflect a sophisticated military and urban planning tradition (Naumann 1971, 236). These fortifications are especially prominent in major urban centers such as Ḫattuša and Alacahöyük, where an integrated defensive system can be observed (Mielke 2011, 178, Vergnaud 2016, 105).

Ḫattuša, represented today by the site of Boğazköy, functioned as the political and military capital of the Hittite state. Its strategic location on a high plateau surrounded by

rough terrain, afforded natural protection—particularly against incursions from northern Kaška groups (Abdel Azeem 2024b, 2-4). The urban footprint of Ḫattuša extended over roughly 180 hectares and comprised an Upper and a Lower City, both enclosed by massive defensive walls that incorporated monumental gates, royal palaces and temples (Neve 1992a, 108)—a clear testimony to advanced urban and military planning. (Fig. 1, 2)

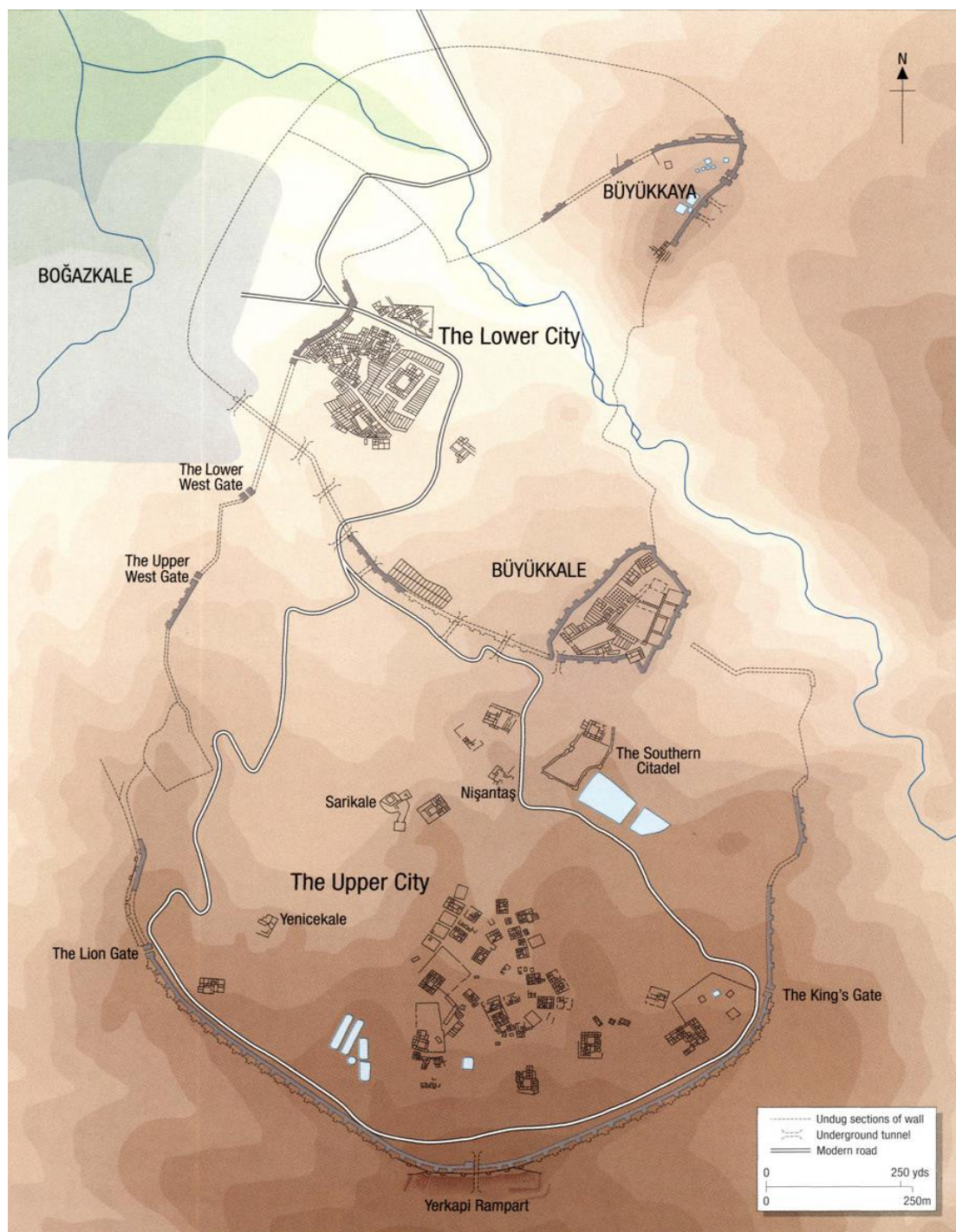


Fig.1. Ḫattuša Fortifications.
(Nossov and Delf 2012, 25)

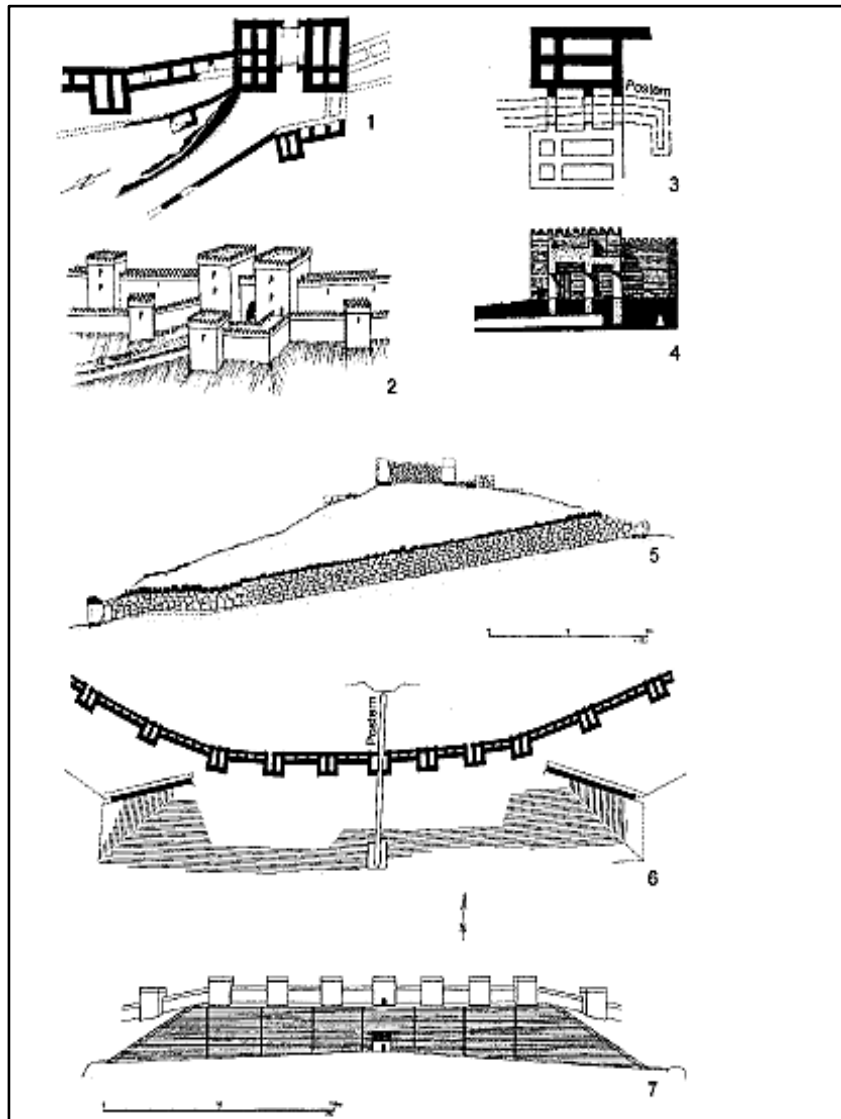


Fig.2. Fortification elements

(1) Boğazköy, King's gate; (2) Boğazköy, reconstruction drawing of the King's gate; (3-4) Alacahöyük postern gate, and reconstruction of section of postern gate; (5) Boğazköy, Yerkapi, section of the postern; (6) Boğazköy, Yerkapi, map of the fortification system; (7) Reconstruction drawing of Yerkapi. (Mielke 2011, 179. fig. 9)

The outer curtain wall, however, was not the only defensive element of Ḫattuša; the city was subdivided into defensible sectors so that individual districts could be held even if parts of the main wall were breached. The royal citadel—containing the palace and the archives—occupied a naturally elevated position over the older city and represented the strongest defended sector, its natural advantages reinforced by walls of the same construction as the main curtain. Additional internal walls partitioned the remainder of the settlement into smaller units, some of which contained fortified houses or secondary strongholds, thereby complicating any adversary's attempt at total conquest (Macqueen 1986, 69).

Ḫattuša's defensive perimeter was also reinforced by a large number of towers; estimates for the Great Wall alone range between 250 and 300 towers (Mielke 2012, 75), many rising to three storeys (Nossov and Delf 2012, 17). Inter-tower spacing—reported between 12 and 30 meters—was calibrated to the effective ranges of contemporary defensive

weapons (bow, sling, spear) (Burke 2008, 65), thereby ensuring continuous defensive coverage along the ramparts.

Monumental and symbolically charged gates formed part of the city's defensive and representational system (Miller 2012, 675). Notable examples include the Lion Gate at the south-western entrance of the Upper City (Fig. 3), named after two carved lions flanking the portal; the so-called King's Gate to the southeast of the Lion Gate, which bears a relief associated with an otherwise unidentified sovereign or a deity; and the Sphinx Gate (the "Sphinxes"), a pedestrian gateway atop the Yerkapi rampart adorned with sphinx statues (Düzgüneş and Demirel 2016, 146). Numerous internal gates also provided access to fortified precincts through narrow stairways that exposed attackers to defensive fire from above (Macqueen 1986, 66).



Fig.3 Lions flanking Ḫattuša's Lion Gate, at the southwest of the fortifications of the Upper City.
(Onurlu, 2004, 9)

Textual sources attribute the initial major works of fortification at Ḫattuša—intensified during the Old Kingdom period—to King Hantili I (ca. 1590–1560 BC), (Simon 2011, 241) who is recorded as claiming that before his reign Ḫattuša lacked fortifications and was unprotected: “[...] *there were no [...fortifica] tions in Hattuša, [...] it [was n]ot defended, and [no]ne of the [f]ormer [kin]gs fortified the city of [H]atti [earlier]. I, [Hantil]i have built [fortified cities] in the [ent]ire country, and [I, Han]tili have fortified [Hattu]ša*” (Simon 2011, 242). While these statements suggest that Hantili's strategy responded in part to Kaška pressure (Abdel Azeem 2024b, 3, Klinger 2002, 441, von Schuler 1965, 23-24), archaeological and stratigraphic evidence implies that the king's initiative likely represented a program of renovation and expansion of pre-existing defenses—perhaps dating back to the time of Ḫattušili I (ca. 1650–1620 BC), when Ḫattuša was first established as the political center (Seeher 2006a, 143). Thus, fortification should be viewed as an intrinsic component of the city's military architecture from an early stage.

Hittite curtain walls continued to be developed over time (Seeher 2006b, 208), sometimes reaching heights of 8–10 meters and supported by towers at intervals of approximately 20 meters (Mielke 2018, 72, Bryce 2002, 234). The walls were commonly built in a double configuration—an inner and an outer wall—using carefully arranged irregular stones (Cyclopean masonry), the interstices being packed with rubble (Macqueen 1986, 66), which produced a robust structural mass.

The latest phases of Ḫattuša's walls demonstrate impressive massivity and defensive depth. In many sectors these curtain walls were complemented by terraces, underground passages, and tunnels that permitted clandestine access between the interior and exterior, or to hidden water sources—complications that rendered sudden frontal assaults or attempts at prolonged starvation sieges both difficult and rarely decisive (Bryce 2002, 115).

Taken together, these elements indicate that Hittite fortifications were not a mere assemblage of defensive works but rather coherent military systems integrating topography, engineered planning, and symbolic projection. Within this integrated defensive system, defensive and offensive tunnels constitute a crucial yet relatively understudied component. Their investigation is therefore central to understanding the tactical and architectural dimensions of Hittite military practice—particularly in Ḫattuša. The present study focuses on the role of tunnels within the Hittite defensive complex and explores their tactical, architectural, and symbolic implications within a broader Near Eastern context (Table 1).

Element	Description	Function
Curtain Walls	Double walls (8–10 m high) built with Cyclopean masonry, rubble-filled core.	Formed the main defensive barrier; provided massivity and resilience.
Towers	250–300 towers, up to 3 storeys, spaced 12–30 m apart.	Allowed archers/slingers continuous coverage; reinforced weak wall segments.
Gates	Lion Gate, King's Gate, Sphinx Gate (Yerkapi rampart), plus internal gates.	Controlled access; symbolic and ceremonial roles; exposed attackers to fire.
Citadel	Elevated royal complex with palace + archives.	Strongest defensive sector; political and administrative center.
Internal Walls	Partitioned city into Upper & Lower sectors and fortified districts.	Enabled defense in depth; allowed local resistance if outer walls breached.
Tunnels	Subterranean passages under walls or ramparts; some linked to water sources.	Allowed sorties, secret communication, or access to water; complex defense.

Table.1. Comparative of Ḫattuša's Fortification Elements

2. TUNNELS IN THE HITTITE KINGDOM

Fortifications in the Hittite realm during the second millennium BCE represent a defining feature of Anatolian military architecture in the ancient Near East. Among the architectural components of these fortifications, tunnels—or posterns—stand out as a strategically sophisticated element of Hittite defensive thought. These subterranean passages were not marginal adjuncts but rather the material expression of engineering skill and deliberate military planning, often adapted to the mountainous and rugged landscapes occupied by the Hittites (Naumann 1971, 302). In visual terms the tunnels, together with the massive walls, form one of the most characteristic impressions of Hittite imperial architecture in Anatolia. In Ḫattuša the so-called tunnel wall is exceptional because it extends to cover the Lower City and the Büyükkaya (Neve 2004, 178), reflecting a highly articulated urban plan. The royal complex at Büyükkale also incorporated tunnels that linked the royal courtyards with the Upper City, thereby illustrating the interplay between military and administrative architecture (Neve 1992a, 47).

Hittite tunnels were primarily built using corbelled vaulting techniques, with large

stone blocks arranged in successive layers, each projecting slightly inward over the layer beneath, and covered by an artificial earth rampart supporting the defensive wall above. In contrast to later Phrygian rock-cut tunnels or fully excavated underground passages, Hittite tunnels were typically constructed above ground level and later covered with construction fill (Naumann 1971, 302). These passages were often made of large, roughly hewn stones (Cyclopean masonry), (Mielke 2012, 75) with floors paved or designed as sloped ramps or staircases to aid movement. A Hittite text, linked to instructions from *Bel Madgalti* ⁽¹⁾ (CTH 261.1), explicitly advises equipping posterns with doors, wooden gates, bolts, and finishing them with plaster and woodwork, clearly indicating that these features were essential to the tunnels' design and operational functionality (d'Alfonso 2021, 178, Miller 2013, 215, 219, 223, 379).

Typical tunnel lengths range between approximately 30 and 80 meters, while widths and heights vary from roughly 1 to 4 meters. At Yerkapi (the Sphinx Gate) in Hattuša, for example, the tunnel extends some 80 meters beneath the Sphinx Gate, descending some 12 meters toward the exterior (Naumann 1971, 304); the corbelled vault reaches a height of roughly 3 meters and a width of about 2.4 meters at floor level (Miglus 2005, 608). At Alacahöyük a tunnel beneath the western gate measures approximately 1.8 meters in height and 1.5 meters in width and is L-shaped in plan (Nossov and Delf 2012, 20), whereas at Alishar the tunnel length reaches some 50 meters (Miglus 2005, 608).

3. GEOGRAPHIC DISTRIBUTION AND SITE EVIDENCE

3.1 Hattuša: Multiple tunnels have been discovered at Hattuša at regular intervals along defensive sectors, with distances between entrances ranging from 67 to 181 meters, indicative of a systematic plan to facilitate internal and external movement (Naumann 1971, 325). One of these passages runs beneath the Yerkapi wall, and eight posterns were identified in the component of the curtain that separates the Lower and Upper Cities—this sector is commonly referred to as the “postern wall.” A substantial tunnel was also located beneath the eastern tower of the Büyükkale gate (reported length 34 m, height 4 m), later blocked-in antiquity (Miglus 2005, 608). West of that sector, between the citadel and the Lower City, six passages were identified in the so-called tunnel wall; their positions suggest that most of these openings functioned primarily as internal connectors between the Upper and Lower Cities. One passage to the east of this series leads outward beyond the walls, and another opens to the fortification perimeter to the northeast of the Büyükkaya outcrop (Miglus 2005, 608).

These tunnels form part of the southern and south-western defenses of the Lower City and extend toward the fort at Büyükkale. Today many of these tunnels are filled with collapse debris so that only the external portals remain visible (Nossov and Delf 2012, 16); nonetheless, their stratigraphic position indicates they belong to some of the earliest phases of the city's fortifications. There is a chronological association between these passages and a large granary complex on the north-western slope of Büyükkale; the granary complex was constructed contemporaneously with this section of wall (Weeden 2022, 538). Radiocarbon (C-14) analyses suggest that this destruction occurred either in the first quarter or in the middle of the second half of the sixteenth century BCE—evidence that aligns with another surface finds datable to the Old Hittite period in the northern city area (Seeher 2006b, 201). The presence of charred timbers and clay floors, combined with the depth and inclination of certain passages, points to their use in offensive operations (Bier 1973, 425). Conservation work on the eastern stretch of the wall has been undertaken in recent years and continued through 2014, connecting with a visitor walkway that now allows the defensive fabric to be exhibited (Schachner 2015, 153).

3.2. Yerkapi (the Sphinx Gate Tunnel): The Yerkapi tunnel is the most famous and best-preserved Hittite passage, and the only one in Hattuša still traversable today. The Turkish name *Yerkapi* “gate in the ground” denotes the tunnel’s position beneath the defensive platform. This military tunnel is an example of corbelled construction, the stones being laid in progressively projecting courses to form a vaulted profile without the keystone of a true arch (Macqueen 1986, 67). The corbelled roof was then capped by an artificial rampart, reflecting the Hittites’ architectural resourcefulness despite their limited use of true arches. The Yerkapi tunnel measures approximately 80–83 meters in length, ranges between 3 and 3.3 meters in height, and lies some 11 meters below the contemporary ground surface (Nossov and Delf 2012, 16). The passage slopes slightly outward to facilitate transit and contains, at its lower entrance, a recess that likely served as a guardroom or sentry’s office (Macqueen 1986, 67).

The tunnel is equipped with inner and outer closures consisting of three large stone blocks fashioned as the jambs of a double-leaf door—this arrangement appears to be unique within Hattuša (Naumann 1971, 304). Functionally, the passage was part of a larger defensive scheme—parallels exist at Alacahöyük and Alishar—and seems to have operated as more than a mere service corridor, since it significantly reduced the distance required to reach the interior via the Sphinx Gate (Naumann 1971, 304).

In August 2022 archaeologists documented 249 painted hieroglyphic incisions on the tunnel’s stonework executed in a red-brown pigment. These graffiti-like signs, frequently representing personal names or divine names, cluster into eight discernible groups, although weathering has obscured several marks (Repola, et al. 2025, 1-17, Schachner 2024, 13-46, Schachner, Alparslan, et al. 2023, 73–85). The survival of these inscriptions in such numbers suggests a ritual or commemorative function for the passage as much as an operational one. Scholars have argued that the Yerkapi tunnel was not merely a sally port but formed part of a processional and ritual axis associated with northern temple complexes, its monumental external presentation making a strong visual impression upon delegations arriving from the south. The artificial mound upon which Yerkapi stands rises roughly 40 meters and extends some 250 meters in length, crowned by a façade that originally featured sphinx statues—the ensemble thus reinforced the tunnel’s symbolic dimension (Schachner, Alparslan, et al. 2023). (Fig. 4).

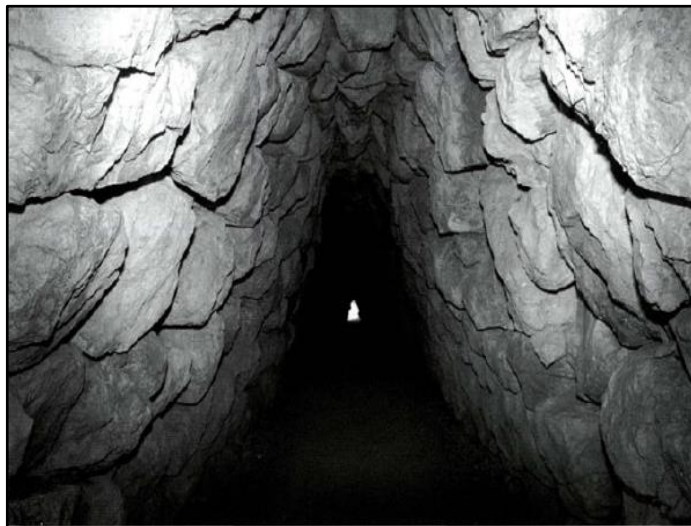


Fig.4. Yekapi postern
(Nossov and Delf 2012, 28)

3.3 Temple Tunnels: Hittite texts refer to tunnels beneath certain temples in Ḫattuša—one passage beneath the Temple of Mizzulla is explicitly mentioned: “*He descended into the tunnel beneath the Mizzulla temple and from it went to the palace.*”⁽¹⁾ Such passages formed part of the great temple at Ḫattuša, a roughly 275-meter square complex within which the primary temple buildings were centrally located. A military tunnel beneath this temple complex evidently served emergency and tactical functions during royal ceremonies, reinforcing the dual defensive and symbolic role of such subterranean works (Macqueen 1986, 117). (Fig. 5)

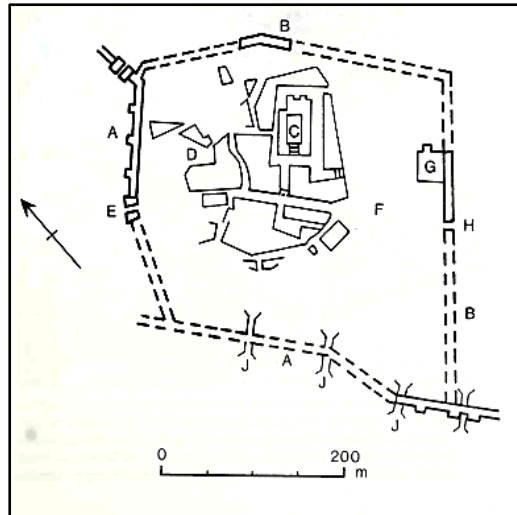


Fig 5. Great temple at Ḫattuša; (J) refers to postern- tunnel
(Macqueen 1986, 117)

3.4 Kesikkaya Tunnel:

Excavations beginning in 2009 revealed a tunnel wall west of the Kesikkaya quarter in the Upper City at Ḫattuša and also uncovered a previously unknown city gate. Work extended eastward to clarify how this defensive construction, detected first through geophysical survey, related to the southern part of Kesikkaya. Although collapse impeded some of the excavation, teams uncovered an additional tower and an edge of the passage showing that the northern tower flanking the passage was not built directly against the bedrock. The distance between the external face of the tower and the tunnel is some five meters—an important observation because the exposed eastern sections of the tunnel wall show towers directly adjacent to the portals. This evidence suggests a long evolution of the tunnel wall and possibly amendments to an earlier plan (Schachner 2011, 41). (Fig. 6)



Fig.6. Remains of Kesikkaya Tunnel
(Schachner 2011, abb. 12)

3.5 Alacahöyük: A tunnel beneath the western gate at Alacahöyük has a distinctive L-shaped layout, indicating design variability in contrast to the generally straight passages at Hattuša (Nossov and Delf 2012, 20). The western gate itself is a chambered gateway, comparable to those documented at Büyükkale and in Hattuša; the tunnel traverses the rampart accumulation on the northern slope of the tell and begins with a 13-meter north-south run before turning west and descending for a further 6 meters (Naumann 1971, 304). (Fig.7).



Fig.7. Alacahöyük tunnel
(Nossov and Delf 2012, 21)

3.6 Alishar: Alishar provides one of the earliest Hittite tunnel models, a passage roughly 50 meters. This example facilitated the orderly movement of individuals and troops and enabled defenders to attack approaching enemies from the flanks (Naumann 1971, 302, The Alishar Höyük seasons of 1930-32, Part II 1930-32). (Fig.8).

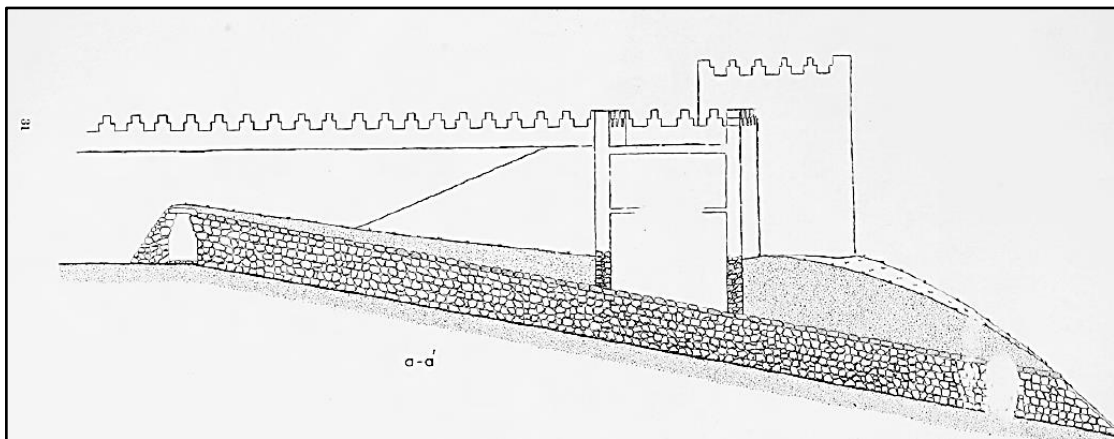


Fig.8. Alishar Tunnel
(The Alishar Höyük seasons of 1930-32, Part II 1930-32, fig. 29)

3.7 Oymağaç (Samsun): A corbelled underground facility was reported at Oymağaç, whose monumental entrance consists of homogenous stone blocks and whose passage extends toward Çörlen Pınarı at the south-eastern foot of the tell. Built with a stone corbel vault and capped with substantial facing slabs, the passage has a headroom sufficient for walking. Archaeologists have yet to decide whether this installation is a military tunnel or an underground ritual structure; based on construction technique, a second-millennium BCE date appears plausible (Karg 2005, 158).

3.8 Korucutepe: At Korucutepe the passages do not appear to be associated with any standard gate complex; although no elaborate gate has been uncovered, the presence of a gate flanked by towers remains a possibility (Bier 1973, 428).

4. TUNNELS TYPES

Two principal tunnel typologies can be distinguished in the Hittite corpus. The first comprises short passages embedded within the thickness of the city wall; these are narrow openings—approximately 1–2 meters wide—where the length of the corridor corresponds to the wall’s thickness. Such posterns represent a simple breach in the curtain that lacks extensive protective devices; to facilitate control they were typically placed adjacent to defensive towers (Miglus 2005, 606).

The second, and architecturally distinctive, type comprises tunnels that pass beneath an artificial earth bridge or a heavy rampart constructed for a high defensive wall. These are a key element of the Hittite defensive technique and are primarily documented in Anatolia. Built of large stone blocks as corbelled vaults (i.e., “false vaults”) prior to the erection of the curtain wall above, such passages can be straight—as at Ḫattuša—or display plan turns and offsets, as at Alishar and Alacahöyük. Floors are commonly inclined as ramps sloping downward toward the exterior (Ḫattuša). These subterranean passages are often flanked by towers or bastions or lie close to the principal gates or the citadel (Miglus 2005, 608).

5. FUNCTIONS OF THE TUNNELS

Hittite tunnels performed multiple and overlapping functions—defensive and offensive military roles, civil uses, and ritual or symbolic activities.

5.1 Defensive Functions: Tunnels permitted clandestine movement of defenders and supply lines during sieges, enabling protracted resistance. They operated as secondary exits (Hittite *luštani*, “postern” or “back gate”) to facilitate retreat or evacuation to more secure sectors—for instance (Miglus 2005, 605), withdrawal toward the southern approaches when Ḫattuša faced attacks by northern Kaška groups (Macqueen 1986, 69). Many passages were deliberately narrow (roughly 1–2 meters in some cases), which simplified their defense by a small number of troops (Lorenz and Schrakamp 2011, 146). Their proximity to towers or gates enabled continuous surveillance and security. Moreover, some tunnels appear to have been designed to be sealed with stones and earth in emergency conditions (Miglus 2005, 605); deliberately collapsible or blockable sections could be used to trap or neutralize infiltrators, converting a potential vulnerability into a defensive ambush. In the Yerkapi tunnel the defenses were further reinforced by the construction of a second external wall in the late thirteenth century BCE that almost closed the Sphinx Gate above the rampart—yet the tunnel below remained operational, which attests to its persistent strategic function (Naumann 1971, 304). Inside the city, tunnels also acted as internal points of resistance that enabled defenders to mount counter-operations against intruders (Nossov and Delf 2012, 21).

5.2 Offensive Functions: Posterns are often characterized as “sally ports”: they allowed defenders to leave their walls covertly to strike besieging forces, especially when the attackers’ lines were vulnerable (Mielke 2011, 178). In some instances, the Hittites dug tunnels in the course of campaigns to undermine besieged cities’ walls from beneath—an offensive application of tunneling reminiscent of broader Near Eastern siegecraft (Bryce 2002, 116).

5.3 Civil Functions: Beyond their military utility, tunnels facilitated everyday circulation of people and animals between interior quarters and the surrounding landscape without resorting to exposed main gates; they reduced congestion at principal entrances during times of unrest and served legitimate civic needs (Mielke 2018, 75).

5.4 Religious and Symbolic Functions: Tunnels could also possess deep ritual significance. The discovery of painted hieroglyphic signs in the Yerkapi passage suggests

ritual usage, and caves and passageways may have been conceived as liminal channels linking the terrestrial realm to the underworld (Bryce 2002, 180). Some scholars have proposed that the Yerkapi passage formed part of a ceremonial axis in Ḫattuša—a route employed in processions or ritual display—thereby reinforcing the tunnel’s symbolic import alongside its tactical role. (Neve 1992b, 17)

6. HITTITE TUNNELS IN A COMPARATIVE PERSPECTIVE

The Hittite tunnel model shares significant features with examples found beyond the Anatolian plateau. The elaborated postern tradition attested in Alishar and Büyükkale finds partial parallels in Ugarit (Ras Shamra) (Naumann 1971, 302, The Alishar Höyük seasons of 1930-32, Part II 1930-32, fig.29), where a tunnel was constructed adjacent to a gate within a stepped stone fortification dated to the late Early Bronze. While technical parallels exist, key differences are also apparent: Ugarit’s tunnel reportedly employed a true keystone vault (a genuine arched construction) (Bier 1973, 428) and was located adjacent to a gate rather than below an earthen rampart as in the Anatolian examples (Yon 2014, 291). This difference reflects both shared technical knowledge and local adaptation.

The Hittite model finds parallels in Palestinian contexts as well—the typological echo of Ḫattuša can be detected in narrow access passages documented at Ai (et-Tell) (Callaway 1980, 72 ff), Megiddo and Arad (Miglus 2005, 606). However, the function of these Palestinian passages was often predominantly civil and agricultural (providing access to fields) (Miglus 2005, 605), which reflects the different environmental and socio-economic context of the Levantine polities.

Technically, Anatolian examples (Alishar, Alacahöyük, Büyükkale, Korucutepe) tend to be built of irregular dry-set stones, whereas Ugarit displays more finely cut masonry (Bier 1973, 428). Many Anatolian passages slope outward away from the city (Büyükkale, Alishar, Alacahöyük, Korucutepe) and in Büyükkale the postern is paved and flanked by retaining walls. At Ugarit a flight of steps is present; at Korucutepe floors were sometimes earth or timber laid over packed surfaces (Bier 1973, 428).

Chronologically, the postern tradition in Alishar, Alacahöyük and Büyükkale stretches back to the transitional horizon between Kültepe/Karum Ib contexts and the Old Hittite state (circa seventeenth century BCE). The later imperial wall passages at Ḫattuša, dated to the fourteenth and thirteenth centuries BCE, represent a continuation and elaboration of those earlier Anatolian traditions (Bier 1973, 428). The typological match between the posterns at Ras Shamra (Ugarit) and the Ḫattuša wall suggests contemporaneity between certain elements of Ugarit’s city wall and the fortifications at Ḫattuša.

Despite the diffusion of Hittite-style tunnel construction to Syria and Palestine, the variations in form and function reveal local adaptations: in Palestine the passages predominantly served agricultural and civil needs, consistent with the agrarian orientation of those sites, whereas in Anatolia the passage tradition was integrated into a martial architectural system.

The emergence of corbelled vaults in Hittite architecture profoundly shaped later Mycenaean fortification practices. Originating in Anatolia during the 16th century BCE, this technique was first employed in posterns, gates, and fountain tunnels before being adopted by the Mycenaeans in the LH IIIB period (13th century BCE) (Maner 2012, 419). Several architectural variants—including ogival, corbelled with keystone, ashlar, and hybrid forms—demonstrate both shared technical traditions and local adaptations (Naumann 1971, 124). The Mycenaeans, while borrowing the architectural concept, altered its construction methods: whereas the Hittites inserted posterns beneath earthen ramparts, the Mycenaeans built sally ports directly into natural ground formations (Maner 2012, 421).

Chronologically, Hittite examples at Alishar, Ḫattuša, Alacahöyük, and Oymağaç precede their Mycenaean counterparts at Mycenae, Tiryns, and Midea. Taken together, the

evidence underscores those corbelled vaults—particularly in the form of fountain tunnels—were a Hittite innovation that exerted significant influence on Aegean military architecture (Maner 2012, 421-22, Maran 2010, 727). This trajectory reflects broader processes of connectivity, cultural transmission, and architectural innovation across the eastern Mediterranean during the Late Bronze Age.

7. DISCUSSION

The present corpus—architectural descriptions, stratigraphic and radiocarbon anchors, textual prescriptions, and the striking material case of Yerkapi—permits a multi-dimensional reinterpretation of Hittite tunnels. Rather than treating them as a single-purpose phenomenon (merely “sally-ports” or “drainage conduits”), the evidence supports reading them as deliberately multifunctional infrastructural elements that mediate military, civic and ideological functions within an integrated urban strategy.

Two complementary architectural facts are decisive. First, the dominant use of corbelled vaulting (Naumann 1971, 302), Cyclopean masonry and the practice of building the passage then overlaying it with an earthen rampart reflect a construction logic adapted to local materials and topography (Mielke 2012, 75). Corbelling is structurally conservative (suitable for heavy fill and slopes) and allows long spans without advanced voussoir technology. Second, the variety of plans — straight (Ḫattuša) (Miglus 2005, 608), L-shaped (Alacahöyük) (Nossov and Delf 2012, 20), stepped or sloped (Büyükkale) (Bier 1973, 428) — indicates conscious formal choices tied to function and terrain. These choices argue that Hittite engineers designed tunnels to be robust, durable, and integrated into the rampart mass rather than ad hoc cuttings. The technical solution (corbelled + overlying fill) simultaneously creates a disguised passage (concealed by rampart) and a structurally safe conduit that resists direct assault and collapse. The Yerkapi double-stone jambs and guardroom recess further indicate a controlled threshold rather than an informal pedestrian route.

While the classification of Hittite tunnels into defensive, offensive, civic, and ritual categories provides a descriptive framework, the archaeological evidence indicates that these functions were rarely isolated. In practice, a single tunnel often embodied multiple, overlapping purposes depending on historical context and immediate need. For instance, passages beneath the Yerkapi rampart in Ḫattuša were clearly designed as military sally-ports (Mielke 2011, 178), yet their monumental scale, sophisticated corbelled vaulting, and accompanying inscriptions suggest a ritual or symbolic dimension that went beyond practical defense (Schachner, Alparlan, et al. 2023). Similarly, some tunnels may have secured water supplies while also facilitating troop movement in emergencies (Naumann 1971, 302). (Table 2, 3 & Fig. 9).

This plurality underscores that Hittite architects conceived of tunnels not as single-purpose installations but as flexible infrastructures that could be redefined over time. The evidence therefore supports a dynamic reading in which military utility, civic necessity, and ideological symbolism intersected within the same architectural form. Such a perspective complicates any rigid typology and instead highlights the adaptive strategies that underpinned Hittite urban defense and political representations, these categories are not mutually exclusive. Instead, they are overlapping modalities whose relative emphasis varied by site, horizon and immediate context. Therefore, any interpretation must treat function as probabilistic, inferred from an intersection of architectural form, associated finds, texts and stratigraphy.

Hittite tunnels were designed with deliberate countermeasures, such as narrow passage widths (Macqueen 1986, 66), lockable wooden doors (Naumann 1971, 304), stone blockades, intentional collapsibility, and the construction of secondary walls and sub-sectors. These features reflect a strategic approach to risk management, enabling tunnels to provide significant tactical advantages—including enhanced mobility, surprise attacks, and ritual

functions—while incorporating architectural and procedural safeguards to mitigate potential risks.

The diachronic pattern (early examples at Alishar/Alacahöyük → apex at Hattuša, 14th–13th c. BCE) suggests increasing institutionalization of tunnel construction—moving from isolated local solutions to a standardized element of urban military system. This trajectory likely mirrors centralization of resources and skilled labor under imperial administration, and correlates with texts prescribing standardized postern outfitting (CTH 261.1) (d’Alfonso, 2021, 178; Miller, 2013, 215, 219, 223, 379). This refers to that the diffusion of tunnel techniques implies coordinated knowledge transfer (royal building programs, itinerant master builders), and therefore the phenomenon is a marker of state capacity, not merely local ingenuity.

Comparative evidence (Ugarit, Palestinian sites, Mycenaeans) reveals technical borrowing alongside local adaptation. Ugarit’s keystone vaults and adjacent gate placement (Yon 2014, 291), reflect different masonry traditions and urban contexts; Palestinian narrow passages often served agricultural access (Miglus 2005, 605). This pattern demonstrates cultural transmission plus functional re-appropriation: the Hittite model spread, but local economic and geo-political conditions determined the practical role.

The ritualization of passages, especially Yerkapi (Schachner, Alparslan, et al. 2023) invites a political reading: tunnels were not only military tools but performative architectures that enacted state power. A monumental, signed, painted subterranean route that links temples, palaces and gates becomes a stage for royal ritual and diplomatic theatre—controlling movement of people and messages, and materially manifesting the cosmology of kingly rule (underworld/under-structure metaphors).

While the Hittite tunnels embodied a multifunctional synthesis of defense, mobility, and symbolic authority, a parallel can be observed in the contemporary context of Gaza. The tunnel systems there similarly transcend a single purpose: while primarily defensive and logistical, they also serve as instruments of political agency, resilience, and community survival. Just as the Hittite tunnels reflected the intersection of military pragmatism with symbolic representation, the Gaza tunnels demonstrate how subterranean architecture can materialize strategies of endurance under siege, embedding both practical necessity and collective identity within their very construction.

8. CONCLUSION

The study of Hittite tunnels reveals the profound strategic and architectural foresight embedded within Hittite urban planning. These structures were not conceived as mere appendices to fortification walls but rather as integral components of a comprehensive vision of defense, control, and symbolic representation. Archaeological evidence demonstrates that the tunnels were never limited to a single function; instead, they embodied multifunctional spaces that ranged from defensive and offensive purposes to ritual and even civic uses, reflecting a sophisticated understanding of architectural flexibility and political pragmatism.

From a comparative perspective, the persistence of such tunnels across several Anatolian sites (Hattuša, Alacahöyük, Alishar) and their diffusion into the Levant (Ugarit, Palestine) illustrates that this architectural phenomenon was not isolated but part of a broader network of cultural and technological exchange. Nonetheless, technical variations—such as the corbelled vaulting of Anatolia versus the true keystone vaulting in Ugarit—highlight divergent interpretations of subterranean space, revealing contrasting emphases between military utility, ritual significance, and civic adaptation.

On a theoretical level, the evidence challenges the rigid separation between “military” and “ritual” or “civilian” functions, suggesting instead a fluid continuum in which these categories overlapped. The Hittite state demonstrated an ability to merge symbolic authority with pragmatic needs in a single architectural form. Thus, Hittite tunnels should not be

understood solely as defensive mechanisms, but as instruments for reproducing political legitimacy, materializing authority, and shaping the urban experience through both practical and symbolic dimensions.

This perspective invites a re-evaluation of Hittite architecture not as silent archaeological remains, but as a multi-layered discourse—simultaneously reflecting strategies of survival, practices of power, and the endurance of collective memory.

Site	Function & Use	Dimensions & Technique	Description	Notes
Hattuša (General)	Military (Defensive/Offensive): Facilitating movement between the Upper and Lower City for defense and counter-attacks.	Spaced 67-181 meters apart. Built into the defensive walls.	Multiple tunnels at regular intervals along the "Postern Wall" sectors.	Part of an integrated defensive system, allowing sectors to be held independently.
Hattuša (Büyükkale)	Military: Likely served as a secure sally port or entrance for the royal citadel.	Length: 34 m, Height: 4 m. Corbelled construction.	A tunnel beneath the eastern tower of the Büyükkale gate.	It was deliberately blocked in antiquity.
Hattuša (Yerkapı)	Multifunctional: Offensive (sally port), Ritual/Symbolic (processions, hieroglyphic inscriptions).	L: 80-83 m, H: ~3 m, W: ~2.4 m. Corbelled vault, sloped floor, double-door jambs, guard recess.	The famous tunnel beneath the Sphinx Gate rampart.	Best-preserved and only fully traversable tunnel today. Features 249 painted hieroglyphic signs.
Hattuša (Temple)	Defensive/Ritual: Emergency escape route for the king during ceremonies; likely had a ritual dimension.	Not specified.	A subterranean passage beneath the Temple of Mizzulla.	Mentioned in Hittite texts (CTH 261.1), linking the temple to the palace.
Hattuša (Kesikkaya)	Military: Part of the extended fortifications of the Upper City.	Dimensions not fully revealed due to collapse.	A tunnel discovered west of the Kesikkaya quarter, unknown city gate.	Shows evidence of evolving defensive plans, as its tower is not directly adjacent to the portal.
Alacahöyük	Military: Allows movement through the rampart for flanking attacks and sorties.	Total L: ~19 m (13m N-S + 6m W), H: 1.8 m, W: 1.5 m.	An L-shaped tunnel beneath the western gate.	Its distinctive L-shape differs from the generally straight tunnels at Hattuša.
Alishar	Military: Facilitates orderly troop movement and flanking attacks against besiegers.	Length: ~50 m.	One of the earliest known Hittite tunnel models.	Represents an early phase of Hittite military tunnel architecture.
Oymağaç	Undetermined: Proposed to be either a military tunnel (for water access) or an underground ritual structure .	Headroom sufficient for walking; exact dimensions not published. Homogenous stone blocks.	A corbelled underground structure leading to a spring.	Its exact function and date are still under investigation but technique suggests 2nd millennium BCE.
Korucutepe	Military: Presumed defensive functions (sally ports, movement).	Not specified.	Tunnels not associated with a standard gate complex.	No elaborate gate was found nearby, but its presence is possible.

Tabel.2. A comparison Table of Tunnels in Hittite Military Architecture.

Site	Defensive	Offensive	Civil	Religious
Hattuša	√	√	√	√
Yerkapi	√	√	√	√
Temple postern	√	×	√	√
Kesikkaya	√	×	√	×
Alacahöyük	√	×	√	×
Alishar	√	×	√	×
Oymağaç (Samsun)	√	√	×	√
Korucutepe	√	?	?	?

Table.3. Comparative Functional Matrix of Hittite and Regional Tunnels

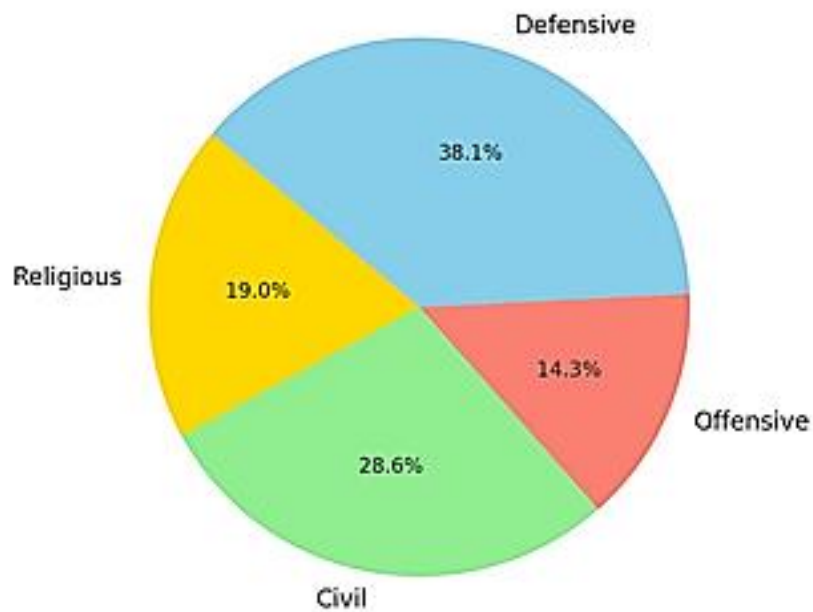


Fig.9. Comparative Functional

Notes:

- (1) The title BĒL MADGALTI "Lord of the Watchtower" designates an official tasked with governing a border or rural province, termed hantezziš auriš ("frontier post"). Their duties extend beyond the border town, leading to the common translation of "Provincial/District Governor." A more accurate rendering, "Governor of a Frontier Province" or "Frontier Governor," highlights the unique role of managing frontier regions, distinct from territories under an EN KUR-TI, and their strategic importance at the Hittite empire's borders. (Bilgin 2018, 88)
- (2) KBo 30.164. iii.12-13; CHD, P, 25.
- (3) CHD, N-L, 88.

Bibliography

- Abdel Azeem, Emad. 2024a. "From Marriage to Capture: Aspects of the Relations between Egypt and Arzawa during the New Kingdom." *SHEDET* 12: 19-38.
- . 2024b. "From the Nile to the Black Sea: Egypt's View of Kaška During the New Kingdom." *Altorientalische Forschungen* 51, no. 1: 1-15.
- Bier, Carol. 1973. "Excavations at Korucutepe, Turkey. Part II: The Fortification Wall." *Journal of Near Eastern Studies* 32, no. 4: 424-434.
- Bilgin, Tayfun. 2018. *Officials and administration in the Hittite world*. Berlin- Boston: de Gruyter.
- Bryce, Trevor. 2002. *Life and society in the Hittite world*. Oxford.
- Burke, Aaron. 2008. *Walled up to Heaven: The Evolution of Middle Bronze Age Fortification Strategies in the Levant*. Winona Lake, Indiana.
- Callaway, Joseph. 1980. *The Early Bronze Age Citadel and Lower City at Ai [et-Tell]*. Cambridge: American Schools of Oriental Research (ASOR).
- d'Alfonso, Lorenzo. 2021. "Borders in the Archaeology of the Hittite Empire." In *Borders in Archaeology: Changing Landscapes in Anatolia and the South Caucasus ca. 3500-500 BCE*, edited by Lorenzo d'Alfonso and Karen S. Robinson, 169-210. Leuven, Paris, Bristol: Peeters.
- Düzgüneş, Ertan, and Serkan Demirel. 2016. "Evaluation of Boğazköy-Hattusha Archaeological Site's Protection Problems in the Scope of Visitor Management." In *Recent Researches in Interdisciplinary Sciences*, edited by Gulnara Nyussupoa, İsa Cürebal, Emin Atasoy Recep Efe, 139-154. Sofia: St. Kliment Ohridski University Press.
- Karg, Norbert. 2005. "Oymağaç I-II." *Reallexikon der Assyriologie und Vorderasiatischen Archäologie* 10: 158-159.
- Klinger, Jörg. 2002. "Die hethitisch-kaskäische Geschichte bis zum Beginn der Großreichszeit." In *Anatolia Antica. Studi in memoria di Fiorella Imparati (Eothen II)*, edited by St. de Martino/F. Pecchioli Daddi. Florence.
- Lorenz, Jürgen, and Ingo Schrakamp. 2011. "Hittite military and warfare." In *Insights into Hittite history and archaeology*, edited by Hermann Genz and Dirk Paul Mielke, 125-152. Leuven, Paris, Walpole: Peeters.
- Macqueen, James. 1986. *The Hittites and their contemporaries in Asia Minor*. London: Thames and Hudson.
- Maner, Çiğdem. 2012. "Corbelled Vaults in Hittite and Mycenaean Fortification Architecture." In *SOMA 2012. Identity and Connectivity: Proceedings of the 16th Symposium on Mediterranean Archaeology*, edited by Anacleto D'Agostino, Guido Guarducci, Valentina Orsi and Stefano Valentini Luca Bombardieri, 419-426. Florence: Archaeopress.

- Maran, Joseph. 2010. "Tiryns." In *Handbook of the Bronze Age Aegean* (ca. 3000-1000 BC), edited by Eric Cline, 722-734. Oxford: Oxford University Press.
- Mielke, Dirk Paul. 2012. *Fortifications and fortification strategies of mega-cities in the Ancient Near East*. Vol. 1, in *Proceedings of the 7th international congress on the archaeology of the Ancient Near East. 12–16 April 2010, the British Museum and UCL, London*. Vol. 1. *Mega-cities & mega-sites, the archaeology of consumption & disposal, landscape, transport & communication*, edited by M. Seymour et.al, 74-91. Wiesbaden,: De Gruyter.
- _____. 2011. "Hittite Cities: Looking for a Concept." In *Insights into Hittite history and archaeology*, by Hermann Genz and Dirk Paul Mielke, edited by Hermann Genz and Dirk Paul Mielke, 153-194. Leuven, Paris, Walpole, Ma: Peeters.
- _____. 2018. "Hittite fortifications between function and symbolism." In *In Understanding ancient fortifications: between regionality and connectivity*, edited by Manuel Fernández-Götz and Dirk Paul Mielke Ariane Ballmer. 63-82: Oxbow Books.
- Miglus, Peter. 2005. "Poterne." *Reallexikon der Assyriologie und Vorderasiatischen Archäologie* 10: 605-608.
- Miller, Jared L. 2013. *Royal Hittite instructions and related administrative texts*. Atlanta: Society of Biblical Literature.
- _____. 2012. "The (City-) Gate and the Projection of Royal Power in Ḫatt." In *Organization, Representation, and Symbols of Power in the Ancient Near East: Proceedings of the 54th Rencontre Assyriologique Internationale at Würzburg 20–25 Jul 2008*, by Gernot Wilhelm, 675-686. Winona Lake, Indiana: Penn State University Press.
- Naumann, Rudolf. 1971. *Architektur Kleinasiens von ihren Anfängen bis zum Ende der hethitischen Zeit*. Tübingen.
- Neve, Peter J. 2004. "Die hethitischen Stadtmauern von Hattuša: eine Bestandsaufnahme." *Architectura. Zeitschrift für Geschichte* 34: 169–182.
- _____. 1992a. "Hattusha, City of the Gods and Temples, Results of the Excavation in the Upper City." *Proceedings of the British Academy* 80: 105-132.
- _____. 1992b. *Ḫattuša-Stadt der Götter und Tempel: neue Ausgrabungen in der Hauptstadt der Hethite*. von Zabern.
- Nossov, Konstantin, and Brian Delf. 2012. *Hittite Fortifications c.1650-700 BC*. New York: Osprey Publishing.
- Onurlu, Sema. 2004. *Symbol space and meaning in Hittite architecture*. "Master's thesis., Middle East Technical University.
- Repola, Leopoldo, Giovanni Varriale, Massimiliano Marazzi, Vincenzo Morra, and Andreas Schachner. 2025. "Survey and Analysis of Hieroglyphic Inscriptions in the Postern of Yerkapı–Ḫattuša." *Heritage* 8: 1-17.
- Schachner, Andreas. 2024. "A new look at an ancient city: An outline of the chronological and urban development of the Hittite capital Ḫattuša." *Anatolian Studies* 74: 13-46.
- _____. 2015. "Boğazköy-Ḫattuša, Türkei: Restaurierungen." *Ausgabe* (iDAI.publications) 3: 152–157.
- _____. 2011. "Die Ausgrabungen in Boğazköy-Ḫattuša 2010, Archäologischer Anzeiger." *Ausgabe* 1: 31–86.
- _____. 2023, Metin Alparslan, Natalia Bolatti Guzzo, Genç Bulent, Massimiliano Marazzi, and Leopoldo Repola. "Die Hieroglypheninschriften in der Poterne von Yerkapı – Erste Ergebnisse: Die epigrafische Dokumentation und die Analyse der Hieroglypheninschriften." In *Die Ausgrabungen in Boğazköy-Ḫattuša 2022*, edited by Andreas Schachner, 73–85.
- Seeher, Jürgen. 2006a. "Ḫattuša – Tuthalija-Stadt? Argumente für eine Revision der

- Chronologie der hethitischen Hauptstadt." In *The Life and Times of Hattušili III and Tuthaliya IV. Proceedings of a Symposium held in Honour of J. De Roos, 12-13 December 2003*, by T.P.J. van den Hout, 131-146. Leiden. PIHANS CIII. Istanbul.
- _____. 2006b. "Chronology in Hattusa. New Approaches to an Old Problem." In *Structuring and Dating in Hittite Archaeology. BYZAS 4.*, by Ulf-Dietrich Schoop, Jürgen Seeher Dirk Paul Mielke, 197-213. Istanbul.
- Simon, Zsolt. 2011. "When were the Fortifications of the Upper City of Hattuša built?" *Anatolica* 37: 239-249.
- The Alishar Höyük seasons of 1930-32, Part II.* Chicago : Oriental Institute of Chicago (OIP), 1930-32.
- Vergnaud, Baptiste. 2016. "Fortifications of Central Anatolia in the Early First Millennium BC." In *Focus on Fortifications: New Research on Fortifications in the Ancient Mediterranean and the Near East belongs*, edite by Silke Müth, Peter I. Schneider Rune Frederiksen, 94-108. Oxford: Oxbow Books.
- von Schuler, Einar. 1965. *Die Kaskäer: Ein Beitrag zur Ethnographie des alten Kleinasien.* Berlin.
- Weeden, Mark. 2022. *The Hittite Empire.* Oxford .
- Yon, Marguerite. "Ugarit. 2014. " *Reallexikon der Assyriologie und Vorderasiatischen Archäologie* (De Gruyter) 14: 291-295.

الأنفاق في المملكة الحيثية، دراسة في العمارة العسكرية الحيثية

الملخص

تُعدّ الأنفاق الدفاعية والهجومية من أبرز الاستراتيجيات العسكرية في العصور القديمة، إذ أدّت وظائف متعددة تراوحت بين تعزيز دفاعات المدن المحصّنة وتمكين الهجمات المباغتة ضد الخصوم. وتُظهر الأدلة الأثرية الدور البارز الذي أدّته هذه المنشآت ضمن الفكر العسكري الحيثي. فقد اعتمدت الدولة الحيثية على منظومات تحصين متقدمة شملت أسوارًا ضخمة وحصونًا قوية، وغالبًا ما دُمجت فيها ممرات تحت الأرض لخدمة أغراض دفاعية وهجومية في آن واحد. تمثل مدينة Hattuša (بوغازكوي)، العاصمة الحيثية وأحد أهم المواقع الأثرية في الأناضول، مثالًا بارزًا على هذا التطور الهندسي والعسكري؛ حيث شكّلت أنفاقها جزءًا أساسيًا من بنية الدفاع الحضري. وقد تنوعت وظائف هذه الممرات بشكل كبير، فشملت حماية مصادر المياه، وتمكين الهجمات المضادة، وفي بعض الحالات أداء طقوس دينية وشعائرية. وتنتشر هذه الأنفاق عبر مناطق مختلفة داخل المدينة (المدينة العليا والمدينة السفلى في خاتوشا) وفي عدد من المستوطنات الحيثية الأخرى. تتناول هذه الدراسة عمارة الأنفاق الحيثية وأنواعها ووظائفها ومدى انتشارها جغرافيًا، مع وضعها ضمن السياق الاستراتيجي والرمزي الأوسع لتحصينات العصر البرونزي المتأخر.

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بيانات المقال

تاريخ المقال

تم الاستلام ١ سبتمبر ٢٠٢٥

تم استلام النسخة المنقحة ١ نوفمبر ٢٠٢٥

تم قبول البحث في ١٠ نوفمبر ٢٠٢٥

متاح على الإنترنت في ١٢ نوفمبر ٢٠٢٥

الكلمات الدالة

الحيثيون، الأنفاق، الممرات، التحصينات، العمارة.