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## **THE IMPACT OF THE CONSTRUCTIVE SOLUTION ON THE FORMATION OF THE PORTAL IN THE ARCHITECTURE OF ARMENIAN CHURCHES OF 4<sup>TH</sup>-7<sup>TH</sup> CENTURIES**

*The article refers to the issues of decorative elements in architecture. The aim of the paper was to reveal the interaction peculiarities of the constructive and artistic solutions of the formation of the portals of the Armenian churches of 4<sup>th</sup>-7<sup>th</sup> centuries. The analysis of the process of formation allowed for carrying out the typological classification of the portals from the point of view of the transformation and development of the lintel construction. The classification showed that the portal created as a decoration of the entrance, as a result of the evolution of compositional-structural components was transformed into a unified constructive-artistic element, which has become the main type used in the later periods of the Armenian medieval architecture. The revealed features of the interaction of decorative and structural elements can be useful in the field of heritage studies and in the development of further works on the formation of decorative elements.*

**Keywords:** portal, structural, decorative, element, architecture, development, formation, churches, Armenian, 4<sup>th</sup>-7<sup>th</sup> centuries.

### **Introduction**

The development of medieval Armenian architecture according to the periodization accepted in the scientific circles is classified into three periods: 4<sup>th</sup>-7<sup>th</sup> - Early Middle Ages; 9<sup>th</sup>-11<sup>th</sup> and 12<sup>th</sup>-14<sup>th</sup> centuries - Developed Middle Ages and 17<sup>th</sup>-19<sup>th</sup> centuries - Late Middle Ages [14]). The latter are conditioned by political, public and socio-economic events, which were important for the history of the country and have left a certain mark on the development of the architecture and the art.

The period of 4<sup>th</sup>-7<sup>th</sup> centuries takes a special place in this context. This period in the history of Armenia is characterized by significant changes in the life of the country. In the 3<sup>th</sup>-4<sup>th</sup> centuries, feudalism replaced the slave-owning system. Feudal-princely dynasties were strengthened, inheritance rights were defined. In parallel with the new socio-economic and political conditions, the pagan faith gave way to Christianity, which in 301 was recognized as the state religion of Armenia. Under these circumstances, in parallel with the civil structures the construction of worship buildings, which were designed to serve the requirements of the new religion, was in full swing. And it was during the 4<sup>th</sup>-7<sup>th</sup> centuries that the main types of churches were developed and brought to life, which are the basis of the entire medieval religious architecture of Armenia [35, 38, 13, 37, 26].

As it has been noted by Sh. Azatyán, the architecture of Armenian churches, among other qualities, stands out for its structural meaningfulness and logical moderation of decoration [3]. At the same time, the fact that the portal is one of the important symbolic components of medieval church structures is undeniable [9, 2, 5, 25]. In the general context of the mentioned, it can be noticed that the portal, which became the main element of decoration in the architecture of the churches of medieval Armenia, is of interest both in terms of structure and aesthetics. And although the constructive-artistic solutions throughout the entire Middle Ages generally stand out with the logic of indissoluble unity, that integrity passed its unique way of formation in the early medieval period. This paper is dedicated to the coverage of the interrelationships between structural and artistic solutions in this complex process.

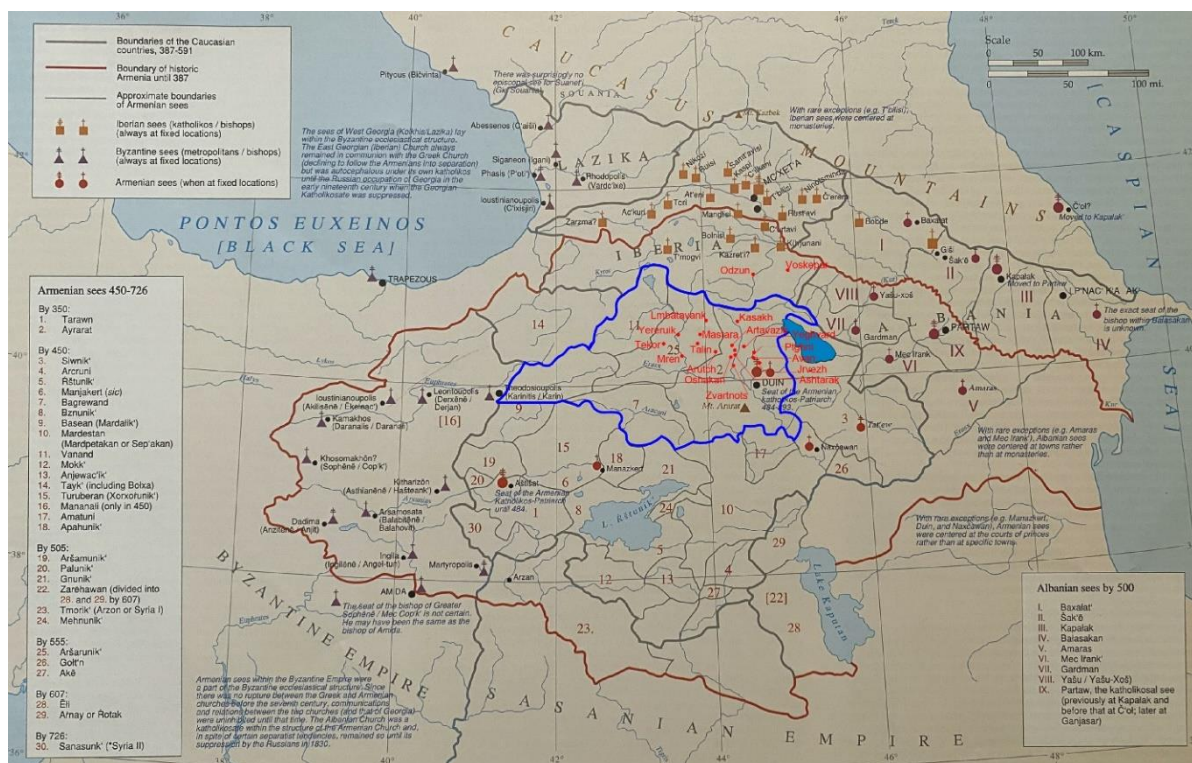
The aim of the article is to analyze the process of formation and evolution of the architecture of the portal of the Armenian churches of 4<sup>th</sup>-7<sup>th</sup> centuries and to reveal the interaction peculiarities of the constructive and artistic solutions within the framework of its formation.

The work was carried out on the basis of field observations, as well as research of published and archival materials on the topic, by scientific methods of theoretical research, comparative analysis, classification and generalization.

The elaboration of the article was based on the separation of certain problems related to the topic and the study of scientific literature on them. The following issues have been examined: the essence, peculiarities and periodization of the Armenian medieval architecture [35, 40, 37, 26, 14]; the architecture of specific Armenian temples, historical information on them, measuring materials and restorations [31, 36, 21, 27, 17, 8, 34, 24, 16]; the architecture, decoration and artistic elaborations of the Armenian medieval portals, the restorations developed on the basis of the comparative analysis and the excavation results [13, 31, 41, 36, 27, 23, 33, 19]; the results of the field observations of the Armenian portals of the 4<sup>th</sup>-14<sup>th</sup> centuries, general analysis, systematization, chronological and typological classification [3]; graphic and analytical information on the monuments outside the Republic of Armenia [38, 37, 19, 10]; general issues on portals in the medieval architecture [9, 2, 1, 5, 25] and in particular, the structural and artistic issues of the lintel [28, 6, 4]; some features of the formation of the structural solutions for coverings [12, 20, 22]; structural issues and stone architecture [7, 18, 30, 32, 29, 11]; implementation principles of stone structures with small elements [39].

The photos used in the figures were taken by the authors, in some cases the materials from Sh. Azatyan's personal archive were used. The drawings of the portals were made by the authors on the basis of A. Sahinyan's, T. Marutyan's, S. Mnatsakanyan's, N. Tokarski's reconstruction materials, as well as their own measurements. In the case of the portals of Yereruik and Arutch temples, the original measurement drawings made by Sh. Azatyan were used.

The article has been elaborated based on a study of the 51 portals belonging to 20 early medieval Armenian churches. The geography of the study is mainly limited to the central and north-eastern borders of Ayrarat Province of Greater Armenia (Mets Hayk), which includes a significant part of the present-day Republic of Armenia and covers the 4<sup>th</sup>-8<sup>th</sup> centuries Dioceses Ayrarat, Arsharunik, Vanand, Bagrevand and the northern part of Basen (Fig. 1). This is due to the historically central importance of the province, as well as the problems of access to the monuments in the current geographical and political situation [10].

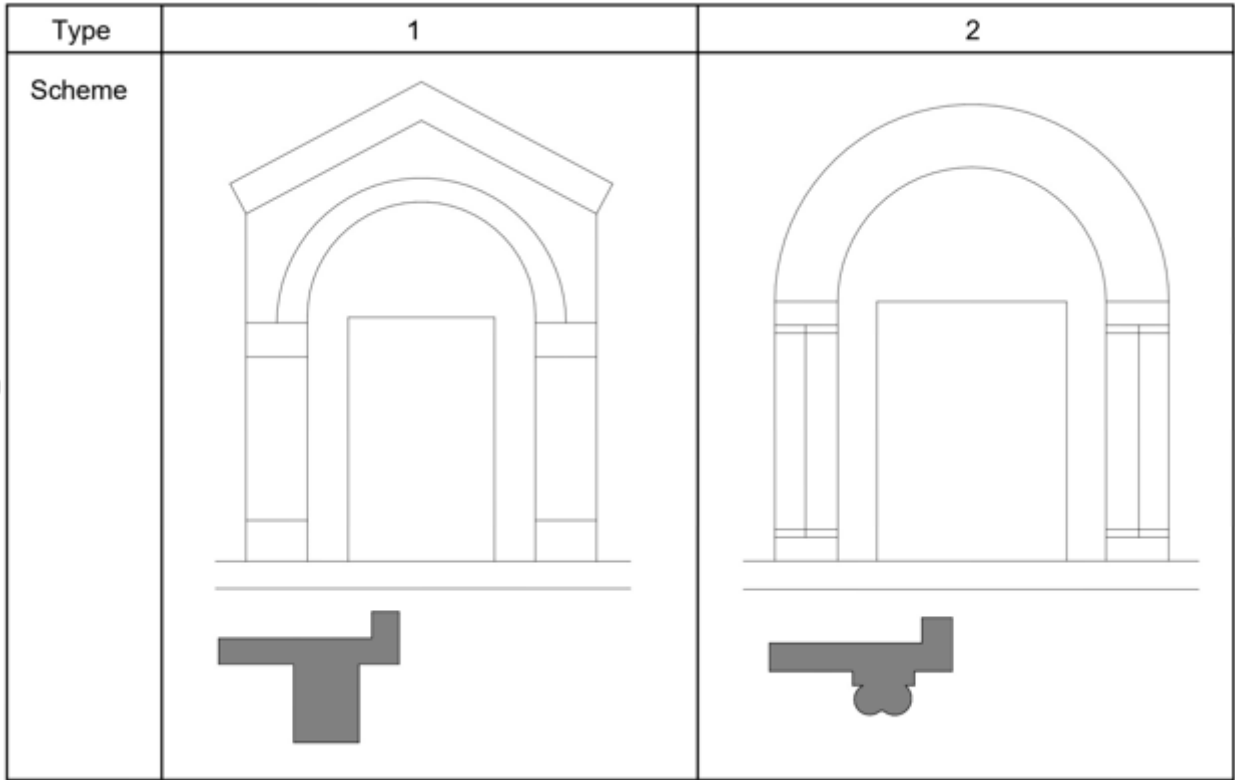


**Fig. 1. Historical Armenia with the location of the Ayrarat Province and the monuments examined (the map: Hewsen RH, Armenia: A Historical Atlas, Chicago, University of Chicago Press, 2001, p.77, Fig. 64, The Development of the Armenian Episcopal Sees; Boundaries of Ayrarat Province: according to State Committee of the Real Property Cadastre of the Government of the Republic of Armenia, National Atlas of Armenia, Yerevan, 2017, p.30-31)<sup>1</sup>**

<sup>1</sup> M.Sargsyan, A.Nazaryan, State Committee of the Real Property Cadastre of the Government of the Republic of Armenia. National Atlas of Armenia. Geodesy and Cartography, vol. II, Yerevan, 2017.

Results

The general chronological-typological classification of the portals of Armenian medieval monumental structures shows the formation patterns for the period of the 4<sup>th</sup>-7<sup>th</sup> centuries [3]. According to that classification, there are two main types of church portals in 4<sup>th</sup>-7<sup>th</sup> centuries (Fig. 2). The first type is the rectangular opening, on both sides of which are placed pylons protruding from the plane of the wall, connected by a horseshoe arch with a pediment covering. This simple but compositionally expressive form of the portal, as a result of the constant development of creative thought and constructive solutions, comes in its numerous varieties in 4<sup>th</sup>-7<sup>th</sup> centuries (Kasagh, Yereruik, Ptghni, Avan, Zvartnots, Talin (Cathedral) and other churches). And from the 6<sup>th</sup> century, another type is also used, which is created by removing the pediment from the portal covering. Such a solution can be seen in the Yeghvard, Mren, Talin (St. Astvatsatsin) and other churches.

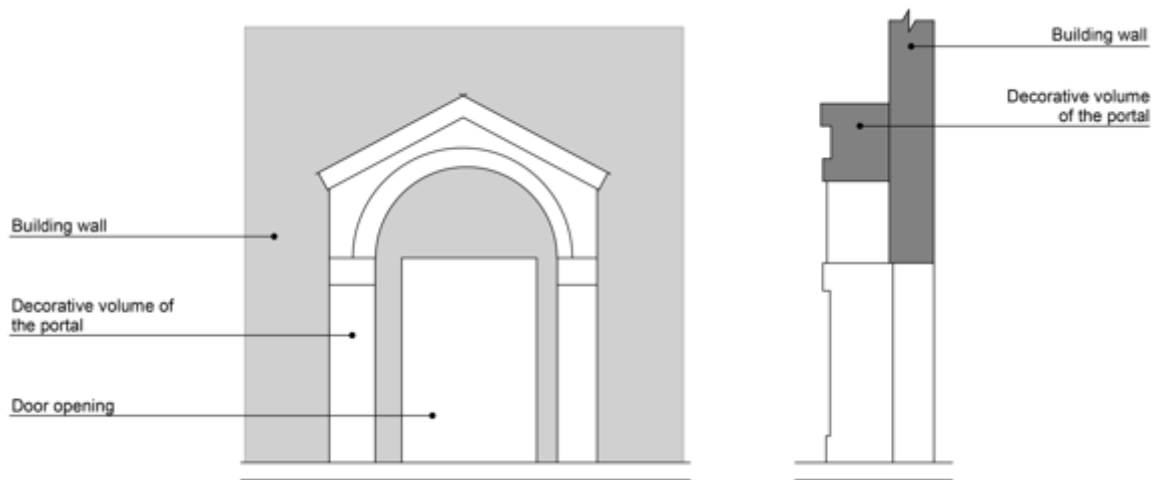


**Fig. 2.** The period of 4<sup>th</sup>-7<sup>th</sup> centuries of chronological-typological classification of the portals of Armenian medieval churches (according to Azatyany Sh.R., *Portals in the Monumental Architecture of Armenia in 4<sup>th</sup>-14<sup>th</sup> centuries*, Yerevan, Sovetakan Grogh, 1987, appendix, Fig. 42)

Both of the above-mentioned types of portals of the 4<sup>th</sup>-7<sup>th</sup> centuries generally consist of the same two main compositional-structural components. The first is the decorative volume of the portal protruding from the plane of the wall. Having a variety of decoration of the details, it retains the basic compositional elements that make up the volume: bases, pylons, capitals and an arch (with or without a pediment). The second is the part of the wall between the decorative volume and the door opening, within which the covering of the door opening is carried out (Fig. 3).

The issue of the constructive relationship between these two components, as noted in the study dedicated to the Palazzo del Priori portal damages, as a problem of construction mechanics is of great importance from the point of view of the portal structure formation [4]. It is noteworthy that in the vast majority of the portals of this period, as the examination of the examples below shows, the decorative part is built independently and does not participate in the distribution of the load coming from the wall of the structure.

And in this sense, the constructive solution of the door opening covering is of special interest. It has had a significant role in the development of portals, their formation processes, as this is where the decorative and constructive problems of portals are mainly related [28].



**Fig. 3.** *The compositional-structural system of the portals of 4<sup>th</sup>-7<sup>th</sup> centuries*

The second element that forms the portal, the part of the wall, comes in a number of variants, which are the result of the gradual development and transformation of the lintel construction. Despite the development of stone arch and vault constructions in 4<sup>th</sup>-7<sup>th</sup> centuries [18], the door opening continues to maintain the rectangular solution. This leads to a peculiar development of the lintel construction. And the rectangular shape of the opening, which is necessary for the installation of the door and its convenient operation, is decisive both for the development of the lintel construction and for the whole portal formation.

The peculiarities of the development of the lintel constructive system can be revealed by observing typical examples.

**Beam.** The rectangular door opening in the portals of the earliest churches of 4<sup>th</sup>-5<sup>th</sup> centuries is covered with a full single-piece stone beam. In general, coverings with such constructive system have been implemented since ancient times, a vivid example of which is the widespread dolmens in the Eurasian continent - burial and cult structures [12, 20, 22]. This system has existed in Armenian architecture until the late Middle Ages. However, in parallel with the creation of the large spans cover systems with significant advantages from the constructive and technological point of view, the beam model continues to be applied, especially in the case of small spans, such as portals. In particular, such a constructive solution has the western portal of the Kasagh Basilica, where the decorative part (almost not preserved on the spot, but the excavated fragments were the basis for A. Sahinyan's restoration) has a completely independent solution from a constructive point of view (Fig. 4).

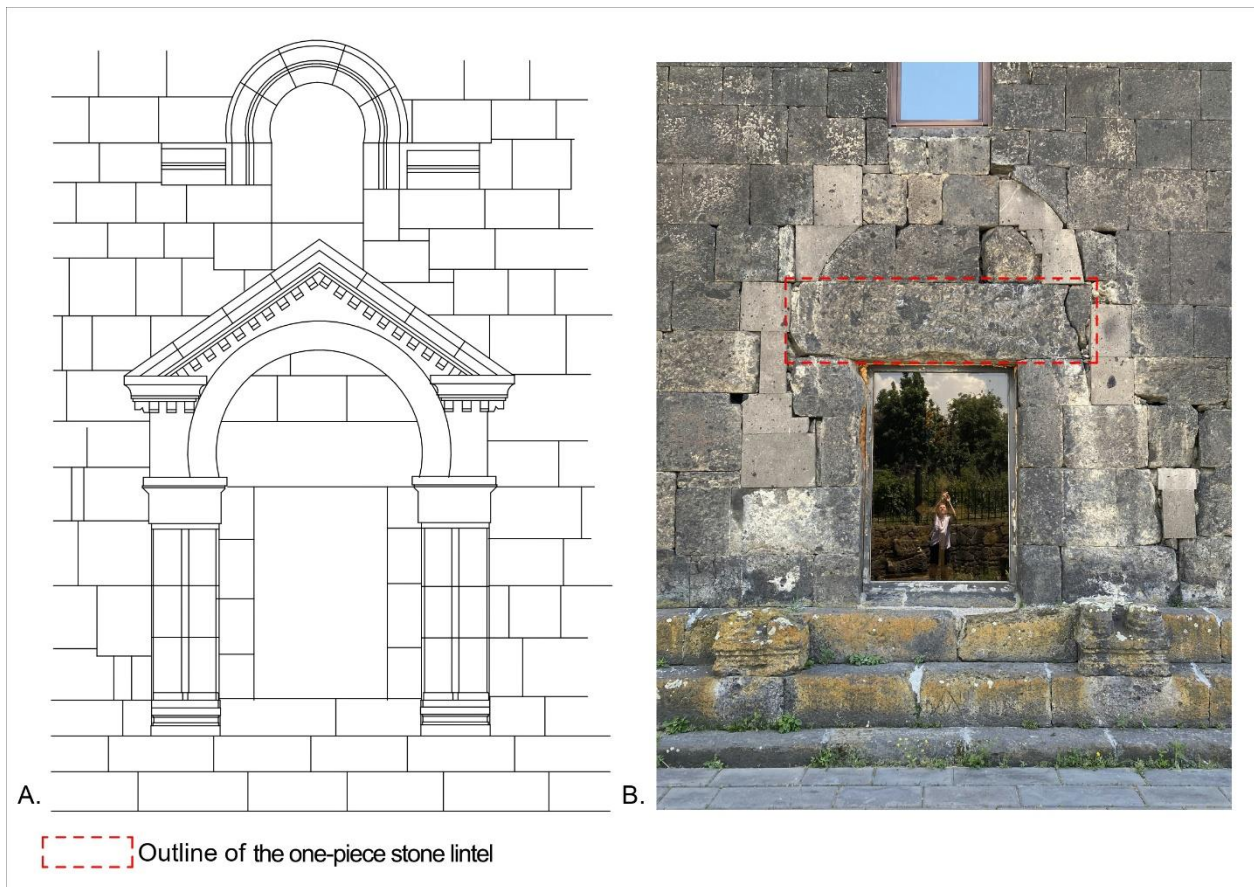
The beam covering the door opening consists of two parts: external (frontal) and internal beams, which together cover the entire thickness of the wall. The width of the door opening is 1500 mm. Beams with a height of 750 mm with the same 750 mm size rest on the side walls of the door opening. The front beam is decorated with ornaments typical of the time.

The northern portal of the Avan Temple, the portals of the Tekor Temple, of Tsiranavor Church in Ashtarak and of St. Astvatsatsin Church in Talin have such a solution (Fig. 5).

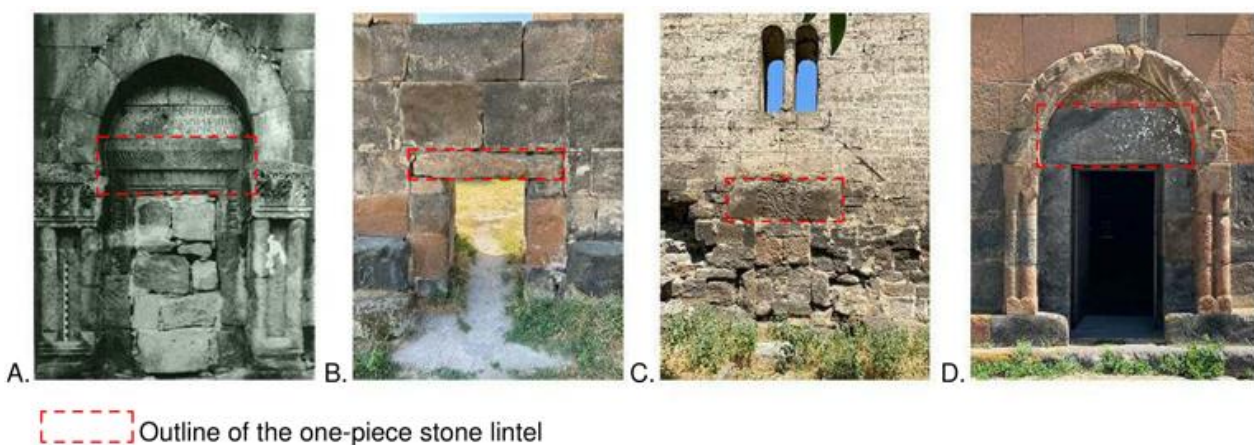
It should be noted, however, that in this system, from the point of view of the structure operation, the lintel stone is in a rather unfavorable condition. It bears all the load of that part of the structure wall, as a result of which cutting forces appear in the supporting parts of the beam, the impact of which increases sharply, especially under the influence of earthquakes or ground settlements [4, 30, 32, 29, 11]. The study of the portals of different churches shows that the mentioned defect is discovered by builder-architects quite early, and



attempts to solve the problem are already noticeable in the structures of almost the same period, which are expressed in other approaches to the implementation of the lintel.



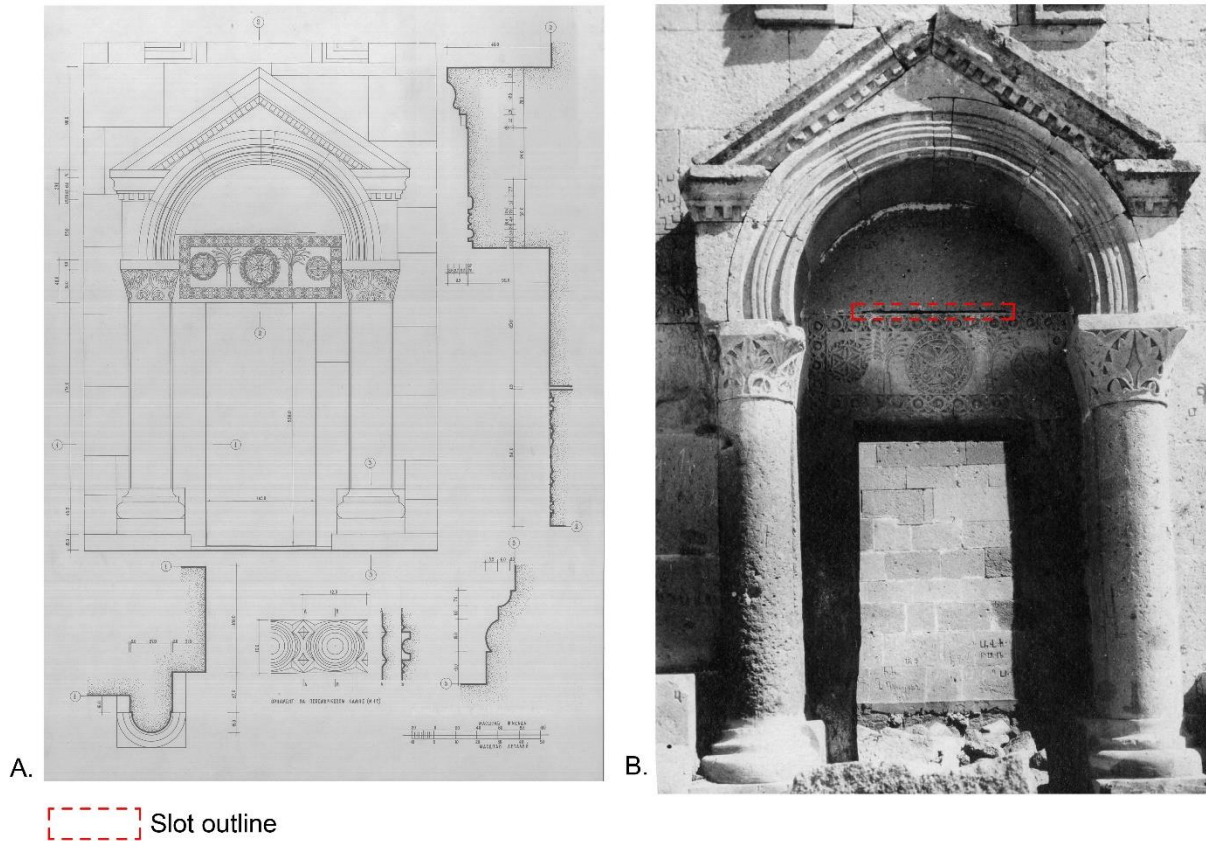
**Fig. 4.** The portal on the western facade of the Kasagh Basilica (4<sup>th</sup> century, Aparan, Aragatsotn Province, Republic of Armenia): A) facade (according to Sahinyan A.A., *Architecture of the Kasagh Basilica*, Yerevan, Academy of Sciences of the Armenian SSR, 1955, p.149, Fig. 123); B) general view



**Fig. 5.** A) The portal on the northern facade of the Tekor Temple (5<sup>th</sup> century, Digor, Kars Province, Republic of Turkey); B) the portal on the northern facade of the Avan Temple (591-602, Yerevan, Republic of Armenia); C) the portal on the western facade of the Tsiranavor Church (5<sup>th</sup> century, Ashtarak, Aragatsotn Province, Republic of Armenia); D) the portal on the western facade of the St. Astvatsatsin Church (7<sup>th</sup> century, Talin, Aragatsotn Province, Republic of Armenia)

**Slot.** In the 4<sup>th</sup>-5<sup>th</sup> centuries, in parallel with the widespread beam covering, another type of door opening covering was created. It is expressed in the system of lintels with unloading slots. The slots are implemented

between the stones of the first and second rows of the lintel, on the stone of the second row. Due to the slots, the lintel stone is released from the directly affecting load, and all the weight coming from the wall is transferred directly from the stone of the second row to the lateral parts of the opening. Here the lintel turns into a self-bearing constructive element that ensures the rectangular opening of the door. Interesting examples from the point of view of the construction and artistic design of this type of covering on the church entrance are the southern and western portals of the Yereruik Temple (Fig. 6).



**Fig. 6.** The right side portal on the southern facade of the Yereruik Basilica (5<sup>th</sup> century, Anipemza, Shirak Province, Republic of Armenia): A) facade (according to Azatyan Sh.R., *Portals in the Monumental Architecture of Armenia in 4<sup>th</sup> -14<sup>th</sup> centuries*, Yerevan, Sovetakan Grogh, 1987, p.58, plate 1, the original drawing used); B) general view

The opening of the western portal door with a 1560 mm span is covered with two large lintel stone blocks – external and internal. The unloading slot is implemented on the second row of blocks, within the whole depth of the wall and has 35 mm height. The artistic development of the lintels on the temple portals is closely connected with its construction. In all three portals, the stone of the first row of the lintel, which is separated from the other rows by an unloading slot, is developed in detail. Such a design of developing the lintels ensured the originality of the artistic expression of the portals [21, 8].

However, it should be noted that the unloading slots, while improving the construction of the lintel, do not give a complete solution to it. Covering the doorway with large stone blocks is of technological and construction difficulties and lags behind the development of construction techniques of the time, where the principle of implementation of structures (walls, arches, vaults) by relatively small elements is already widely used [39]. And such an approach to covering the door opening as in Yereruik Temple was later left out of the portal implementation practice and was found in the structural solutions of smaller internal doors of the buildings, as in the case of the 4 internal doors of Avan Temple (Fig. 7). It should also be noted that the decorative part in the portals of Yereruik Temple is also independent and does not take part in the general operation of the wall structure.

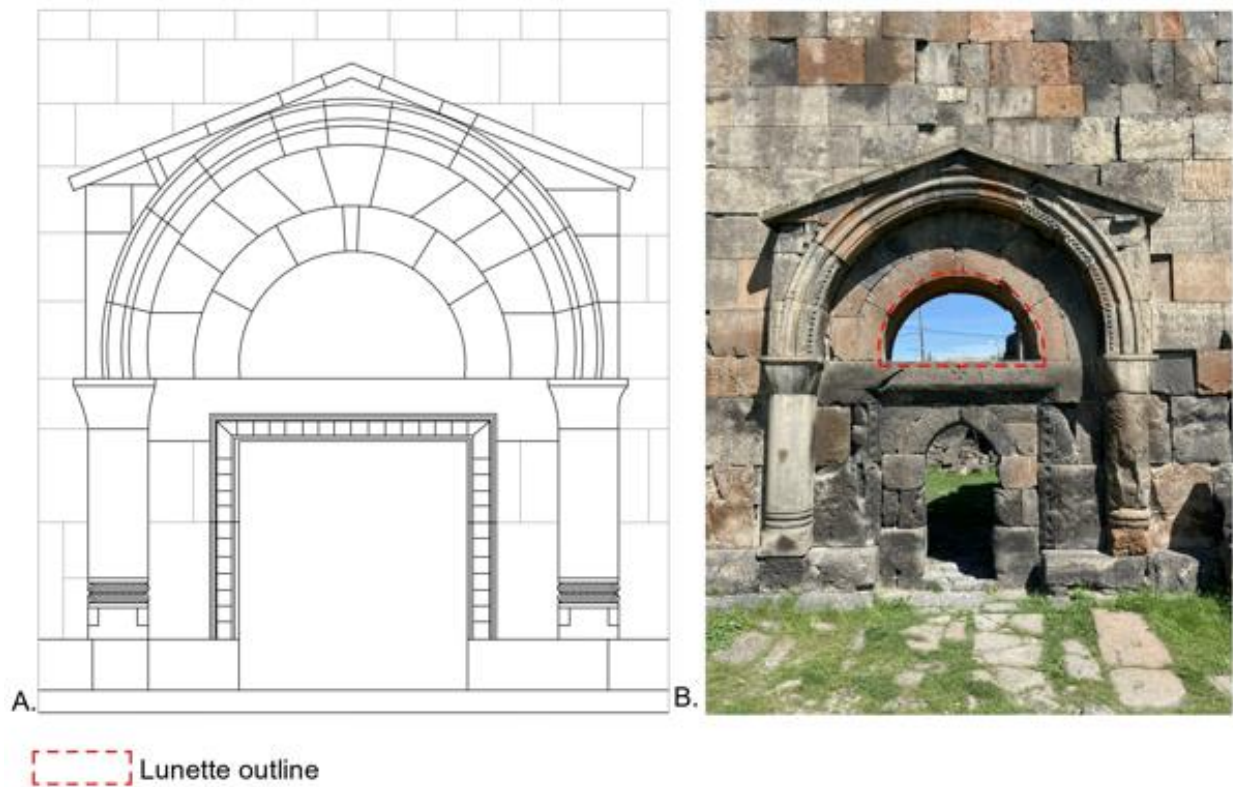




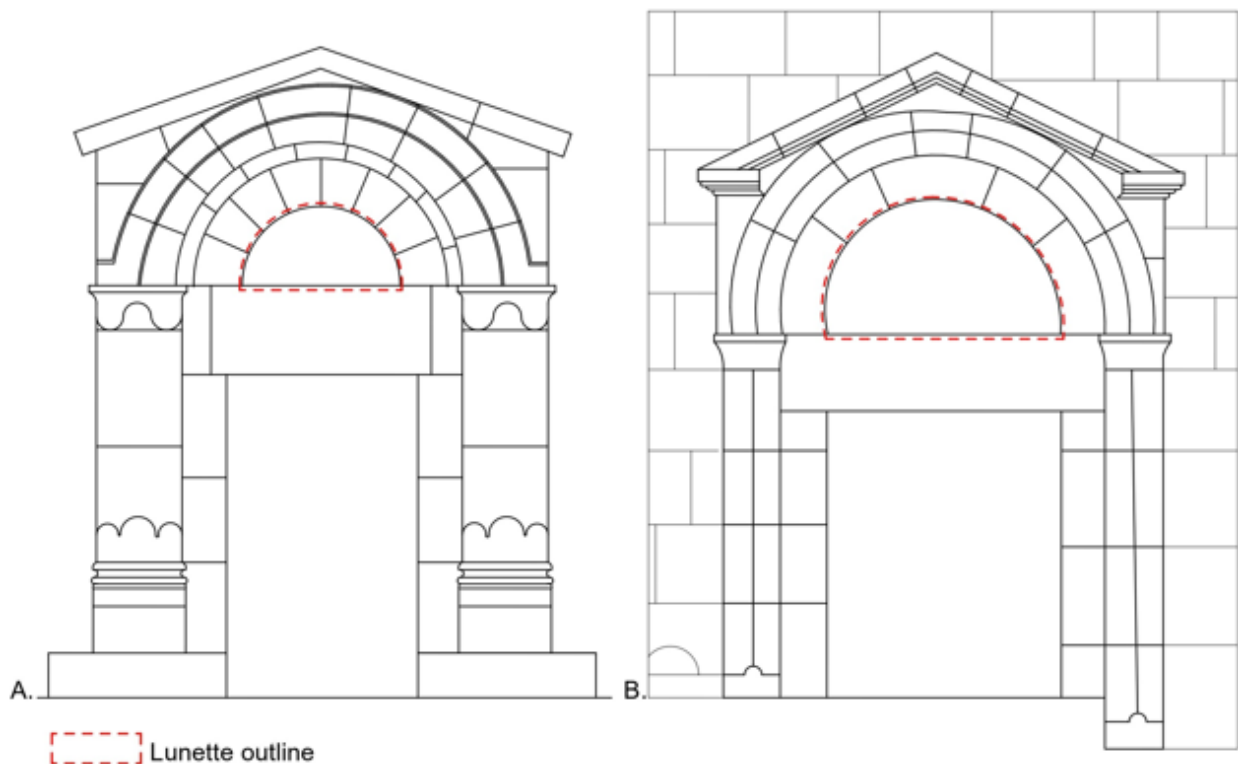
**Fig. 7.** *The inner doors of the Avan Temple (591-602, Yerevan, Republic of Armenia)*

**Lunette.** The logical continuation of the unloading slot is the lunette applied in the practice of construction of the portals of already 6<sup>th</sup>-7<sup>th</sup> centuries. From the engineering point of view, lunette plays the role of the slot. In this case, the constructive principle of releasing the lintel stone from direct load remains unchanged, only the stones of the second row of lintel complicated from the point of view of technology and construction, are replaced with an arch, which also has an advantage in terms of reliability [6]. In particular, an example of the lunette use is the western portal of the Avan Temple (Fig. 8). This example, however, manifests that the lunette solves a partial problem in the construction of the lintel. Although the lunette arch bears the load of the wall, the self-supporting stone of the lintel required for the installation of the rectangular door, which is preserved in this type as well, is in a rather unfavorable condition from the constructive point of view. The span part of the beam is free from bottom and top parts, and at the edges - in the supporting parts, it takes the forces coming from the arch. In the case of large spans and large dimensions of structural elements, a vivid example of which is the western portal of the Avan Temple, damages occur under the influence of cutting forces during seismic tremors [7]. These become the reason for the implementation of an additional wall section in the doorway opening of this portal later (Fig. 8).

Examples of the application of lunette are also found in the portals of the Zvartnots Temple and the Jrvezh Church (Fig. 9). In Zvartnots Temple, which is one of the most important monuments in the field of Armenian church architecture, all 5 portals have similar solution: they all have lunette [17]. It should be noted that according to A. Yeremian's comparative analysis, there were portals with such a solution in St. Hripsime Church (618, Vagharshapat, Republic of Armenia). However, they were later substantially changed and complete facts on original solutions were not preserved [41].



**Fig. 8.** The portal on the western facade of the Avan Temple (591-602, Yerevan, Republic of Armenia): A) facade (according to Marutyan T.H., *Avan Temple and Similar Monuments*, Yerevan, Hayastan, 1976, p.19, Fig. 12); B) general view



**Fig. 9.** A) One of the portals of the Zvartnots Temple (641-661, Zvartnots, Armavir Province, Republic of Armenia: according to Mnatsakanyan SKh, *Zvartnots*, Moscow, *Iskusstvo*, 1971, p.29, Fig. 11); B) the portal on the western



*facade of Jrvezh Church (7<sup>th</sup> century, Jrvezh, Kotayk Province, Republic of Armenia: according to Tokarsky NM, Jrvezh, Yerevan, Academy of Sciences of the Armenian SSR, 1959, p.57, Fig. 20)*

**Closed Lunette.** The application of lunette creates a new type of portal with unique artistic expressiveness. However, this option of covering the door opening does not become widespread as well. It can be assumed that one of the reasons for the rejection of this covering method were the difficulties related to closing the opening in the lunette part.

The problem of closing the lunette opening is evidenced by the fact of implementation of stone masonry in those parts later, as well as the creation of closed lunettes, where the lunette is replaced by a stone block with a circular top part. An example of this is the western portal of the 7<sup>th</sup> century Mren Temple (Fig. 10).

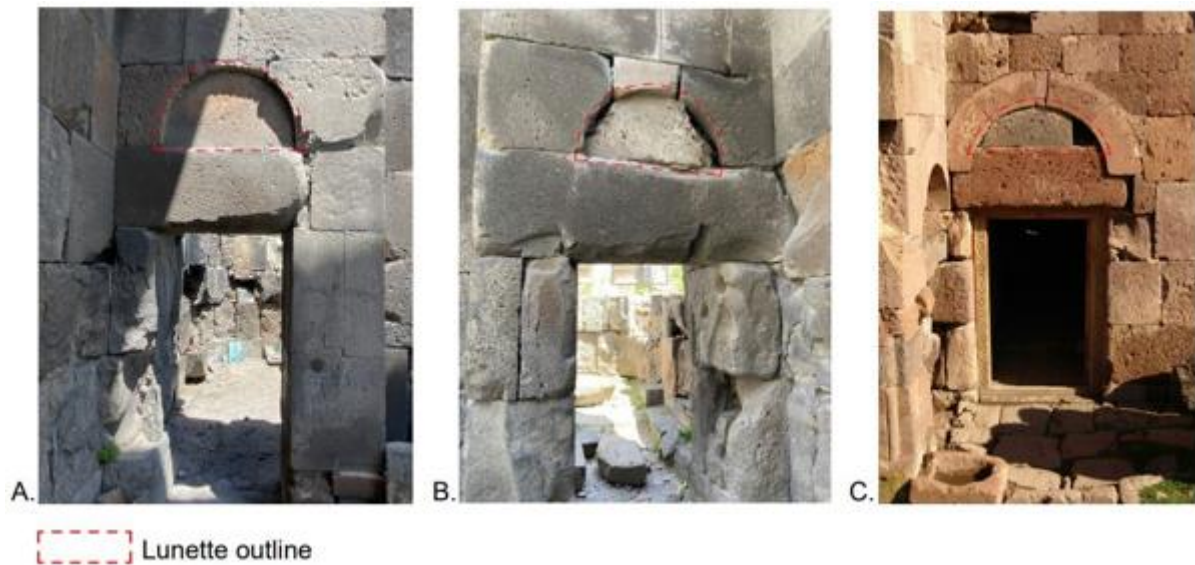


 Lunette outline

**Fig. 10.** *The covering structure of the western portal of the Mren Temple (640, Kars Province, Republic of Turkey)*

This, being an example of a closed lunette, is at the same time quite one of a kind. Here the lintel stone is not rectangular but trapezium-shaped. The width of the stone closing the lunette is smaller than the door opening and is also smaller than the size of the upper zone of the trapeziform lintel. Both of these stones are carved with bas-reliefs with unique religious and secular motifs. The portal on the northern facade of the Temple has the same solution [19].

There are portals with closed lunette also in Lmbatavank. The application of such a solution can also be found in the inner doors of the churches, in particular, in the sacristy entrances of the Ptghni Temple (Fig. 11).



**Fig. 11.** A, B) The inner doors of the Ptghni Temple (6<sup>th</sup> century, Ptghni, Kotayk Province, Republic of Armenia); C) the portal on the western facade of the St. Stepanos Church of Lmbatavank (7<sup>th</sup> century, Artik, Shirak Province, Republic of Armenia)

**Beam and Arch.** Another approach to the lintel unloading is the combination of different solutions in two layers of the wall masonry (external and internal). In this case, the beam carrying the load from the wall is preserved in the external part, and an arch of a size of the door opening is implemented in the internal part. Such a solution can be seen in the portals of the Arutch Temple (Fig. 12). These are implemented in a form of a niche-portico covered by span roof with the appearance of a pediment. This serves both the purpose of protecting from various weather conditions and, apparently, of forming appropriate psychological preparations before entering the temple [1]. In the lintel part, there is a masonry with a semicircular top consisting of three stones, of which the lower beam stone bears the load of the external layer masonry of the wall. The covering of the door opening implemented in a form of a semicircular arch from the inside, which is the direct support of the internal layer masonry of the wall.

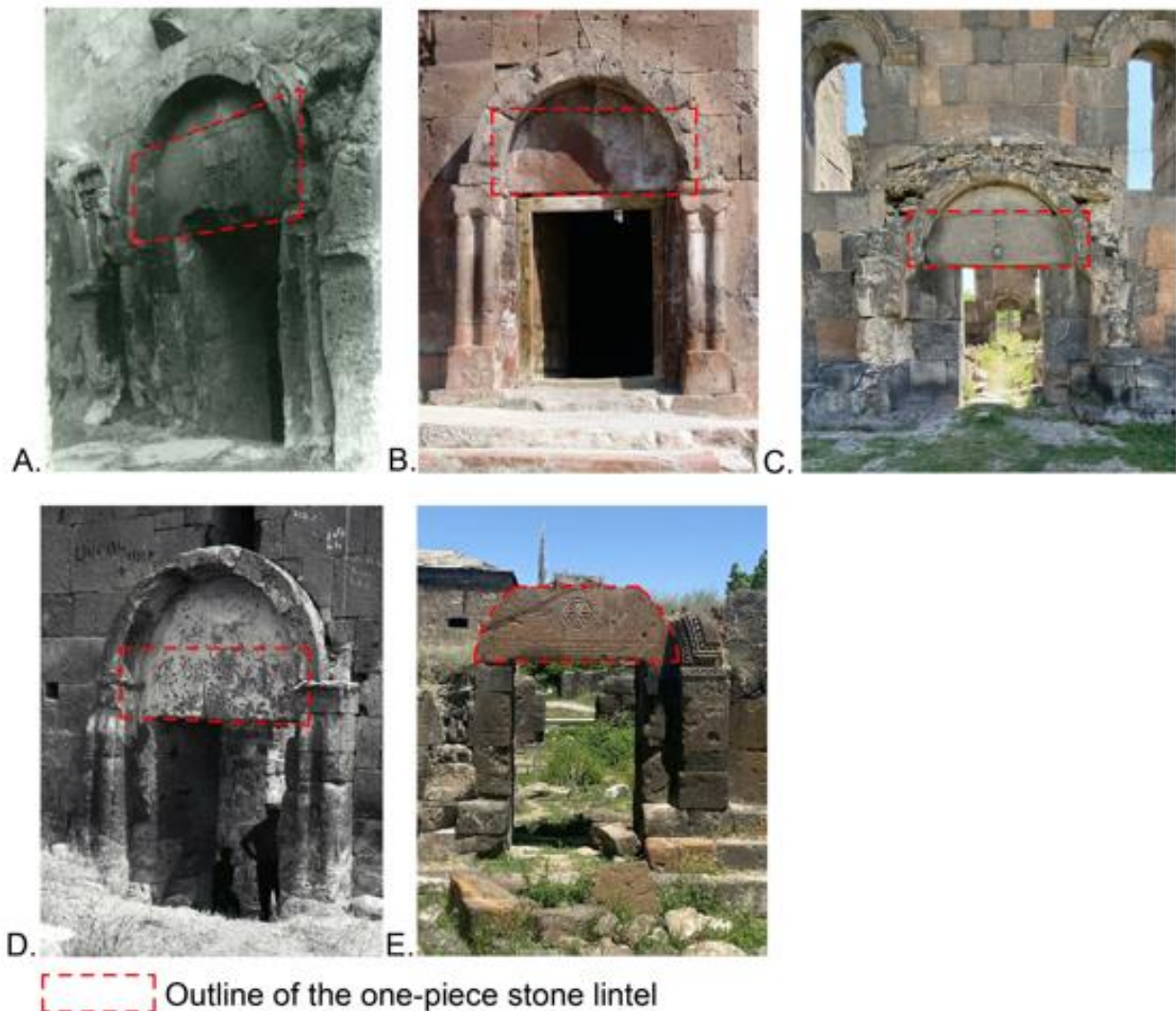


**Fig. 12.** The portal on the northern facade of the Arutch Temple (666, Arutch, Aragatsotn Province, Republic of Armenia): A) facade (according to Azatyan Sh.R., *Portals in the Monumental Architecture of Armenia in 4<sup>th</sup>-14<sup>th</sup>*



centuries, Yerevan, Sovetakan Grogh, 1987, p.66, plate 5, the original drawing used); B) general view from the outside; C) general view from the inside

The application of the combined solution is also found in Odzun, Ptghni, Yeghvard, Mastara, Byurakan Artavazik churches (Fig. 13).



**Fig. 13.** A) The portal on the southern facade of the St. Astvatsatsin Church (6<sup>th</sup> century, Odzun, Lori Province, Republic of Armenia); B) the portal on the western facade of the St. Hovhannes Church (7<sup>th</sup> century, Mastara, Aragatsotn Province, Republic of Armenia); C) the portal on the northern facade of the Ptghni Temple (6<sup>th</sup>-7<sup>th</sup> century, Ptghni, Kotayk Province, Republic of Armenia); D) the portal on the western facade of the Artavazik Church (7<sup>th</sup> century, Byurakan, Aragatsotn Province, Republic of Armenia); E) the central portal on the southern facade of the Yeghvard Temple (6<sup>th</sup> century, Yeghvard, Kotayk Province, Republic of Armenia)

It should be taken into account that the presence of a portico at the Arutch Temple portals, however, does not affect the solutions of the opening covering, and the decorative part of the portal does not bear the load of the external layer masonry of the wall in any way. And the mentioned, in fact, also refers to the portals of all the churches already discussed. Here, the components of the decorative part of the portal - arch, vault, pediment, pylol, base, capital are all inserted in the wall slightly or are placed in front of the wall [33]. They do not directly participate in the transfer of the load of the entire wall height to the ground, and the elements of the upper zone generally rest on the construction of the door opening lintel.

**Unloaded Tympanum.** A direct consequence of above-mentioned approaches to the closed lunette and the combination of beam and arch in two layers of the wall masonry can be considered the creation of a new type of door opening covering, where the stone of lintel beam as well as the stone closing the lunette are united in one block - the tympanum stone. Such a solution can be seen in the portals of the 7<sup>th</sup> century churches



Mankanots in Oshakan, Karmravor in Ashtarak, St. Astvatsatsin in Voskepar and Katoghike in Talin (Figures 14, 15).



**Fig. 14.** A) The portal on the western facade of the St. Astvatsatsin Church (7<sup>th</sup> century, Voskepar, Tavush Province, Republic of Armenia); B) the portal on the western facade of the Mankanots Church (7<sup>th</sup> century, Oshakan, Aragatsotn Province, Republic of Armenia); C) the portal on the western facade of the Karmravor Church (7<sup>th</sup> century, Ashtarak, Aragatsotn Province, Republic of Armenia)

Both portals of St. Astvatsatsin Church in Voskepar have this solution. Here the decorative volume is completely independent of the tympanum. The tympanum of the western portal has cracked in its entire height under the weight of the upper part of the wall [16]. Both portals have an arch of a size of the door opening on the inside (Fig. 14a). The tympanum of the portal of the Mankanots Church in Oshakan has the same solution (Fig. 14b).

In the tympanum of the portal of the Karmravor Church in Ashtarak, the ratio of the tympanum and the decorative section is more obvious and clear, as the decorative part of the portal is missing, due to which the constructive solutions of the door opening part of the wall are visible. The tympanum has wings at the edges, on which the arched stones placed above the tympanum rest. There is an arch of a size of the doorway from the inside (Fig. 14c).

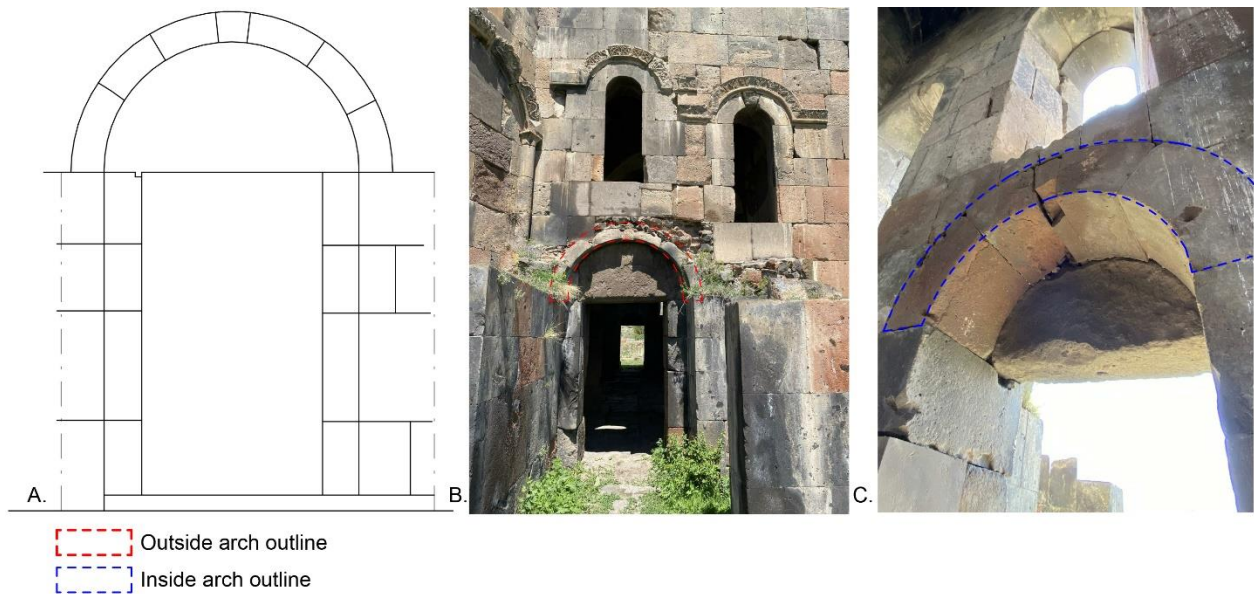
In the Talin Cathedral portals, which have a portico solution like the Arutch Temple ones, the door opening covering is externally implemented with the above-mentioned tympanum stone block, and internally, as in the Arutch Temple, with an arch. The tympanum stone, which has wings in the bottom part, is developed from two sides, externally for the facade and internally for the interior. Here the internal arch is semicircular, the height is less than the height of the tympanum and acts as a support for it (Fig. 15).

The tympanum created by the mechanical union of two constructive elements (the lintel beam and the stone closing the lunette) had partial defects. The first is that rectangular wings inertially left from the lintel are of no constructive significance. The second is that these wings hinder the complete implementation of the arch built above the tympanum, which in turn prevents the complete unloading of the tympanum. Tympanum stones of the Talin Cathedral typically have cracks along the entire height of the rectangular wings (Fig. 15).

It should be taken into account that the covering solution for the Talin Cathedral portals differs significantly from the versions of Mankanots in Oshakan, Karmravor in Ashtarak and St. Astvatsastin in Voskepar. Here, the stones of the arch built above the tympanum are exactly the stones of the decorative part, which are no longer inserted in the wall, but go deep inside, taking the load of the external layer of the wall (Fig. 15).

This allows us to prove that the creation of this type of door opening covering is a turning point in the formation of portals. If before that the decorative volume and the part of the wall that made up the covering of

the door opening were independent from the structural and constructive point of view, here the portal arch, while preserving the decorative function, at the same time bears the load of that part of the wall and becomes a constructive component, leaving to the tympanum stone only the functions of insulation and giving a rectangular form to the door opening.



**Fig. 15.** The right side portal on the western facade of the Talin Cathedral (7<sup>th</sup> century, Talin, Aragatsotn Province, Republic of Armenia): A) facade; B) general view from the outside; C) general view from the inside

It is noteworthy that this new type of tympanum which gives new opportunities of artistic design and is more reasonable from the constructive point of view, undergoing some improvements (the wings left from the lintel beam are removed, which allows the implementation of a complete load-bearing arch, in the supporting parts the tympanum corners intersect at 45 degrees, as a result of which the cutting forces at the edges are eliminated), becomes primary in the Armenian medieval monumental architecture and greatly widespread in later centuries [40, 13, 37, 3, 34, 24].







### Summary and Conclusion

The analysis of the development of the portal architecture of the Armenian churches of the 4<sup>th</sup>-7<sup>th</sup> centuries based on the methods of theoretical research, comparison, classification and generalization allows revealing some regularities of the interaction of constructive and artistic solutions in the process of portal formation. In particular, from the point of view of the transformation and development of the lintel construction, it is possible to make a certain typological classification of the portals of 4<sup>th</sup>-7<sup>th</sup> centuries Armenian churches (Fig. 16).

The classification shows that although from the point of view of the lintel structure there is a certain evolution in the typological transformation process of the portals, it does not have a clear, definite direction. Originating from the ancient beam type, it has in parallel led formation of new types expressing the attempts to unload the lintel, which, however, did not exclude the use of the beam type. At the same time, as a result of this multilateral process, the preconditions for the structural-artistic unity of the architecture of the portals were formed, which became primary in the further Armenian medieval architecture.

In particular, the classification makes it obvious that significant changes and differences in the lintel construction appear in the second element that forms the portal - in the wall part and depend on the constructive solution of the lintel. While following the development of the forms in the tympanum part, the desire to find a more structurally stable, reliable system for covering keeping the rectangular form of the doorway becomes obvious. As a result, there are changes in the structural role of the two main compositional and structural components of the portal - the decorative and wall parts. The decorative part is included in the constructive

system of the structure wall, and the part of the portal wall covering the doorway becomes a self-supporting tympanum, free from the load of the structure wall.

Type	Beam	Lintel unloading attempts				Unloaded tympanum
		Slot	Lunette	Closed lunette	Beam and arch	
Scheme (facade and section)						
4th century	3 portals of the Kasagh Basilica	—	—	—	—	—
5th century	4 portals of the Tekor Temple, 2 portals of the Tsiranavor Church in Ashtarak	3 portals of the Yerenuik Basilica	—	—	—	—
6th century	Northern portal of the Avan Temple	—	Western portal of the Avan Temple	—	3 portals of the St. Astvatsatsin Church in Odzun, 3 portals of the Ptghni Temple, 5 portals of the Yeghvard Temple	—
7th century	The portal of the St. Astvatsatsin Church in Talin	—	5 portals of the Zvartnots Temple, western portal of the Church in Jrvezh	Western and northern portals of the Mren Temple, 2 portals of the St. Stepanos Church of Lmbatavank	2 portals of the St. Hovhannes Church in Mastara, 3 portals of the Arutch Temple, the portal of the Artavazik Church in Byurakan	5 portals of the Talin Cathedral, 2 portals of the St. Astvatsatsin Church in Voskepar, the portal of the Mankants Church in Oshakan, the portal of the Karmravor Church in Ashtarak

**Fig. 16.** Typological classification of the portals of Armenian churches in 4<sup>th</sup>-7<sup>th</sup> centuries according to the transformation and development of the lintel construction

Thus, it can be stated that the portal, which was a form of a decorative design of the entrance in the architecture of the 4<sup>th</sup>-7<sup>th</sup> centuries Armenian churches, acquires a new artistic expression at each stage of the lintel construction evolution, and, taking the functions of bearing the covering as well as the applying hardness to a wall weakened by the doorway, becomes a unified constructive-artistic element.

## References

- [1]. M. Abel, Within, Around, Between: Micro Pilgrimage and the Archivolted Portal. *Hispanic Research Journal*, 10 (5), 2009, 385-416.
- [2]. G. Alessandrini, G. Dassù, R. Bugini, L. Formica, The Technical Examination And Conservation of the Portal of St Aquilino's Chapel in the Basilica Of St Lorenzo, Milan. *Studies in Conservation*, 29 (4), 1984, 161-171.
- [3]. SH.R. Azatyan, Portaly v monumental'noy arkhitekture Armenii IV-XIV vv. *Sovetakan Grokh*, Yerevan, 1987 (in Russian).
- [4]. A. Borri, G. Castori, Damage and Seismic Vulnerability of the Portal of Palazzo Dei Priori. *International Journal of Architectural Heritage*, 5 (2), 2011, 219-240.
- [5]. M. Castineiras, The Romanesque Portal as Performance. *Journal of the British Archaeological Association*, 168 (1), 2015, 1-33.



- [6]. J. DeLaine, Structural Experimentation: The Lintel Arch, Corbel and Tie in Western Roman Architecture. *World Archaeology*, 21(3), 1990, 407-424.
- [7]. M. Domaszewski, C. Knopf-Lenoir, J.L. Batoz, G. Touzot, Shape Optimization and Minimum Weight Limit Design of Arches. *Engineering Optimization*, 11 (3-4), 1987, 173-193.
- [8]. P. Paboudjian, A. Novello, The "Ererouk" basilica, Ares, Milano, 1977.
- [9]. Ts. Gabashvili, Portaly v gruzinskoy arkhitekture. *Tekhnika da Shroma*, Tbilisi, 1955 (in Russian).
- [10]. A.Yu. Kazaryan, Ot Ardzh Aricha do Mrena. *Sravnitel'nyy analiz raboty ekspeditsiy 1920 i 2013 godov, izuchavshikh pamyatniki v okrestnostyakh Tekora. Armenological Issues: Bulletin*, 2 (5), 2015, 65-76 (in Russian).
- [11]. G. Giardina, A. Marini, P. Riva, E. Giuriani, Analysis of a Scaled Stone Masonry Facade Subjected to Differential Settlements. *International Journal of Architectural Heritage*, 14(10), 2020, 1502-1516.
- [12]. D. Gilead, Burial Customs and the Dolmen Problem. *Palestine Exploration Quarterly*, 100 (1), 1968, 16-26.
- [13]. V.M. Arutyunyan, S.A. Safaryan, *Pamyatniki Armyanskogo Zodchestva*. State Publishing House for Literature on Construction and Architecture, Moscow, 1951 (in Russian).
- [14]. V.M. Harut'yunyan, *Haykakan chartarapetut'yan patmut'yun*, Luys, Yerevan, 1992 (in Armenian).
- [15]. R.H. Hewsen, *Armenia: A Historical Atlas*. University of Chicago Press, Chicago, 2001.
- [16]. S. Karapetian, E. Abrahamian, A. Hakobian, R. Kortoshian, G. Movsissian, H. Hovhannissian, A. Gevorgian, *The Historical Monuments of Voskepar*. Research on Armenian Architecture Foundation, Yerevan, 2013.
- [17]. W.E. Kleinbauer, Zvart'nots and the Origins of Christian Architecture in Armenia. *The Art Bulletin*, 54 (3), 1972, 245-262.
- [18]. Man-Chung Tang, The Art of Arches. *Structure and Infrastructure Engineering* 11(4), 2015, 443-449.
- [19]. C. Maranci, Building Churches in Armenia: Art at the Borders of Empire and the Edge of the Canon. *The Art Bulletin*, 88(4), 2006, 656-675.
- [20]. V.I. Markovin, Western Caucasian Dolmens. *Anthropology & Archeology of Eurasia*, 40 (4), 2002, 68-88.
- [21]. N.Ya. Marr, Yereruykskaya bazilika. *Armyanskiy khram V-VI vv. v okrestnostyakh Ani*. Academy of Sciences of the Armenian SSR, 1968 (in Russian).
- [22]. L.M. Martínez-Torres, Conservation of Alto de La Huesera Neolithic Dolmen, Laguardia, Spain. *Journal of Architectural Conservation*, 20 (2), 2014, 139-148.
- [23]. T.H. Marut'yan, *Avani tachary yev hamanman hushardzannery*, Hayastan, Yerevan, 1976 (in Armenian).
- [24]. T.A. Marutyan, *Arkhitekturnyye pamyatniki Zvartnots, Avan, Sobor Aniyskoy Bogomateri*. Khorurdain Grokh, Yerevan, 1989 (in Russian).
- [25]. P.L. Mercadal, M.C. Savin, S.G. Soutelo, A.G. Garcia-M, R. Chapoulie, A.L. Marqueze, PPP García, Marble Pieces in the Romanesque Portal of Glory of the Santiago de Compostela Cathedral. New Data through a Multi-Analytical Approach. *International Journal of Architectural Heritage*, 14(8), 2020, 1239-1251.
- [26]. S.Kh. Mnats'akanyan, K.L. Hovhannissian, A.A. Sahinyan, *Aknarkner hin yev mijnadaryan Hayastani chartarapetut'yan patmut'yan*. Academy of Sciences of the Armenian SSR, Yerevan, 1978 (in Armenian).
- [27]. S.Kh. Mnatsakanyan, *Zvartnots*. *Iskusstvo*, Moscow, 1971 (in Russian).
- [28]. K.A. Morrison, The Eighteenth-Century 'Restoration' of the West Portals of Saint-Denis and the Problem of the Lintels. *Journal of the British Archaeological Association*, 139(1), 1986, 134-142.
- [29]. R. Nowak, R. Orłowicz, Testing of Chosen Masonry Arched Lintels. *International Journal of Architectural Heritage*, 2020, 1-15.
- [30]. Rama Al Rabady, Ancient Masonry Structures Within an Integrated Approach: the Reinforced Corbelled Flat Roofs of Umm El-Jimal. *The International Journal for the History of Engineering & Technology*, 89 (1-2), 2019, 122-141.
- [31]. A.A. Sahinyan, *Arkhitektura Kasakhskoy baziliki*. Academy of Sciences of the Armenian SSR, Yerevan, 1955 (in Russian).
- [32]. V. Sangiorgio, G. Uva, J.M. Adam, Integrated Seismic Vulnerability Assessment of Historical Masonry Churches Including Architectural and Artistic Assets Based on Macro-element Approach. *International Journal of Architectural Heritage*, 15 (11), 2020, 1-14.
- [33]. G.S. Shakhkyan, *Odzun yekeghets'in*, *Sovetakan grogh*, Yerevan, 1983 (in Armenian).
- [34]. G.S. Shakhkyan, *Lorri: patmut'yan k'arakert ejer*, Hayastan, Yerevan, 1988 (in Armenian).
- [35]. J. Strzygowski, *Die Baukunst der Armenier und Europa*. Kunstverlag Anton Schroll & Co., Vienna, 1918.

- [36]. N.M. Tokarskiy, Dzhhrvezh. Academy of Sciences of the Armenian SSR, Yerevan, 1959 (in Russian).
- [37]. N.M. Tokarskiy, Arkhitektura Armenii IV-XIV vekov, Armgosizdat, Yerevan, 1961 (in Russian).
- [38]. T.H. Toramanyan, Nyut'er haykakan chartarapetut'yan patmut'yan. Armfan, Yerevan, 1942 (in Armenian).
- [39]. D.Wendland, Traditional Vault Construction Without Formwork: Masonry Pattern and Vault Shape in the Historical Technical Literature and in Experimental Studies. International Journal of Architectural Heritage, 1 (4), 2007, 311-365.
- [40]. A.L. Yakobson, Ocherk istorii zodchestva Armenii V-XVII vekov. State Publishing House of Architecture and Urban Planning, Moscow, Leningrad, 1950 (in Russian).
- [41]. A.B. Yeremyan, Khram Ripsime. Haypethrat, Yerevan, 1955 (in Russian).

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