

ANNALES ZBORNÍK
MUSEI SLOVENSKEHO
NATIONALIS NÁRODNÉHO
SLOVACI MÚZEA

GEDENKSCHRIFT ZBORNÍK NA PAMIATKU
FÜR MAGDA PICHLEROVÁ MAGDY PICHLEROVEJ
STUDIEN ŠTÚDIE



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ARCHEOLÓGIA SUPPLEMENTUM 11

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A NEW INSIGHT INTO PROBLEMATIC OF ROMAN BUILDING TERRACOTTA FROM BRATISLAVA-RUSOVCE

TOMÁŠ JANEK

Keywords: Roman building terracotta, stamps, petrography, morphometry

Abstract: *Thousands of bricks have been found in the area of Slovakia and in many cases they provide us information about possible date of buildings. Most of the finds come from old excavation and need to be re-examined. New methods such as petrography and morphometry have been used to analyse material from Bratislava-Rusovce. As the result, four main groups of identical stamps were identified. Analysis of clay show the origin of bricks in Vindobona.*

Study of ceramic building materials gives us an important evidence of Roman building activity not only in the camps across Danubian Limes but also in the stations in barbaricum. Thousands of bricks and their fragments have been found in the area of Slovakia, and more than 1000 were stamped by Roman units. These bricks give us not only information about which unit participated on construction works, but sometimes also provide dates or period, when the constructions were held. However, most of the finds come from old excavation and also their classification is based on older works. The research methods of Roman bricks advanced in the last years and can provide us more information that they could in the past. For these reasons, there is a need to re-examine all roman bricks with new, modern methods and reconsider their interpretation in the lights of recent excavations. In 2014 a new project started at Charles University in Prague with the goal of re-examining Roman building ceramics from the area of the Czech Republic and Slovakia. Since the Slovak National Museum along with the Academy of Sciences in Brno, Slovak Academy of Sciences and Stadtarchäologie Wien showed support to this project, it will be possible to investigate the production and distribution of bricks in wider context. In this project, the methods used are not only modern but some of them were newly developed. Stamped material found on the place of ancient Gerulata will be the first to be re-examined.

Archaeological focus on Roman stamped bricks in the region of Pannonia started with work of János Szilágyi: *Inscriptiones tegularum Pannonicarum. Dissertationes Pannonicae* in 1933. In his work, he tried to gather all the stamped bricks from region of Pannonia. Bricks stamped by legions, cohorts and also by private workshops can be found in this collection. He made the first attempt in the typological classification of the stamps and even tried to create some sort of ideal design for Pannonia. The second study on Roman bricks, with focus on Vindobona, has been made by Alfred Neumann in work *Ziegel aus Vindobona* in 1973. He brought to use new, more accurate typological classification. The greatest contribution of his work was his focus on the material from which the bricks were made. He assumed that depending on clay used, it would be possible to determine which bricks were made at the same time. Unfortunately he was not able to find some kind of pattern in the use, mainly because the same source of clay was in use for a very long time. The greatest progress in the field of Roman stamp research has been made by epigraphic Barnabás Lőrincz. With use of epigraphic analyses he managed to date some of the stamps. Date span stretches from years to centuries. In his work *Dissertationes Archaeologicae – Pannonische Ziegelstempel III. Limes Strecke Ad Flexum – Ad Mures* in 1977 he collected all the known stamps from the region. His typology serves as the base for research even today, despite some inaccuracies. Interpretation of bricks from ancient Gerulata made by Ludmila Kraskovska and Magda Pichlerova is also based mostly on these studies and their classification of private workshops still remains correct.

Methodological approach

In the research of Roman building terracotta, two methodological approaches are most widely used. Typology combined with epigraphy, which focuses on the stamp and petrology, which observes the composition of the clay. While analyses of the clay show very promising results, the outcome of the typological classification is identification of thousands of different types, which become difficult to follow. The classical typological approach has been therefore supplemented by a newly developed method based on computer comparison of photographs. Both approaches will be explained more closely below.

Petrography

Petrographic analyses, despite the data they can provide, are still not widely used in Roman building terracotta research. Such analyses are commonly used in Britain, but in Pannonia we have results only from few locations. In the rest of Pannonia the analyses were never done. First analyses were done by J. Musil, Ch. Gugl and M. Mosser on 397 pieces from Carnuntum (148), Vindobona (218), Mušov (16), Mikulčice (10), Klosterneuburg (2), and Oberleiserberg (2) (*Gugl 2003, 223*). Nowadays these analyses are supplemented by another 620 pieces from Vindobona and few other locations.

This method is considered destructive. Samples are cut from the bricks with the strict criteria. The stamp cannot be damaged and even the sample can't have big size. Afterwards, the samples are observed under stereoscopic or electron microscope, depending on necessary accuracy of the results. For basic microscopic analyses samples with size under 1

cm are sufficient. By these analyses we observe composition of the clay – the size and amount of the particles. The most accurate particle analysis along with mineralogy is done by radiography. Chemical analyses can reveal the place of origin of the clay.

On the base of these analyses scholars were able to distinguish 17 different clay types used in the excavated material. Four of the types (numbers 1, 3, 5, 13) have their origins in private brickyards. Numbers 7, 9, 10 have unknown place of origin. On two types – 15 and 16, both private and military stamps occur. Source of the majority of the bricks (80% from all pieces, numbers: 2, 4, 6, 11, 17) has been located in the brickyard which was discovered in the Vienna district Hernals (Mosser 2015, 55). Problem with the analyses is that we need to have comparative material for localisation of the source. The kilns discovered with bricks from Vindobona serve as good base, but it's the only evidence of brick production we have from Pannonia. This state of evidence could suggest central production in Vindobona for wide area, but we need to be very careful when proposing such conclusions. Appearance of both military and private stamps on the bricks with same clay type suggest, that the army could hire private workshops to produce smaller amount of material (for renovations or smaller building activity).

Morphometry

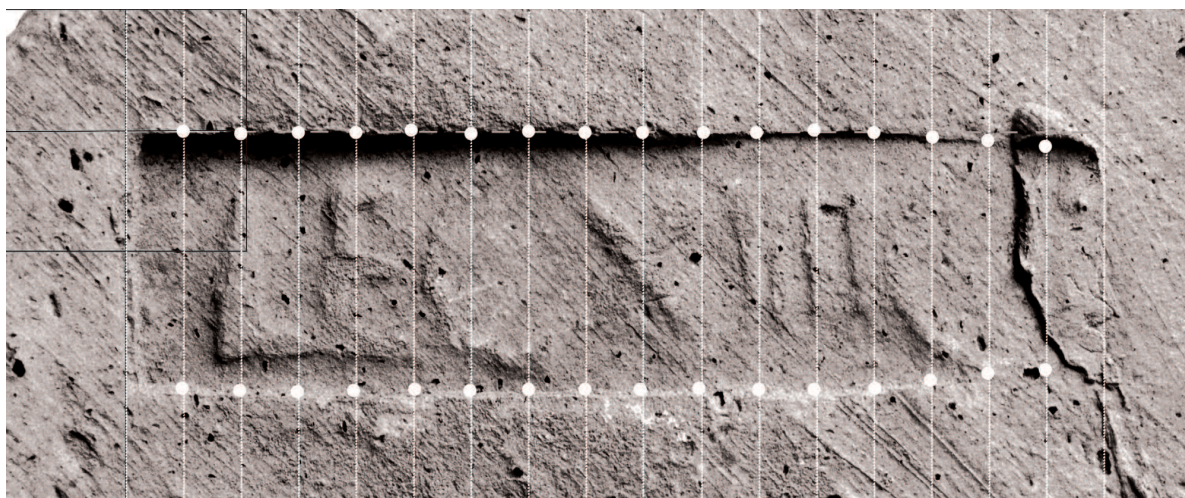
Closer observation of the stamps has revealed mistakes in the current typology. The state of preservation of the stamps can widely differ and in some cases it can undergo such a significant change, it does not resemble the original shape anymore. Small ornaments and letters are easily abraded and sometimes it is almost impossible to see those changes with the bare eye. The second problem in the typological research is the amount of finds. There is more than 5000 stamped bricks just from Vindobona and it is very hard to examine all of them precisely with focus on all small details. Therefore development of new method was crucial for further progress.

The new method had to fulfil two conditions. Firstly, to be more accurate than analyses made by the naked eye and secondly, to be simple enough, so it would be possible to apply this method to a large numbers of artefacts.

To fulfil the first condition I decided to exclude the observations of letters and small ornaments and to focus barely on the edge of the stamp. The reason for this was that even if the letters on the stamp were completely destroyed, edges remained almost intact. Dies for stamping were made from wood, clay or iron, but most importantly they were handmade (Kurzman 2006, 65). Every die was therefore unique and even if the motives were used repeatedly, or they tried to copy the look of the stamp, proportions were never the same. Because of these reasons I decided to measure and compare exact proportions of the edge of the stamp. To fulfil the second condition, the computer application was necessary.

The procedures are as follows: All dimensions are taken from photographs. High quality is extremely important here, because if the photos are not sharp enough, the deviation gets too big for the analysis to work. The photo of the stamp needs to be perpendicular to the surface, because different gradient of the surface can cause deviations bigger than 1 millimetre. The good lighting is also crucial, because even small shadows can cause a bias in the measurements.

After the pictures of the stamps are taken, they need to be scaled to the same resolution. In the next step the stamp needs to be aligned to the grid along two axes. First point touches vertical axis at the left side of the stamp. The second, horizontal axis touches the stamp at two or more points in the upper part of shape. If the shape is rectangular, axes simply follow the edges. The whole stamp is then divided by another set of axes to 17 parts. Each point or landmark is then put on the place where the axis crosses the edge of the stamp (picture 1). Coordinates for each point are extracted afterwards using TpsDIG2 software. With this procedure it was possible to achieve the accuracy of measurement about 0,25mm. The exact same procedure must be performed for every stamp, otherwise the method will not work. After the extraction of the coordinates it is possible to proceed to the analyses. For basic ones, MorphJ software is used, which contains principal component analysis (PCA) function (Klingenberg 2011, 353). PCA shows the changes of the shape



Picture 1. Position of landmarks on the stamp. Stamp is divided by 16 parallel axes, landmarks are positioned on the place where axes crosses the edge of the stamp.

within one stamp type. I have tried to use it also for different stamps type comparison, but it was not sufficient. For that reason it was necessary to develop comparison system which is based on the difference of distances within each point. Its combination of combinatorics and cluster analyses. At first, the distance for each point between two stamps is calculated. To avoid working with huge amount of data, the average distance between two stamps is calculated. Cluster analysis then shows if the average distance is small enough to confirm if stamps come from the same die. Distances shorter than 1 mm are considered to be equal (table 1).

ap27719	ap27720	ap27734	ap27735	ap27743	ap27744	ap27755	ap27758	ap27760	ap27762	ap27771	ap27775	ap27786	ap27789	ap27795	ap27979	AP27983	
0,92	0,71	1,62	1,01	2,00	2,76	2,29	2,26	0,54	0,84	1,34	1,60	2,94	1,39	6,85	2,20	3,00	ap27718
	0,74	0,96	0,84	0,98	2,87	2,17	2,46	0,90	0,83	0,92	1,60	3,15	0,93	7,02	2,51	2,83	ap27719
		1,57	0,97	0,93	2,98	2,02	2,40	0,78	0,75	1,65	1,82	3,31	0,98	7,03	2,51	2,71	ap27720
			1,26	0,82	2,75	3,26	3,15	1,81	1,68	0,90	1,76	4,03	1,13	8,21	2,52	2,12	ap27734
				1,78	2,50	2,32	2,39	0,92	0,92	0,56	1,75	3,17	1,16	7,35	2,08	2,62	ap27735
					3,28	3,13	3,24	1,28	1,80	0,95	1,62	4,62	1,48	8,52	3,10	1,84	ap27743
						4,11	3,39	2,80	3,02	2,20	3,48	3,85	2,97	8,76	1,16	3,30	ap27744
							1,50	2,12	1,98	3,29	2,95	3,00	2,15	6,22	3,15	3,60	ap27755
								2,12	2,29	3,12	3,32	2,18	2,42	5,95	2,24	4,03	ap27758
									0,65	1,81	2,07	2,91	1,29	6,77	2,24	2,98	ap27760
										1,22	1,89	3,12	0,88	6,86	2,45	2,90	ap27762
											1,70	3,95	1,51	8,29	2,06	2,48	ap2771

Table 1. Results of morphometric comparison. Stamps with the distance between the landmarks lesser than 1 mm are considered to be equal.

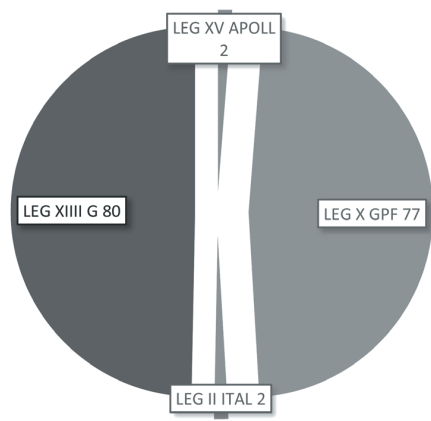
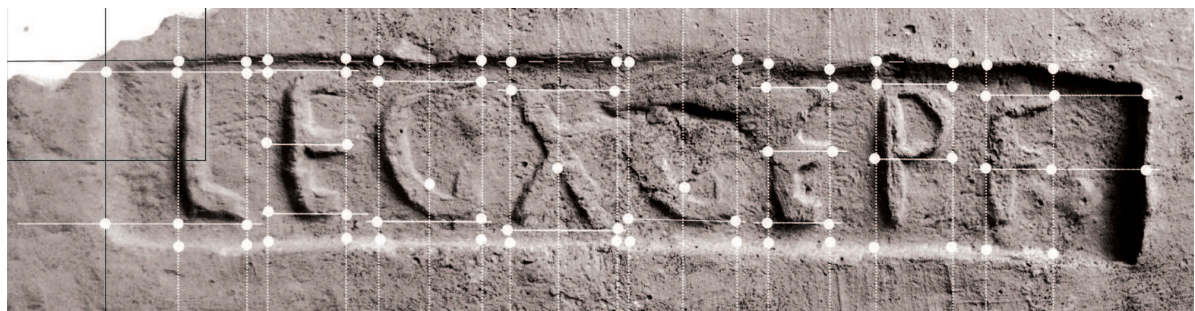


Chart 1. Amount of bricks stamped by legions found at Bratislava-Rusovce.

The same principle of comparison has been applied also on fragments, although the system of landmarks is more complicated in this case (picture 2). The focus here is on the letters and their position between each other and to the edges of stamp. The amount of landmarks is much higher in this case and can reach up to 70 for stamps with long inscription. This system is still in development, but is showing very promising results already.



Picture 2. Position of landmarks on the stamp used for the comparison of fragments. The landmarks are set up with help of various axes placed around the letters.

	Typological analyses	Morphometrical analyses - whole stamps	Morphometrical analyses - fragments	summary
LEGXGEPF I	5	5	12	22
LEGXGEPF II	1	2	10	13
LEGXGPF I	13	1	16	30
LEGXIIIIG	15	5	9	29
LEGXG	1			1
LEG II TEMPSONIUS URSCINUS DUCUS	5			5
TEMP URS	3			3
ATTILIA FIRMAE	1			1
COH I AELIA SAG	1			1
C.I.IVL	1			1
unidentified				64

Table 2. New classification of stamps supported with morphometric analyses.

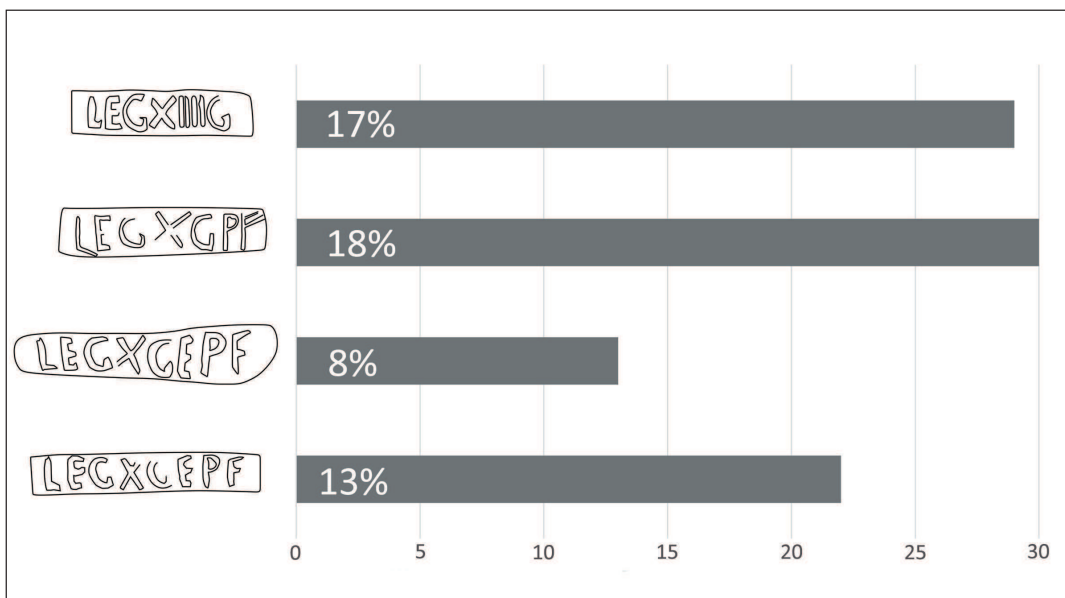


Chart 2. Main groups of stamps with the overall percentage share.

Preliminary analysis of the stamps from Gerulata

Roman building ceramics found in ancient Gerulata can be separated in two main groups. First group belongs to the private workshops and is connected with civil use. The second belongs to legionary production and is connected with building of the auxiliary camp. First analyses focused on the legionary production. Since all building material was found in secondary positions it cannot be used as dating base for buildings (*Kraskovská 1991, 49*). The majority of building material belongs to the 10th and the 14th legion and it can be presumed that these two units are responsible for building the camp (chart 1). New typological comparison of the stamps was supplemented by morphometric analysis in 60 cases, 47 of which were fragments (table 2). As the result, 4 main groups of stamps which were created by the same die were identified (chart 2).

The first type has a rectangular shape and has LEG X GPF inscribed. (14 tegulae, 16 imbrices)

The second type also has a rectangular shape, but has LEG X GEPF inscribed. (7 tegulae, 15 imbrices)

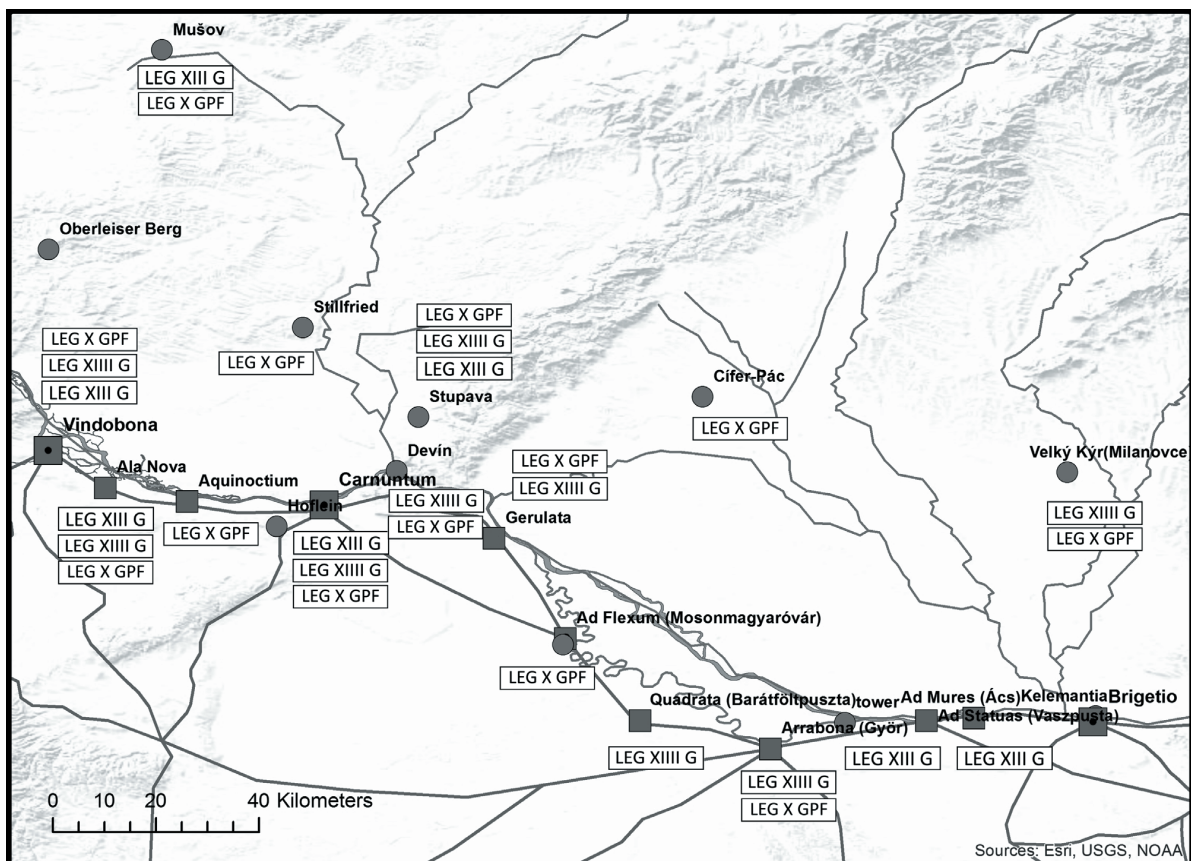
The third has a shape of planta pedis and has LEG X GEPF inscribed. (15 imbrices)

The fourth type has a rectangular shape with LEG XIIIIG inscribed. (29 tegulae)

Samples for preliminary clay analysis were taken from all of the stamped bricks. In the first step stereoscopic microscope is used for creating the basic group. Some of the samples were also compared to building material from Mušov, which has source already proven to be in Vindobona. All compared samples show similar clay pattern with the ones from Mušov and probably have their source in the workshop in Vindobona. This applies also for the bricks stamped by the XIII. legion for which the source was thought to be Carnuntum (*Kraskovská 1991, 53*). This would mean that the stamps of the XIII. legion belong to the period between 101 and 118 AD when the legion was garrisoned in Vindobona and can be set into 2nd building phase of the camp (*Brandl 1999, 204*). It is also interesting that stamps of XIII. legion are found only on tegulae while third type of X. legion appears on imbrices only. This could suggest cooperation of both legions by producing the material, but could also simply mean that X. legion used older material which was made by previous legion.

Conclusions

When we look closely on the bricks stamped by legions garrisoned in Vindobona and their spread across the area of upper Pannonia, it is possible to determine the distribution area of brickyard located near camp (map 1). The area reaches from Vindobona to Ad Mures, with camp Gerulata included. In some cases the specific stamp types can be traced over this area. Similar stamp type of XIII. legion has been found on Stupava and Devín (*Plachá 1986, 346*). The second and third type of X. legion has typological parallels in Ad Statuas (*Gabler 1989, 149*). Even if Ad Statuas was build a little bit later than Gerulata, after 89 AD, both camps could be rebuilt in the same time around beginning of the 2th century (*Viszy 2003, 70*). Morphometric analyses reveal, that stamped material might be in fact rather homogenous then spread into many different types. This indicates that material was produced in great amount and probably for more construction sites at once. The construction of auxiliary camp of Gerulata was therefore part of bigger building activity along Limes Romanus in this area. Further research of building material from other camps may reveal not only how the production and distribution worked but also how the whole limes was constructed.



Map 1. Distribution of the legionary bricks around the Limes on Danube.

LITERATURE

Brandl 1999 – U. Brandl: Untersuchungen zu den Ziegelstempel römischer Legionen in den nordwestlichen Provinzen des Imperium Romanum. Katalog der Sammlung Julius B. Fritzmeier. Passauer Universitatsschriften zu Arc. 6, Rahden/Westf 1999.

Gabler 1989 – D. Gabler: The Roman Fort at Ács-Vaspuszta (Hungary) on the Danubian limes. Oxford 1989.

Gugl 2003 – Ch. Gugl, M. Mosser, R. Sauer: Archäometrische und archäologische Untersuchungen an gestempelten Ziegeln aus dem Raum Carnuntum und Vindobona. In: O. Harl (Hrsg.), Fundort Wien. Berichte zur Archäologie 6/2003, 2003, 228-237.

Klingenberg 2011 – C. P. Klingenberg: MorphoJ: an integrated software package for geometric morphometrics. Molecular Ecology Resources 11. Oxford 2011, 353-357.

Kraskovská 1991 – L. Kraskovská: Kolkované rímske tehly z polohy Bergl v Bratislave-Rusovciach. Zbor. SNM 85, Arch. 1, 1991, 49-68.

Kurzmann 2006 – R. Kurzmann: Roman military brick stamps: a comparison of methodology. Oxford 2006.

Mosser 2015 – M. Mosser: Die Legionsziegelei von Vindobona im 17. Wiener Gemeindebezirk. Fundort Wien 18, 2015, 50-93.

Plachá 1986 – V. Plachá: Römerzeitliche Besiedlung von Bratislava-Devín. Arch. Rozhledy 38, 339-357.

Viszy 2003 – Z. Viszy: The Roman Army in Pannonia. Pécs 2003.

NOVÝ POHĽAD NA PROBLEMATIKU RÍMSKEJ STAVEBNEJ KERAMIKY Z BRATISLAVY-RUSOVIEC

TOMÁŠ JANEK

Štúdium rímskej stavebnej keramiky hrá dôležitú úlohu vo výskume vojenských táborov a rímskych stavieb celkovo. Iba z územia Slovenska pochádza viac ako tisíc kolkovaných tehál a ich fragmentov. Väčšina z nich však bola nájdená počas starých výskumov a preto je potrebná ich revízia modernými postupmi. Ako hlavné metódy skúmania boli zvolené petrografia a morfometria. Petrografia skúma zloženie hliny tehál a umožňuje určiť ich pôvod. Morfometria je založená na počítačovom porovnávaní fotiek kolkov. Jedná sa o úplne novú metódu, ktorej princíp spočíva v prevedení tvaru kolkou na set súradníc, ktoré je následne možné porovnávať. Presnosť merania je približne 0,25mm a je tak možné určiť aj fragmenty kolkov. Rímska stavebná keramika z Bratislavy- Rusoviec je prvým súborom na ktorý sú tieto postupy aplikované. Bolo možné vytvoriť nové rozdelenie podľa typov a vyčleniť štyri hlavné skupiny s najväčším zastúpením. Predbežné výsledky analýz hliny naznačujú, že tehly majú svoj pôvod v tehelnom okrsku vo Vindobone. Vzťahuje sa to aj na tehly kolkované 14. légiou, čo značí, že museli byť vyrobené počas jej pôsobenia vo Vindobone medzi rokmi 101-118 n.l. Typologické paralely s ostatnými náleziskami naznačujú, že materiál mohol byť vyrábaný pre niekoľko táborov súčasne.

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