

Sławomir Józwiak

(Nicolaus Copernicus University in Toruń)
<https://orcid.org/0000-0002-8228-4347>

Marcin Wiewióra

(Nicolaus Copernicus University in Toruń)
<https://orcid.org/0000-0003-4079-686X>

Clay harvesting and production of bricks
in the Teutonic Order state in Prussia in
the 14th and the first half of the 15th centuries.
An attempt at a synthesis

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Clay harvesting and production of bricks, tiles and floor ceramics for the construction of Teutonic castles in Prussia in the late Middle Ages in the light of written sources

There is no doubt that, as early as the second half of the 13th century, a number of secular and sacred buildings were already being erected in the Teutonic Order state in Prussia with bricks baked on site. Unfortunately, the very poor data contained on this subject in the written sources of the time allow virtually nothing to be said about the specific locations and ways in which building materials were produced, let alone attributing them to specific buildings. This remark also applies to individual Teutonic castles, which in their masonry (stone and brick) form were certainly already being erected from the second half of the 13th century onwards. And if there are some isolated, perfunctory source references on the subject, their proper interpretation is not an easy task. Tomasz Jasiński, for example, interprets the information contained in a document of

1276 in the following way: the Toruń brickyard, producing for the castle of the local commander and both towns (Old and New), was handed over for temporary use to the local Franciscans, and consequently it was at this time that the construction of the high castle in Toruń with its curtain-type perimeter defence wall was completed.¹ The individual stone and brick buildings of this fortress were erected as early as 1255 and 1263, which is stated *expressis verbis* in the surviving written sources from that time, but it is also known that the construction of the individual buildings in the space of both the high castle in Toruń and the bailey there continued both at the end of the 13th century and throughout the 14th century.² It is therefore difficult to prove that the change of ownership of one brickyard mentioned in 1276 is a convincing caesura for the completion of the local high castle. After all, it cannot be ruled out that at that time there were already two brickyards in operation in Toruń.

Fortunately, much more numerous sources from the second half of the 14th century onwards (especially treasury and inventory records) give a much more detailed insight into the technical organisation of the production and use of bricks for Teutonic fortified buildings in Prussia.

An excellent example of this is the story of the large-scale construction of what was perhaps already the third (in chronological order) walled commander's castle (including the bailey) in Ragnit, which was completed between 1397 and 1409.³ To meet the needs of the newly erected fortress, at least one brickyard was built in its immediate vicinity (although it is difficult to pinpoint the exact location),⁴ manned by numerous attic and other workers employed

¹ PrUB, Bd 1/2, nr 342; T. Jasiński, *Toruń XIII–XIV wieku – lokacja miast toruńskich i początki ich rozwoju (1231 – około 1350)*, in: *Historia Torunia*, t. 1: *W czasach średniowiecza (do roku 1454)*, red. M. Biskup, Toruń 1999, pp. 140, 146. On the interpretation of this source, see below in this article.

² More on this topic: S. Józwiak, J. Trupinda, *Topografia i układ przestrzenny krzyżackiego zamku komturego w Toruniu w świetle średniowiecznych źródeł pisanych*, ZH 2016, t. 81, z. 3, pp. 7–35.

³ On the construction, topography and spatial layout of the Ragnit castle, see S. Józwiak, J. Trupinda, *Budowa krzyżackiego zamku komturego w Ragnecie w końcu XIV – na początku XV wieku i jego układ przestrzenny*, KHKM 2009, R. 57, nr 3–4, pp. 339–368; S. Józwiak, J. Trupinda, *Uwagi na temat sposobu wznoszenia murowanych zamków krzyżackich w państwie zakonnym w Prusach w końcu XIV – pierwszej połowie XV wieku*, KMW 2011, nr 2, pp. 201–213, 224–226.

⁴ In historical sources, brickyards in the Ordenstaat in Prussia were referred to as *zigsilchune*. Marian Arszynski's suggestion that this term should be under-

there – clay trampers (*sumpfreter*; *somptreter*; *trayros*), or helpers (*knechte*).⁵ In 1400, the Teutonic treasurer gave a large sum of money to an anonymous brickmaker who was going to Ragnit.⁶ In 1402–1403, the plant employed brickmakers Hannus Scharffen, Nicholas Yszenburg and a certain Hannus.⁷ In the same year 1403 they were joined by Hannus Roszenow (from Gdańsk?).⁸ In 1404, another brickmaker, this time from Starogard Gdański, named Peter), was producing “broad” bricks in the Ragnit brickyard.⁹ In the same year, four more unnamed brickmakers (from Gdańsk?) worked there together with the *zigilstricher* Herman.¹⁰ In 1406, another specialist in this field, Barthusz Frankensteyn,¹¹ joined them. In 1407, in turn, two other brickmakers (Urban and Grunegras) and two clay trampers (*treter*) – Barthusz Flomig and Nicholas Breitwagen¹² – were employed in the production of bricks for the construction of the Ragnit castle. The last payment to the next two brickmakers employed in the construction of the castle in Ragnit, Nicholas Smedechin and Bartolomeus, was recorded on 3 March 1409, and this was the year in which the construction of the castle establishment there (including the bailey) was completed.¹³ In addition, it is known that the individual buildings of the Ragnit brickyard were built of wood (in 1404 the carpenter Hannus was paid a considerable amount of money for their construction) and were covered with thatched reed roofs.¹⁴

stood as a “spacious shed” intended for drying the shaped bricks before firing is erroneous and results from this researcher’s limited knowledge of the written sources of the period, cf. M. Arszczyński, *Organizacja i technika budownictwa ceglanego w Prusach w kontekście europejskim*, Malbork 2016, pp. 93–94. For, it is enough to look at Teutonic accounting or municipal sources of the time to conclude that the noun *zigilshune* simply meant a brickyard with places for storing clay, forming and producing bricks, firing them, storing them, etc.; on this subject, see further below.

⁵ *Das Marienburger Tresslerbuch der Jahre 1399–1409* [hereinafter: M. Tr.], hrsg. v. E. Joachim, Königsberg 1896, p. 426.

⁶ “Zum ersten 42 m. dem zigilstricher, als her ken Rangnith zoch” – M. Tr., p. 48.

⁷ *Ibidem*, pp. 192, 247, 250.

⁸ *Ibidem*, p. 249.

⁹ “Item ½ m. eyne zigilstricher von Stargardt, der zu Ragnith breiten zigil strichen sal; [...] item 3 m. Peter zigeler von Stargardt uf rechenschaft gegeben; her sal zu Ragnith breyten steyn strichen” – *ibidem*, pp. 289, 297.

¹⁰ *Ibidem*, pp. 303, 305, 327.

¹¹ *Ibidem*, p. 389.

¹² *Ibidem*, p. 423.

¹³ *Ibidem*, p. 581.

¹⁴ *Ibidem*, pp. 247, 305.

In the accounts of the Malbork (Marienburg) treasurer it was relatively rare to find information about the quantities of bricks produced by the brickmakers in Ragnit for the construction of the local castle. In 1403 it was 122,000, while in 1404 – 200,000.¹⁵ However, the demand was much greater. So, the question is, were large batches of the necessary bricks imported? This cannot be ruled out, although unfortunately there is no evidence in sources. The Ragnit castle brickyard was also equipped with integrated kilns for firing clay-formed bricks (*zigiloven*).¹⁶ The question is how to understand the reference from 1407: “leymfuren zu Ragnit: item 30 m. Peter Melczer, Mertin Reymer und Heyncze Kasshuben den grebern zu Ragnith gegeben of leymfuren zu vyr zigilschunen”.¹⁷ Did the “diggers” mentioned therein supply clay for brick production to as many as four brickyards, or for the erection of four buildings (of half-timbered construction) in one brickyard? In the same year (1407), a tile brickmaker (*dachsteynstrycher*), Teyckfus, was working in Ragnit together with his helper. He had a brickmaker table specially adapted for the manufacture of flat tile (*flachsteynlade*).¹⁸ Analogous information appears under 1409. At the time, four tables for brick making and one for flat tile making were being repaired there.¹⁹ On 4 November 1407, the Ragnit castle commander received money of more than 101 marks from the treasurer to pay the diggers, lime breakers, trappers and brickmakers working on the erection of the local fortress.²⁰

Relatively much can be said about the organisation of the building materials and construction work in the context of the erection of the alderman’s castle in Grabiny (within the Malbork commandery). It is true that the local office was established as early as the 1340s²¹ but intensive construction work on a second, more decent seat (regular masonry castle) for the local prefect was

¹⁵ *Ibidem*, p. 277.

¹⁶ *Ibidem*, pp. 277, 327.

¹⁷ *Ibidem*, p. 422.

¹⁸ *Ibidem*, p. 426.

¹⁹ “Item 1 fird. vor 4 muersteynladen unde 1 flachsteynlade. item 8 scot vor dy muersteynlade zu beslon. item 6 sol. vor dy flachsteynlade zu beslon” – *ibidem*, p. 581.

²⁰ *Ibidem*, p. 441.

²¹ On the establishment of the vogt office in Grabiny, see S. Józwiak, *Centralne i terytorialne organy władzy zakonu krzyżackiego w Prusach w latach 1228–1410. Rozwój – przekształcenia – kompetencje*, Toruń 2001, p. 137.

carried out in the late 14th and early 15th centuries.²² Bricks were mentioned in the inventories of this office from the early 1380s: 13,000 (6 January 1381), 550,000, plus 100,000 unbaked (1 January 1387), 150,000 (13 December 1393).²³ They may already have been the product of the local, Teutonic, castle-based brickyard. However, if they were produced for the construction of the prefect's castle in Grabiny, then – in the context of the information contained in the sources from the first decade of the 15th century²⁴ – the unusually long period of its erection would be surprising. The records of the Teutonic treasurer's accounts from 1402 are also puzzling. They would suggest that, on the one hand, bricks for the construction of the castle in Grabiny were both produced in the brickyard located in its vicinity²⁵ and transported there (question: from where?).²⁶ Over time, however, probably all the bricks for the construction of the local castle were produced on site. Under the year 1403, the Malbork treasurer's book records the relatively large sums spent on the activities of two *zigilshunen* (32,000 bricks were baked in the kiln of one of them) and the brickmaker (*zigilstricher*) and bricker (*zigiler*) working there.²⁷ A little further on under the same year there is mention of 97,000 bricks and 54,000 roof tiles produced on the orders of the vogt of Grabiny. The relatively large sums of money that were spent on transporting these materials to the building site²⁸ allow us to conclude that these brickyards were not in close proximity to the castle in Grabiny. In the same year (1403) firewood to be used for the brick kiln in Grabiny was purchased (in Gdańsk?) for the substantial sum of over 63 marks.²⁹ Interesting information about the course

²² For a general account of the Grabiny castle, preserved only in small fragments, see M. Knyżewski, *Siedziby średnich i niższych rangą urzędników krzyżackich na terenie dzisiejszej Polski. Studium archeologiczne*, Łódź 2020, p. 257.

²³ *Das Marienburger Ämterbuch* [hereinafter: M.A.], hrsg. v. W. Ziesemer, Danzig 1916, pp. 26–27.

²⁴ On this subject, see further below.

²⁵ "Grebín: [...] ítem 30 m. uf dy zygilshune" – M. Tr., p. 143.

²⁶ "Ítem 6 m. den luthen, dy den zigel haben voringet zu furen [...]; Grebyn [...] ítem 8 m. vor zygel zu furen [...]; ítem 45 m. 4 ½ scot und 8 pf. vor zygel zu furen, vor delen und vor ander gerethe zur muwer" – *ibidem*, pp. 143, 161.

²⁷ *Ibidem*, p. 213.

²⁸ *Ibidem*, p. 214.

²⁹ "Ítem 63 m. und 3 fird. vor 16 schog an 4 bornronen zum zigeloven ken Grebin gekouft [...]" – *ibidem*, p. 253.

of construction works is brought by records from 1404. The most prominent builder in the Teutonic Order state in Prussia at that time, Niclus Fellenstein, worked there with quite a large team of masons and helpers.³⁰ Employed in the two local brickyards (one of which was being enlarged), the bricker (*zigeler*) and the brickmaker (*zigilstricher*) produced a total of 618,000 bricks at the time.³¹ In the following year (1405), the building work in Grabiny (still involving Niclus Fellenstein) did not slow down. An anonymous brickmaker with a team produced and baked a total of 648,000 bricks in two brickyards and two kilns.³² Over two years (1404–1405), this would give a total of 1,266,000 bricks produced locally for the construction of the castle in Grabiny. This is not all, as in 1406, for the work carried out there, the brickmaker baked additionally 310,000 bricks in the kiln of the local brickyard,³³ while in the following year (1407) – 540,000 tiles and bricks.³⁴ It is interesting to note that somewhere in the vicinity of one of the two brickyards in Grabiny, a lime kiln built of bricks was also operating. This is known because a need to repair it was recorded in 1407.³⁵ In the Malbork treasurer's book, further interesting source information on the construction carried out on the castle in Grabiny appears under the year 1408. One of the two brickyards there was enlarged and re-roofed. One of the brick kilns was also being rebuilt and received a new roof on this occasion. This work did not prevent the brickmaker and his team from producing and baking nearly 300,000 new bricks.³⁶ Perhaps the most interesting thing about the record analysed here, however, is that 36,000 "Flemish floor bricks" were then imported from Gdańsk (probably transported by sea) for the interior furnishings of the castle in Grabiny.³⁷

³⁰ On this subject, see B. Schmid, *Niclus Fellenstein budowniczy Zakonu Niemieckiego. Studium z historii architektury*, in: *Sprawozdania zarządu Towarzystwa Odbudowy i Upiększania Zamku Malborskiego*, red. A. Dobry, J. Trupinda, Malbork 2020, pp. 533–537.

³¹ M. Tr., pp. 291–292.

³² *Ibidem*, pp. 333–334.

³³ *Ibidem*, p. 375

³⁴ *Ibidem*, pp. 413–414.

³⁵ "Item ½ fird. vor zygel zu furen zum kalkoven zu bessern" – *ibidem*, p. 414.

³⁶ *Ibidem*, p. 455. The section of the record where the number of burnt bricks is listed is corrupted, but based on the sum paid by the treasurer to the brickmaker (72 marks) it can be estimated fairly accurately.

³⁷ "Item 19 m. 3 ½ scot 9 den. vor 36000 flamisch esterichzygel mit den fur von Danczk ken Grebyn" – *ibidem*, p. 455.

It seems that in 1409, the basic framework of the new castle was already in place. There was still a brickyard with a brickmaker operating there but the focus was already primarily on the décor elements.³⁸ This enterprise was still in operation in 1412.³⁹

At the turn of the 14th and 15th centuries a new, spacious, regular seat of the Teutonic Procurators of Bytów in Gdańsk Pomerania was erected (from the end of the 14th century this office was under the direct authority of the Grand Masters).⁴⁰ Fortunately, the course of the construction of this walled castle is relatively well documented in accounting sources from that time. Again, there is no doubt that at least one brickyard was erected in the vicinity (although it is difficult to pinpoint exactly where) in order to provide sufficient quantities of the necessary building materials for this development. In 1403, a brickmaker working there produced 97,600 bricks on the order of the procurator.⁴¹ A great deal of interesting information on the subject analysed here is contained in the Malbork treasurer's book under the year 1404. An anonymous brickmaker working in Bytów at the time, together with his team, baked 160,000 bricks in four kilns (40,000 in each kiln). In addition, he had previously produced 126,000 bricks and 34,000 roof tiles. On this occasion, the source mentioned some interesting technical details. The treasurer paid the brickmaker to buy 8 shovels, two carts, to erect sheds for storing moulded bricks and (unbaked?) roof tiles⁴² and to dig a pit for kneading clay (*dachsumpe*).⁴³ In 1405, the brickmaker produced 209,300 bricks in Bytów, on the occasion of

³⁸ *Ibidem*, p. 523.

³⁹ *Das Marienburger Konventsbuch der Jahre 1399–1412* [hereinafter: M. Kon.], hrsg. v. W. Ziesemer, Danzig 1913, p. 295.

⁴⁰ On the question of the administrative subordination of the procurators in Bytów, see S. Józwiak, *Centralne...*, pp. 124–125. On the construction of the Bytów castle, see H. Domańska, *Zamek w Bytowie na tle architektury obronnej zakonu krzyżackiego z przełomu XIV i XV wieku*, "Kwartalnik Architektury i Urbanistyki" 1978, t. 23, nr 3, pp. 151–162; C. Herrmann, *Ragnit, Neidenburg, Bütow – die letzten drei Deutschordensburgen in Preußen*, in: *Die Burg im 15. Jahrhundert. Kolloquium des Wissenschaftlichen Beirats der Deutschen Burgenvereinigung*, hrsg. v. H. Hofrichter, J. Zeune, Braubach 2011, pp. 160–164; S. Józwiak, B. Wasik, *Murowany zamek prokuratorów krzyżackich w Bytowie w średniowieczu. Chronologia wznoszenia, rozplanowanie i układ przestrzenny*, ZH 2023, t. 88, z. 4, pp. 5–37.

⁴¹ "Butow: item 24 m. und 9 ½ scot dem zygilstricher, do vor hat her dem pfleger uf den rasen geantwert 97600 muwersteyns" – M. Tr., p. 211.

⁴² "Item 5 fird., die zigilschune und die dachschune zu machen." – *ibidem*, p. 294.

⁴³ *Ibidem*.

the enlargement of the local brick kiln at that time.⁴⁴ Much later, at the end of 1448, sending the brickmaker to Bytów is recorded twice in the accounts of the Malbork treasurer.⁴⁵

Accountancy sources from the turn of the 14th and 15th centuries also mention the construction of an irregular Teutonic procurator's castle in Międzyłęż on the Vistula, within the then administrative boundaries of the Malbork commandery.⁴⁶ Under April 1400, there is an entry in the Malbork treasurer's book stating that, among other things, 22,000 bricks from Międzyłęż were transported to Tczew, and that they were intended for the construction of a mill there.⁴⁷ On the basis of this mention, it could be inferred that a brickyard was then operating next to the newly erected fortress at Międzyłęż and produced enough brick to be able to distribute the surplus to other nearby building ventures. In fact, other entries from that year (1400) mention a brickmaker (*zigilstrichir*) and a brickyard (*zigilshune*) working in Międzyłęż.⁴⁸ At the end of December 1401, in the context of the work to erect this fortress, the Malbork treasurer paid an anonymous brickmaker (*zigilstricher*) for baking 80,500 bricks.⁴⁹ Records from the subsequent year (written at the end of December 1402) mention 160,800 bricks produced by the brickmaker working there, a pit with lying clay (*leymgraben*), a brick kiln and contracted large quantities of wood to fire it.⁵⁰ Under the year 1403, an anonymous man is mentioned for making bricks in Międzyłęż,⁵¹ which means there must have been a brickyard there. In 1404, in turn, the treasurer paid the brickmaker who worked there (who produced and baked 60,000 bricks in the local brick kiln) and also financed a pit with lying clay (*leymgraben*) created by the same.⁵² A handful of interesting information appears at the turn of 1404 and 1405. An anonymous brickmaker working

⁴⁴ *Ibidem*, p. 375.

⁴⁵ J. Sarnowsky, *Die Wirtschaftsführung des Deutschen Ordens in Preußen (1382–1454)*, Köln–Weimar–Wien 1993, Quellen, no. 5, p. 723.

⁴⁶ For a summary of knowledge on this site, see M. Knyżewski, *Siedziby...*, p. 263.

⁴⁷ M. Tr., p. 48.

⁴⁸ *Ibidem*, p. 49.

⁴⁹ *Ibidem*, p. 139.

⁵⁰ *Ibidem*, pp. 210–211.

⁵¹ "Item 4 sch. dem manne geschant, der zu Meszelancz zigil strichet" – *ibidem*, p. 256.

⁵² *Ibidem*, p. 293.

in Międzyłęź at that time was paid by the treasurer to produce 91,000 bricks and roof tiles (the source record shows that a pit with lying clay was still used there); they were baked in four brick kilns operating on site.⁵³ Construction of the fortress in Międzyłęź was continued in the following year (1406): the brickmaker and his team produced (and baked in three brick kilns) 54,000 bricks.⁵⁴ Entries in the Malbork treasurer's book under 1407 show that a Teutonic official continued to pay the brickmaker and finance the operation of a brick kiln located there.⁵⁵ The following year (1408) the aforementioned brickmaker and his team working there (using a specialised brickmaking table called *strychlade* produced and baked a total of 113,000 bricks in four brick kilns.⁵⁶ In 1409, he was paid by the local Teutonic procurator for his work and given a horse.⁵⁷ It is interesting to note that, at least in 1412, the logs for burning in the brick kilns in Międzyłęź were purchased in Świecie (and thus came from the southern part of Gdańsk Pomerania) and were floated down the Vistula and Nogat from there.⁵⁸

There is interesting source information from the turn of the 14th and 15th centuries on the expansion of the seat of the Tczew vogt in Sobowidz (northwest of Tczew).⁵⁹ In 1400, there was a brickyard (*zigilschune*) somewhere in close proximity to the building erected there, with as many as five brick kilns in operation.⁶⁰ Each could bake 25,000 bricks,⁶¹ which at maximum operation would result in a total of 125,000 bricks. A reference from 1403 shows that the roof structures of the local *zigilschune* were covered with wisp and shingles.⁶² In the same year (1403), the brickmaker (*zigilstricher*) produced 125,000 bricks there. For the purpose of his work, a special

⁵³ *Ibidem*, p. 334.

⁵⁴ *Ibidem*, p. 374. If this fragment of the source refers to the fact that wood for burning in brick kilns was purchased "zu der zigilschunen", then we should automatically reject M. Arszynski's idea, cited above, that this noun was used in late medieval sources from the Prussian area to denote drying facilities for shaped, but not yet baked bricks. On this subject, see above.

⁵⁵ M. Tr., p. 413.

⁵⁶ *Ibidem*, pp. 449, 454.

⁵⁷ *Ibidem*, p. 523.

⁵⁸ M. Kon., p. 284.

⁵⁹ For a summary of the existing knowledge on this site, see M. Knyżewski, *Siedziby...*, p. 272.

⁶⁰ M. Tr., pp. 94, 142.

⁶¹ *Ibidem*, pp. 209–210 (mentioned in 1403).

⁶² *Ibidem*, p. 210.

brickmaker's table (*zigillade*) was funded and 14,200 bricks were "trimmed" (whatever that is supposed to mean).⁶³ A reference from 1404 shows that there were at least two brickmakers in Sobowidz.⁶⁴ A lot of interesting information was recorded under 1406. The brickmaker working there produced 150,000 bricks at the time. Repairs were made to the brickyards (shingles, wisp for roofing) as well as the brick kiln roofs. In addition, a house, undoubtedly of half-timbered construction, was built for the brickmaker.⁶⁵ In the following year (1407), 150,000 bricks were again produced in the local brickyards,⁶⁶ while in 1409 the treasurer paid the brickmaker to dig a pit for lying clay. There were only 5,000 ready-to-use bricks there.⁶⁷ Perhaps, then, the construction of the castle-seat of the vogt of Tczew in Sobowidz was nearing completion.

It is reasonable to wonder whether the Commander of Gniew (in Gdańsk Pomerania) did not have his own brickyard at least from the end of the 14th century. For, in April 1400, the treasurer paid this Teutonic official for 40,000 bricks and 7,000 tiles intended for the erection of an unknown structure, for 46,500 more, sent to Tczew for the construction of some mill there, and in June of that year for 17,500 bricks, i.e. their manufacture and shipment via the Vistula to Tczew (for the same mill?).⁶⁸ In a fragment of accounts dated July 1448 and drawn up by the head of the cellar of the Grand Masters, then in charge of the central Malbork coffers, a payment of 50 marks to the Commander of Gniew for the purchase of 63,000 bricks is recorded.⁶⁹ It can therefore be suspected that this Teutonic official did indeed have his own brickyard, but the question is where exactly it was located.

The Malbork treasurer's book under 1404 mentions the erection of brickyards (how many?) in Tilsit (northwest of Ragnit).⁷⁰ Was it

⁶³ *Ibidem.*

⁶⁴ *Ibidem*, p. 309.

⁶⁵ "Item 9 fird. den zymmerluten vor des zigilstrichers hus zu buwen. item 9 fird., das hus zu decken und cleiben" – *ibidem*, p. 376.

⁶⁶ *Ibidem*, p. 413.

⁶⁷ *Ibidem*, p. 523.

⁶⁸ *Ibidem*, pp. 48–49.

⁶⁹ K. Neitmann, *Der Hochmeister des Deutschen Ordens in Preußen – ein Residenzherrscher unterwegs. Untersuchungen zu den Hochmeisteritineraren im 14. und 15. Jahrhundert*, Köln–Wien 1990, Anhang [Appendix], no. 3, p. 146.

⁷⁰ "Item 12 m. 8 scot vor die cleyne zigilschune of der Tilsit zu buwen" – M. Tr., p. 327.

about the construction of the prosecutor's castle there? This is all the more surprising as the first information about the erection of a brick Teutonic fortress in Tilsit dates only from 1407.⁷¹ In any case, the same source mentions under 1409 the "brick burner" working there.⁷² In fact, the so-called damage list, drawn up after the war of 1409–1411 and not preserved today, mentions two burnt brickyards in Tilsit together with two brick kilns.⁷³ But it seems that the production carried out locally was insufficient, since the list of expenses for the construction of the castles of Ragnit and Tilsit, drawn up in 1408 at the behest of the Ragnit castle commander, mentions importing 60,000 bricks for the needs of the latter (the question is: from where?).⁷⁴

In the case of Teutonic fortifications of the late 14th and early 15th centuries, there is also plenty of information in the sources that is difficult to be interpreted unequivocally. In the Malbork treasurer's book under 1399 (but with reference to the previous year) expenditure was recorded for, among other things, some construction work. The entire record was entitled *Rognhusen*⁷⁵ so it was either the castle of the vogt in Rogóžno in the Chełmno Land, or the fortified mill in Słup on the Osa River, a few kilometres away.⁷⁶ It is known from here that both of these buildings suffered some damage during the torrential downpours and floods of 1388.⁷⁷ But why would the reconstruction be initiated as late as after 10 years? This case is all the more interesting as the Teutonic treasurer in 1398 financed the baking of as many as 266,000 bricks and tiles in seven kilns.⁷⁸ Would these kilns (and at the same time the brickyards) be located somewhere in the vicinity of the castle

⁷¹ On this subject, see S. Józwiak, J. Trupinda, *Uwagi na temat...*, pp. 215–223, 225–226.

⁷² "Tylset: [...] item 2 m. Hans Pflsmid dem zigelborner uf rechenunge gegeben [...]" – M. Tr., p. 581.

⁷³ "Tilßid (Tilsit). Czur Tilsid vorbranten czwu czigelschunen iczliche vor 80 m., item 2 czigelofen, iczlicher 10 m." – C. Krollmann, *Die Bau- und Kunstdenkmäler des Ordenslandes Preußen in den Schadenbüchern (1411/19)*, Berlin 1919, p. 51.

⁷⁴ Sarnowsky J., *Die Wirtschaftsführung...*, Quellen, no. 29, p. 797.

⁷⁵ M. Tr., p. 11.

⁷⁶ On the fortified mill at Słup, see R. Kubicki, *Młynarstwo w państwie zakonu krzyżackiego w Prusach w XIII–XV wieku (do 1454 r.)*, Gdańsk 2012, pp. 167–168, 511.

⁷⁷ M. Duda, S. Józwiak, *Nadwiślańskie zamki krzyżackie wobec powodzi w XIV i XV wieku*, in: *Historia – klimat – przyroda. Perspektywa antropocentryczna*, red. P. Oliński, W. Piasek, Toruń 2018, p. 54.

⁷⁸ M. Tr., p. 11.

of the vogt of Rogóžno? In the light of the surviving sources, it is difficult to give a clear answer to this question.

No less puzzling are the references in the Malbork treasurer's book of 1405. Under the entry "Lipienek" (the castle of Teutonic vogts in the Chełmno Land), we read a list of fees for some construction projects – construction of a brickyard, a brickmaker, a pit with lying clay.⁷⁹ Was this project carried out somewhere in the vicinity of the Lipienek castle, which had existed since at least the end of the 13th century?⁸⁰ But to what end? Nothing is known about the construction work carried out there in the early 15th century.

The comprehensive inventory of the Elbląg commandery of 1 May 1396 lists, among other things, the 274,000 bricks and 33,000 tiles collected there.⁸¹ The purpose of these building materials can be guessed – at the time they were probably used for erecting buildings for the two castle baileys,⁸² but the question remains open as to where the Elbląg Commander obtained these bricks and tiles from. The source references in the Malbork treasurer's book under the year 1408 are interesting. This official then financed the construction of a granary, which – as can be inferred from surviving information – was probably located in the space of one of the two baileys of the commander's castle in Elbląg, but was to be owned by the Grand Master. An analysis of the related records leads to the conclusion that the construction materials used for the works (e.g. 62,200 tiles, 14,000 bricks) did not come from any of the castle's brickyards, but were imported (the question is: from where?).⁸³ And this fact can even be explained in quite a logical way. The Elbląg castle, which had already existed since the end of the 13th century (the bailey area of which was undoubtedly still being developed with further buildings), was squeezed between the two Elbląg towns and there was simply no free space to set up

⁷⁹ *Ibidem*, pp. 346–347.

⁸⁰ On this stronghold, see S. Józwiak, J. Trupinda, *Zamki krzyżackie w świetle średniowiecznych źródeł pisanych*, in: *Castra Terrae Culmensis. Na rubieży chrześcijańskiego świata*, red. M. Wiewióra, t. 1, Toruń 2020, pp. 135–138.

⁸¹ *Das grosse Ämterbuch des Deutschen Ordens* [hereinafter: G.A.], hrsg.v. W. Ziesemer, Danzig 1921, p. 80.

⁸² On the topography and spatial layout of the Elbląg castle at the turn of the 14th and 15th centuries, see J. Trupinda, S. Józwiak, *Zamek krzyżacki w Elblągu. Topografia i układ przestrzenny na podstawie średniowiecznych źródeł pisanych*, "Studia z Dziejów Średniowiecza" 2015, t. 19, pp. 197–223.

⁸³ M. Tr., p. 503.

new brickyards in its vicinity. And given the fact that there were at least two brickyards in the topography of Elbląg towns at that time,⁸⁴ the Teutonic authorities could have purchased for their own needs the building material coming for example from their production. But they may also have brought it in from outside, as the references in the income and expenditure accounts of the Elbląg Commander Heinrich Reuß von Plauen from 1446–1449 would indicate. For, in 1446 this Teutonic official donated more than 33 marks to the town council of Pasłęk for 57,300 bricks and 8,000 tiles.⁸⁵ Analogous records appear later in this source: 28,900 bricks and 1,000 tiles (1446), 100 bricks (1447), 22,000 bricks (1448).⁸⁶ Similar references in this account are made to another small town in the area of the Elbląg commandery, namely Miłakowo: 14,000 bricks (1446), 6,600 bricks and 1,100 tiles (1446), 11,050 bricks (1447),⁸⁷ or Morąg: unknown quantity (1446), but judging by the payment (more than 32 and a half marks), it would be some 50,000 bricks, about 35,000 bricks (1447), 77,000 bricks and 5,000 tiles (1448).⁸⁸ In 1447, the commander of Elbląg ordered a wheelwright from Morąg to pay 8 scots for transporting two carts of bricks overland.⁸⁹ It seems that all of these building materials were used for the expansion and development of the baileys of the Elbląg castle. And were the bricks and tiles referred to here manufactured in these small towns? Probably yes, even though nothing is known of brickyards existing there in the first half of the 15th century. Meanwhile, this form of cooperation between the Order's authorities and the small towns in the context of the expansion of the Teutonic castle is confirmed in the sources from the middle of this century related to Brodnica. In a letter sent to the Grand Master on 15 September 1452, the local commander, Heinrich von Rabenstein, informed, among other things, that due to the necessity of building stables and unspecified towers (undoubtedly buildings in the bailey of the Brodnica castle) and favourable weather conditions for carrying out such works, he had asked the town council to lease the town's

⁸⁴ On this subject, see further below.

⁸⁵ GSPK, XX HA, OF, no. 200b I (Allerhand Rechnungen der Komthurei Elbing), f. 348.

⁸⁶ *Ibidem*, ff. 363, 379, 401.

⁸⁷ *Ibidem*, ff. 352, 369, 379.

⁸⁸ *Ibidem*, ff. 362, 373, 401.

⁸⁹ *Ibidem*, f. 375.

brickyard for a year (its exact location is difficult to indicate). As the commander pointed out in his letter, without this he would not have enough building materials (presumably he meant bricks).⁹⁰ Meanwhile, the Brodnica town council refused the commander's request, pointing out that production at this brickyard hardly met the town's own needs. However, the Teutonic official hoped that, thanks to the Grand Master's request, the burghers would change their minds.⁹¹ A few weeks later, the case continued. This time, in a letter of 14 October 1452, Commander of the Brodnica Land informed the superior of the Order, among other things, that he had personally negotiated with the local councillors to lease their brickyard for a year for his building needs (the erection of several buildings in the bailey area, but this time unspecified), but they still had refused. They had only agreed to let one kiln in this brickyard (the question remains how many were there in total) work for the needs of the commander. The Teutonic official seemed satisfied with this proposal.⁹² The content of the sources analysed here would therefore suggest that in the mid-15th century the Teutonic Commanders in the Teutonic Order state in Prussia, when they initiated works on extending or rebuilding their castles, no longer built their own brickyards, but tried to make use of the production capacity of such enterprises operating in towns, including small towns, for an appropriate fee.

The inventory of the Gdańsk commandery, drawn up on 27 December 1389, lists two brickyards: the first, without specifying its location – which was said to have 661,850 bricks and 51,250 tiles, and the second, in Puck, seat of the Teutonic Master of Fishery – which

⁹⁰ “Ouch genediger liber her homeister! So hat mir der rat den kalk zcu gesayt, was ichen dis jar bedorffen werde und habe en vort agemut, daz sy unß dy czigelschewne nach eyn jar welden leyen, uff das wir dy turme und stalkunge och weder underdach brechten, wen sich der mewer czewlich furdert in desem guten weter und vormuthe mich woll, werde wir sy nicht krigen, daz wir vor beyde zcum hawße und och zcun turmen nicht steyns notdorffen werden haben [...]” – GSPK, XX HA, OBA, no. 11441.

⁹¹ *Ibidem*

⁹² “[...] gnediger liber her homeister; alz ich ewir genoden am nesten alz von der czygelschawne wegen gesreben hatte. Zo habe ich mit dem ratte dorawß geret, ab sy uns nach eyn jar hette moch werde. Nu sprechen sy, das sy ir mit nichte entperen mogen. Sunder mochte sy ewir genode vormogen, das sy uns vort nach eynen ofen zcu burnen gunnen welden. So mochte wir daste bas zcu komen [...]” – GSPK, XX HA, OBA, no. 11510.

in turn was said to have 672,000 bricks.⁹³ The first batch was undoubtedly prepared with a view to extending the bailey area of the Gdańsk castle, while the second batch was probably intended for the construction of the brick residence of the Teutonic Master of Fishery in Puck.⁹⁴ Records in the inventories of the following years confirm the large production of bricks in both brickyards: Gdańsk – 402,500 bricks and 30,000 tiles, Puck – 797,000 bricks plus 20,000 unbaked ones (24 June 1391); Gdańsk – 12,500 bricks and 56,500 tiles, Puck – 748,000 bricks (1 May 1396); Puck – 748,000 bricks (18 October 1407).⁹⁵ The inventory of 21 November 1428 lists 118,000 bricks and 113,000 tiles in the brickyards of the Gdańsk castle.⁹⁶ In the light of the references cited here, it is difficult to deny that, at least from the 1380s onwards, the Gdańsk commanders had their own brickyard, but, as in the case of Elbląg, it must have been located somewhere outside the bailey area, as there would simply have been no room for its erection and operation. It can be assumed that the reference was to the brickyard mentioned in the sources in the mid-1350s and located on the border between the estates of the Bishop of Włocławek and the patrimony of the Main Town of Gdańsk (today's Zarosłak district).⁹⁷

And what was the situation with regard to the acquisition of bricks for the permanent extension of the Malbork capital castle (including the two bailey areas), which had been in progress since the third decade of the 14th century? Source data on this only appears from the late 14th century onwards. The inventory list of the Malbork's "masonry supervisor",⁹⁸ drawn up on 11 November 1398 on the

⁹³ G.A., p. 685.

⁹⁴ Archaeologists date the time of the erection of the brick castle in Puck to the late 14th and early 15th centuries – on this subject, see J. Kruppé, M. Milewska, *Dzieje zamku w Pucku*, Warszawa 2014, pp. 30–53.

⁹⁵ G.A., pp. 687–688, 690.

⁹⁶ *Ibidem*, p. 705.

⁹⁷ On the location of this brickyard, see Z. Maciakowska, *Średniowieczna granica pomiędzy dobrami biskupa włocławskiego pod Gdańskiem a patrymonium Głównego Miasta*, in: *Pomerania – Prussia – Polonia. Rozprawy ofiarowane prof. Wiesławowi Długokęckiemu z okazji 65. urodzin*, red. R. Kubicki, Gdańsk 2022, p. 63.

⁹⁸ On the functioning of this office in the Teutonic Order state in Prussia, see S. Józwiak, J. Trupinda, *Das Amt des 'Bauleiters' (magister lapidum; magister laterum; steinmeister; cзыgelmeyster; muwermeister) im Deutschordensstaat im 14. Jh. und in der ersten Hälfte des 15. Jh.*, "Ordines Militares. Colloquia Torunensia Historica. Yearbook for the Study of the Military Orders" 2015, vol. 20, pp. 239–268.

occasion of the replacement in this office, shows that the outgoing predecessor left to his successor, among other things: 100,000 bricks and 90,000 tiles. A brickmaker (*czygilstrycher*) also worked for the institution.⁹⁹ It is much more difficult to say where exactly the brickyard working for the capital Malbork castle could have been located. It is true that, on the basis of the research carried out to date, the location of the seat of the Malbork “mason’s superintendent” (*steynhove* in the north-eastern part of the second bailey)¹⁰⁰ can be indicated with a high degree of probability, but in view of the large number of buildings of an economic and utilitarian nature accumulated in this space, should we also look for a brickyard there? This can be questioned. The sources say nothing about this in any case. This by no means excludes the possibility that Teutonic Knights could have their own brickyard for the permanent expansion of the Malbork castle. Only that it must have been located outside the capital’s fortress complex (in the sense of the high castle and bailey). But where exactly? Some source clues on the subject are contained in the expenditure book of the Malbork castle commander of 1410–1420. Under the year 1412, it records payment for digging a ditch “behind the brickmaker’s” reaching as far as the “horse paddock” of the capital convent.¹⁰¹ This rather enigmatic statement probably meant the seat of the Malbork brickmaker. Unfortunately, it is not known where exactly this “horse paddock” was located. In addition, it is not entirely certain that the brickmaker lived in the complex of buildings of the local brickyard, although this is very likely. This is supported by the payment for the making of a transom for the forge “behind the brickmaker’s”¹⁰² (1412), which would mean that this utility premise of the brickyard would have been located adjacent to the brickmaker’s home. Another reference from that year (1412) shows that the “stickler” worked on the chambers/rooms (seat?) of the brickmaker.¹⁰³ From

⁹⁹ M.A., p. 115.

¹⁰⁰ S. Józwiak, J. Trupinda, *Organizacja życia na zamku krzyżackim w Malborku w czasach wielkich mistrzów (1309–1457)*, 3rd ed., Malbork 2019, pp. 441–443.

¹⁰¹ “Item Niclus Schibelbetn hot voringet den graben hinder dem czigilstriger bes an den coventsrosgarten” – *Das Ausgabebuch des Marienburger Hauskomturs für die Jahre 1410–1420* [hereinafter: AMH], hrsg. v. W. Ziese, Königsberg 1911, p. 62.

¹⁰² “Item 4 sc. vor. 1 slos am slage hynder dem czigelstriger” – *ibidem*, p. 74.

¹⁰³ “Item Gerke ist voringet des czigelstrichers stobe czu klebyn und dy kamern czu estrichen vor 2 m.” – *ibidem*, p. 80.

this record, it could be inferred that it was not bricked, but was of half-timbered construction. In the same year (1412) the acquisition of clay for the “brickmaker’s house” was recorded.¹⁰⁴ Would this mean that it was of half-timbered construction as well? The brickmaker mentioned in the source was probably an employee of the castle brickyard and lived in the complex of its buildings. Using both these and later accounts, the publisher of the Malbork castle commander’s expense book, Walther Ziesemer, claimed the location of the capital stronghold’s brickyard during the Teutonic times to the east of its baileys, by the later “Lehmkaule” street – today’s Warecka Street,¹⁰⁵ which seems quite likely. In addition, the expenditure book of the Malbork castle commander contains a lot of information about both the production capacity of this brickyard and its equipment. In 1415, the old and new brickmakers working there produced a total of 402,000 bricks and tiles (plus one kiln of unknown capacity waiting to be baked),¹⁰⁶ in 1418 – 264,500 bricks, with an additional 42,000 unbaked ones located in the kiln,¹⁰⁷ while in 1420 – 255,000 bricks. Here, once again, another 37,000 or so were still waiting to be baked.¹⁰⁸ And the scale of the need is illustrated by a reference from 1412, which shows that a total of 231,000 tiles were used for individual roofing projects on various buildings, above all the castle bailey, but also the brick buildings in the manor in Kaldowo (on the other bank of the Nogat River).¹⁰⁹ A reference from 1411 shows that at least one brickmaker and six clay diggers worked in the Malbork castle brickyard.¹¹⁰ When you add the bricker (*czigeler*) with his companion,¹¹¹ you get an idea of the minimum staff employed there. The accounts of the Malbork castle commander of 1448 mention the sum given to the local brickmaker for a year’s work. His exploration and harvesting of clay was also funded.¹¹² The surplus production of bricks and roof tiles

¹⁰⁴ “Item 4 sc. 2 knechten, dy leym gruben czu des czugelers huse” – *ibidem*, p. 79.

¹⁰⁵ *Ibidem*, p. 461 – editor’s note.

¹⁰⁶ *Ibidem*, p. 166.

¹⁰⁷ *Ibidem*, p. 308.

¹⁰⁸ *Ibidem*, p. 352.

¹⁰⁹ *Ibidem*, p. 61.

¹¹⁰ *Ibidem*, p. 37.

¹¹¹ *Ibidem*, pp. 79, 308.

¹¹² “Item 46 m. 22 sc. dem czigelstreicher gegeben uffs jar mit im ist abege-rechent; her bleib nichte schuldig. Item 8 m. 6 ½ schil. demselbigen uff leym zcu gruben gegeben” – GSPK, XX HA, OBA, no. 9764, f. 1v.

from the Malbork castle brickyard was also transported to other places: Kałdowo or Benowo (the Teutonic procurator's castle south-west of Malbork).¹¹³ But under the year 1415, it is mentioned that 13,000 bricks were brought in (via the Vistula and the Nogat) from Tczew (from the brickyard of the local vogt or the town plant?).¹¹⁴ It is reasonable to suspect that later on (in the 1540s), when extending the bailey quarters of the Malbork castle, additional quantities of bricks were purchased by the Teutonic authorities from the town brickyards (of Nowe, Tczew, Gniew or Elbląg), as indicated, for example, by information contained in the accounts of the Malbork castle commander of 1448.¹¹⁵

In the expense book of this official from the second decade of the 15th century, there is relatively much information about the functioning and equipment of the brickyard of the capital castle. In the close proximity of the brickyard, there was a pit for kneading clay (it can be assumed that this too was sourced not far from the brickyards).¹¹⁶ The brickmaker working there had his own stable, an unspecified cellar and at least one brick kiln. There was also plenty of workshop equipment: the "brickmaker tables" and "tile tables" (*dachsteingezoge*, *muwersteynlade*, *czigellade*) produced by carpenters, which were bound with ironwork by locksmiths; as well as special tables for cutting bricks, forming various types of shapes, etc.¹¹⁷ It is interesting to note that, at least in 1412, the trunks for fuelling the Malbork brick kilns were purchased in Świecie (and thus came from the southern

¹¹³ AMH, pp. 32, 237, 251.

¹¹⁴ *Ibidem*, p. 177.

¹¹⁵ "Item 99 m. 3 vird. 8 d. vor czigelfuer von der Neuwenborg, Dirsaw, Mewe, Elbing [...]" – GSPK, XX HA, OBA, no. 9764, f. 3. A fragment of accounts from July 1448, drawn up by the Teutonic cellar superintendent then in charge of the central Malbork treasury, records a payment of 60 marks for the purchase of 61,000 bricks in the town of Tczew – K. Neitmann, *Der Hochmeister...*, Anhang [Appendix], no. 3, p. 146. In a letter of 4 September 1448, the mayor and council of this town informed the Grand Master that 22,000 tiles had been shipped to Malbork. In turn, in a letter of 6 September 1448, the treasurer reported to the superior of the Order, among other things, on the gradual acquisition and importation to Malbork (including on rafts) of 17,000 bricks contracted in Tczew, Nowe and Elbląg for use in various construction works on the bailey buildings – GSPK, XX HA, OBA, no. 9649, no. 9652; J. Sarnowsky, *Die Wirtschaftsführung...*, p. 350.

¹¹⁶ "Item 4 sc. 2 knechten, di den summp reyne machten in der czigelschune." – AMH, p. 70.

¹¹⁷ *Ibidem*, p. 72, 74–75, 111, 166, 238–239, 308.

part of Gdańsk Pomerania) and were floated to Malbork by the Vistula and the Nogat.¹¹⁸

The information contained in two inventories of the Toruń commandery is worth attention. The one of 20 December 1383 records 465,000 bricks to be sent to Lubicz,¹¹⁹ undoubtedly for the construction of the fortified mill there.¹²⁰ On the other hand, the inventory of 25 December 1384 records 720,000 bricks without any comment.¹²¹ It is difficult to doubt that they were intended either for continuing the construction of the Lubicz mill or, less likely, to be used for further buildings erected within the bailey area of Toruń.¹²² Unfortunately, it is impossible to say whether these bricks were produced in some local Teutonic brickyards (the question is where would they be located?) or ordered and bought from the city brickyards of Toruń (there were two such plants operating there at the time).¹²³ A similar problem of where the bricks were produced at the end of the 14th century applies to the commandery of Świecie, Brodnica or Nieszawa. The inventory of the first of these Teutonic territorial administration units of 12 March 1392 records bricks produced in as many as 32 kilns, each with a capacity of 16,000, which would give a total of 512,000 bricks.¹²⁴ They were intended for the construction of a procurator's castle in Nowy Jasiniec (27 km southwest of Świecie).¹²⁵ In addition, the same inventory mentions 20,000 bricks for the Świecie fortress and 100,000 for three unspecified mills.¹²⁶ Were all the bricks mentioned in the referenced source produced in the Świecie castle brickyard? Perhaps, but it is still unclear where this plant

¹¹⁸ M. Kon., p. 283.

¹¹⁹ G.A., p. 428.

¹²⁰ On this facility, see R. Kubicki, *Młynarstwo...*, pp. 71, 470.

¹²¹ G.A., p. 429.

¹²² M. Arszczyński's assertion that the figures from Toruń quoted here indicate some production of bricks for stock is unacceptable (cf. M. Arszczyński, *Organizacja...*, p. 99). This researcher did not include information on the mill in Lubicz, nor did he have any knowledge of the intensive construction work carried out at the end of the 14th century in the bailey area of the Toruń castle; on this subject, see S. Józwiak, J. Trupinda, *Topografia...*, pp. 19–32.

¹²³ On the question of brickyards operating in large Prussian towns and cities, see more below.

¹²⁴ G.A., p. 614.

¹²⁵ For a summary of the present state of knowledge on this castle, see M. Knyżewski, *Siedziby...*, p. 267.

¹²⁶ G.A., p. 614.

could be located. In the inventory of the Brodnica commandery, compiled in 1396, there is information about a brickyard (*czigelschune*) which produced an unspecified quantity of bricks for the construction of the procurator's castle in Lidzbark Welski.¹²⁷ Again, it is unclear whether this was a Teutonic brickyard and, if so, where exactly it would have been located. On the other hand, the inventory list of the Nieszawa commandery of 15 October 1382 records 89,000 bricks and 4,500 tiles. The next one (of 1388) mentions 18,000 bricks.¹²⁸ They may have been intended for both the erection of some building in the bailey area of Nieszawa castle and for the procurator's manor, subordinate to the commander, in Murzynno in the region of Kujawy.¹²⁹ However, it is difficult to say whether these building materials were produced in the brickyard near the castle (the question is: where could it be located?) or purchased, for example, in Toruń.

At the turn of August/September 1431, the Teutonic knights' army burnt down the town and occupied the castle in Dybów (Nowa Nieszawa), built by order of Władysław Jagiełło opposite Toruń.¹³⁰ A letter-report from an anonymous commander present on site, dated 6 November 1431, stated, among other things, that in preparation for the extension of this building (gathering the team and building materials) a Teutonic official had ordered the baking of two kilns full of bricks.¹³¹ The question is how to interpret this note. Did the commander order his own brickyards to be built in the vicinity of the castle, which he intended to extend, or only the brick kilns themselves?

In the sources from the first decades of the 15th century, we can find traces of Teutonic brickyards that were located in the

¹²⁷ *Ibidem*, p. 378. On the castle in Lidzbark Welski, see M. Knyżewski, *Siedziby...*, p. 262. At the same time, one cannot, of course, agree with the author's suggestion that this fortress was first attested in sources as late as in 1409.

¹²⁸ G.A., pp. 476–477.

¹²⁹ On the seats of Teutonic officials in the territory of the Nieszawa commandery, see S. Józwiak, K. Kwiatkowski, *Wykaz świadczeń czynszowych z obszaru komturstwa nieszawskiego i domen krzyżackich na Kujawach z 1407 roku*, "Ziemia Kujawska" 2007, t. 20, pp. 80–92.

¹³⁰ For a more detailed account of the circumstances of these events, see S. Józwiak, J. Trupinda, *Zamek w Nowej Nieszawie (Dybówie) w świetle średnio-wiecznych źródeł pisanych*, "Rocznik Toruński" 2015, t. 42, pp. 176–178.

¹³¹ "[...] so habe ich lasin bornen [...] czweyne ofen czigel!" – GSPK, XX HA, OBA, no. 5837.

provinces and topographically were not associated with the construction of any particular building. Let us refer, for example, to the Königsberg castle complex. The local inventory of 10 January 1422 shows that 220,000 bricks and 38,000 roof tiles were baked in the brickyards (*czigelschuwne*) located in Zimmau on the Pregel, southwest of Tapiava, and that 50,000 additional bricks were still to be baked by the brickmaker (*czigelstreycher*) working there.¹³² It is quite likely that there was a reference to a Teutonic brickyard working for the Königsberg castle. Equally interesting is the information about the import of bricks from Rossiten on the Curonian Spit, on the border of the Königsberg and Klaipėda commanders. In 1402–1404, large sums of money were paid to a mason and carrier, Marquart Hassen, for carrying (undoubtedly by sea) bricks from Rossiten to Klaipėda, presumably for the expansion of the local castle.¹³³ Bearing in mind that the amount of 45 marks recorded in 1404 related to the importation of 443,000 bricks from there,¹³⁴ it is sufficient to take into account the other sums from those years (356 ½ marks) to realise that the total may have been about the importation of up to 30,000,000 bricks.¹³⁵ Klaipėda was probably not the only direction of their expedition. In 1405, the commander of Elbląg gave the Rossiten brickmaker a total of 86 marks,¹³⁶ which would have been enough to produce and transport from there

¹³² G.A., p. 19. It is interesting that an identical form of this entry appeared in the inventory drawn up on 15 March 1422 – *ibidem*, p. 23. It was as if nothing had changed in this matter for more than two months. On the Zimmau brickyards, see G. Vercamer, *Siedlungs-, Social- und Verwaltungsgeschichte der Komturei Königsberg in Preußen (13.–16. Jahrhundert)*, Marburg 2010, p. 485.

¹³³ On the expansion of Klaipėda castle in the late 14th and early 15th centuries, see S. Józwiak, *Krzyżacki murowany zamek komturski w Kłajpedzie w świetle średniowiecznych źródeł pisanych*, “Klio. Czasopismo Poświęcone Dziejom Polski i Powszechnym” 2015, t. 32(1), pp. 3–29. In 1406, a “brickmaker” (*zigeler*) was sent to Klaipėda by order of the Teutonic marshal, in 1406 and 1408 a brickyard (*zygilschuwyne*) was mentioned there, and in 1409 a brickmaker (*zygelstrycher*) – M. Tr., pp. 391, 408, 454, 525. A letter from the commander of Klaipėda to the Grand Master in the second decade of the 15th century shows that there was a functioning brickyard there, but that there were difficulties in obtaining wood for the brick kilns or suitable clay for making roof tiles – GSPK, XX HA, OBA, no. 28189. Prior to this, however, bricks for the expansion of the Klaipėda castle were imported in large quantities from outside, as shown above.

¹³⁴ “Item 45 m. Marquart Hassen gegeben noch von den 443000 zigel, die her im 1403 yare ken der Memel von Rossiten zu furen [hatte]” – M. Tr., p. 297.

¹³⁵ *Ibidem*, p. 137, 192, 248, 257, 297.

¹³⁶ *Ibidem*, p. 337.

some 900,000 bricks. Unfortunately, it is not known what construction work the Elbląg commandery intended to use them for.

Brick and tile production in the cities and towns of the Teutonic Order state in Prussia in the late Middle Ages

Concise information about brickyards in the cities and towns of the Teutonic Order state appears as early as the second half of the 13th century. Tomasz Jasiński found unambiguous information about the first brickyard in Toruń in a document issued on 17 or 21 January 1276 by the Teutonic Land Master of Prussia, Konrad von Thierberg, settling the dispute between the Old and New Towns of Toruń, in a passage concerning the course of the boundaries of individual patrimonies.¹³⁷ Would the term “domus laterals” used in this diploma actually include a brickyard? It seems so, as the same document mentions that it was located in the neighbourhood of the “Polish Village” (*villa Polonicalis*).¹³⁸ Yet the oldest list of rents of the Old Town of Toruń from around 1318, under the heading “de orto in polonicali villa”, mentions, among others, a certain Heynmannus, son-in-law/brother-in-law (*gener*) of master Nune, a brickmaker (*laterator*), obliged to pay rent of either 3,000 bricks or one marka of denariuses.¹³⁹ It is difficult to doubt that the aforementioned Heynmannus was the tenant or even the owner of the brickyard located there, i.e. north-east of the walls of the New Town of Toruń.¹⁴⁰ From at least the second half of the 14th century, another brickyard was located on the banks of the Vistula, about 2 km west of the defensive walls

¹³⁷ “[...] ultra terminos suorum ortorum ita distinctes: a villa Polonicali per directum sub monte usque ad viam antiquam Dobrinschen vulgariter nuncupatum domibus autem lateralibus hiis terminis non inclusis, quos (!) volumus fratribus minoribus pro tempore sibi concessis (!), nobis autem et civibus utriusque civitatis omni tempore, quo necesse fuerit, reservari [...]” – PrUB, Bd. 1, H. 2, no. 342; T. Jasiński, *Toruń XIII–XIV wieku...*, pp. 140, 146.

¹³⁸ PrUB, Bd. 1, H. 2, no. 342.

¹³⁹ F. Prowe, *Die ältesten Zinsregister der Altstadt Thorn*, “Mitteilungen des Coppersnicus-Vereins für Wissenschaft u. Kunst zu Thorn” 1931, Bd. 39, p. 163.

¹⁴⁰ On its location, see K. Mikulski, *Przestrzeń i społeczeństwo Torunia od końca XIV do początku XVIII wieku*, Toruń 1999, p. 42.

of Toruń's Old Town.¹⁴¹ In any case, two brickyards were mentioned in the lists of rents drawn up on wax plates (from the late 14th century and from the years 1414–1417). The first of these was leased/owned by a certain Hermanus Ysernhewpt. At the end of the 14th century, the town charged 3,000 bricks or one mark as rent (presumably annually), while in 1414–1417 it charged 2,500 bricks or one mark.¹⁴² The second brickyard was leased/owned by a certain Ewird Reynoff. He was also obliged to give the town – as it seems – 3,000 bricks as annual rent or the equivalent of one mark (late 14th century; 1414–1417), but if the need arose, the town was to buy additional bricks from him at a price of 8 scots per 1,000 bricks.¹⁴³ Krzysztof Mikulski, analysing the rental registers quoted here, preserved on wax plates, came to the conclusion that the two brickyards they referred to were located to the west of the defensive walls of the Old Town of Toruń. The same researcher formulated the thesis that at the beginning of the 15th century there were at least four municipal brickyards in Toruń.¹⁴⁴ However, his proposal was the result of a misinterpretation of the source records. Actually, the list of rents from the end of the 14th century cited above, entitled “de domus laterum Michaelis dandus ume”, mentions, in addition to the figures mentioned above (Hermanus Ysernhewpt and Ewird Reynoff), two others, but apart from the fact that they too paid a specific rent, there is no mention of their having any connection with brickmaking.¹⁴⁵ A similar situation is repeated in the record of 1414–1417. Under the heading “czins von den czigil heusern of Michaelis zugeben” are listed, in order, Hermanus Ysernhewpt, Ewird Reynoff and then six more rent-payers.¹⁴⁶ Here, too, there is no question of them being any kind of brickmakers or brickyard tenants. It is likely that these were owners of ordinary plots of land or gardens located in the vicinity of the brickyards, so it is not possible to multiply the number of such

¹⁴¹ Tomasz Jasiński formulated the thesis that it could have already been established with the foundation of the Old Town of Toruń, i.e. in the middle of the 13th century at the latest – see T. Jasiński, *Przedmieścia średniowiecznego Torunia i Chełmna*, Poznań 1982, p. 97. However, this cannot be proven.

¹⁴² *Tabliczki woskowe miasta Torunia (ok. 1350–I poł. XVI w.)*, red. K. Górski, W. Szczuczko, Warszawa–Poznań–Toruń 1980, pp. 21, 58.

¹⁴³ *Ibidem*, pp. 21–22, 58.

¹⁴⁴ K. Mikulski, *Przestrzeń...*, pp. 42–43.

¹⁴⁵ *Tabliczki woskowe...*, pp. 21–22.

¹⁴⁶ *Ibidem*, p. 58.

Toruń businesses on the basis of the records cited here. It is noteworthy that the rent paid by both Herman Ysernhewpt and Ewird Reynoff (at the end of the 14th century and in 1414–1417) was identical to that which the brickmaker of the brickyards located north-east of the defensive walls of Toruń's New Town¹⁴⁷ was obliged to pay around 1318. It appears, therefore, that only two city brickyards were mentioned in the rent registers from the end of the 14th century and from 1414–1417: one located 2 km west of the ramparts of Toruń's Old Town and the other located north-east of the ramparts of Toruń's New Town.

They were probably initially leased by the brickmakers, but at the turn of the 14th and 15th centuries, a special brick-making office was established on the initiative of the town council, to which they were subordinated. It was usually headed by a member of the town council referred to as the *chigelmeister*. His responsibilities included hiring permanent and seasonal workers, purchasing raw materials and selling the bricks produced. He reported annually to the town council on the income and outgoings of the brickyards. The clay was harvested in the vicinity of the brickyards. Its deposits are derived from deposits of the variegated clay, the so-called Poznań clay. It contained a lot of iron and kaolin, which gave it exceptional plasticity. In the first quarter of the 15th century, the production of the two Toruń brickyards varied between 400,000 and 450,000 bricks per year.¹⁴⁸

The first source mention of the Chełmno brickyards is interesting. Here, by virtue of a document dated 1294,¹⁴⁹ the prior and the convent of the local Dominicans agreed with the councillors on a temporary (for 35 years) exchange of property. The monks gave the town their garden “at the foot of the mountain in a northerly direction” in exchange for an area “on the plain in front of the Old Town in a westerly direction”, i.e. in the suburb by the Vistula, on the site of the Rybaki settlement, where they intended to build a brickyard, a brick kiln and other facilities necessary for their operation.¹⁵⁰ It is difficult to doubt that the Dominicans of Chełmno intended to set

¹⁴⁷ F. Prowe, *Die ältesten...*, p. 163.

¹⁴⁸ T. Jasiński, *Przedmieścia...*, pp. 97–98.

¹⁴⁹ On the dating of this source, see T. Jasiński, *Pierwsze lokacje miast nad Wisłą. 750 lat Torunia i Chełmna*, Toruń 1980, pp. 44–45.

¹⁵⁰ “[...] ipsi nobis concesserunt locum pro ponendo horreo laterum et fornace iuxta illud et ceteris ad hoc pertinentibus [...]” – *Urkundenbuch des Bisthums Culm*, bearb. v. C.P. Woelky, Bd. 1, Th. 1–2, Danzig 1885–1887, no. 1227.

up this enterprise (but only for 35 years) in order to secure building materials for the erection of their church and monastery. At the same time, it is clearly stated in the document that the brickyard was yet to be built. Did the townspeople already have another facility of their own at that time? That remains unknown. In any case, around 1330 the natural course of events was for the town to take over the above-mentioned brickyard from the Dominicans. At the beginning of the 15th century, a second such enterprise was located to the east of Chelmino (suburb of Pantkensee), but apart from the fact that it existed,¹⁵¹ nothing more about its functioning can be gleaned from the surviving sources of the period.

Brickyards of the Old Town of Elbląg (two?) existed from at least the beginning of the 14th century. Contracts from the 1330s (1331–1337) show that their tenants (brickmakers and masons), after a certain period of rent-free time (several years), were obliged to pay the town rent in kind ranging from 4,000 bricks or tiles to 20,000 bricks.¹⁵² From references in the rent book of the suburbs of the Old Town of Elbląg from 1374, it appears that the city actually had two brickyards (“censum in duobus horreis laterum”) at that time: one in the northern suburb, about 1 km north-east of the Market Gate, the other – east of St George’s Hospital.¹⁵³ An agreement dated 21 February 1378 is interesting: the latter institution handed over the brickyard it owned to the town council (was this related to the completion of the church at St George’s Hospital?), and the town then leased it to the brickmaker Claus, in return for an annual rent in kind of 18,000 bricks and 4,000 tiles.¹⁵⁴ It is possible that the same Claus (mentioned as Claus Tygeler) was still the tenant of this brickyard in 1403 (as can be seen from an entry in the rent book of the Old Town of Elbląg from that year); in any case, the annual rent he paid at that time amounted to 18,000 bricks and 4,000 tiles (he owned two brick kilns). The tenants of the second brickyard, Hans Tygeler and Tyme

¹⁵¹ T. Jasiński, *Przedmieścia...*, p. 128.

¹⁵² CDW, Bd. 1, no. 255; A. Semrau, *Beitrag zur Geschichte der Bautätigkeit in der Altstadt Elbing im 13. und 14. Jahrhundert*, “Mitteilungen des Copernicus-Vereins für Wissenschaft und Kunst zu Thorn” 1923, Bd. 31, p. 21.

¹⁵³ *Księga rentowa przedmieść Starego Miasta Elbląga z lat 1374–1430. Księga czynszowa Starego Miasta Elbląga z 1403 roku*, red. C. Kardasz, R. Czaja, Toruń 2022, pp. 4, 12, 75 – editors’ note.

¹⁵⁴ CDW, Bd. 3, no. 49.

Goltsmit, paid an annual rent of 10,000 bricks (they owned one brick kiln).¹⁵⁵ Interesting information appears under the year 1408 in the account book of the Old Town of Elbląg. Here, the town received from the “bricklayers” *tygeleren*), Willam and Hans (this is probably the tenant of the second town brickyards mentioned in 1403), from their *schuenen*, 28,000 bricks and 2,900 roof tiles (this is well over the size of the annual rent that the brickmaker-tenant was obliged to pay in 1403). They were to be used for the extension of one of the towers of the ramparts and for the roofing of the town scribe’s house.¹⁵⁶ It appears that the war damage to the Malbork castle and the need to rebuild (and further expand) the stronghold caused the Elbląg brickyards referred to above, leased by Willam Sukaw and Hannus Czygeler, to send the tiles they produced to the capital castle in 1411–1412. The total at the time was around 90,000.¹⁵⁷ Apparently, immediately after the war, the Malbork castle brickyard was either dilapidated or could not keep up with orders.

At least one brickyard, managed by two town officials (*chigelheren*) was owned by the Old Town of Braniewo in the early 15th century. This is known from a written report of 1424 recording the income and expenditure of the institution. Almost 71,000 bricks and 4,300 roof tiles were baked there at the time in three brick kilns. There is, in addition, a handful of interesting information about the day-to-day running of the town’s brickyard, such as the renting of a house to the brickmaker.¹⁵⁸ According to a similar report for the year 1425, in turn, a total of around 40,000 bricks and 4,000 tiles were baked in two kilns. Here, too, a little additional information emerges about the operation of this brickyard: the bringing in of the clay, the operation of the two kilns – a small and a large one, the staff (brickmaker, roofers, bricklayer, bricklayer and his house), the hauling of cooled bricks from the brick kiln, etc.¹⁵⁹ However, it is difficult to indicate its exact location. It was probably located in front of the town.

The source information on Gdańsk is somewhat surprising. It would seem that at least two local brickyards would have

¹⁵⁵ *Księga rentowa...*, pp. 75, 97.

¹⁵⁶ *Nowa Księga Rachunkowa Starego Miasta Elbląga 1404–1414*, wyd. M. Pelech, cz. 1: *1404–1410*, Warszawa–Poznań–Toruń 1987, p. 113.

¹⁵⁷ M. Kon., pp. 259, 296–297.

¹⁵⁸ CDW, Bd. 4, no. 33, pp. 96–98.

¹⁵⁹ *Ibidem*, no. 81, pp. 140–142.

served the three towns there between the 14th and 15th centuries. However, if we take into account the references from the years 1379–1382 in the treasurer's book of the Main Town of Gdańsk, we are astonished to discover that bricks for the construction work carried out there at that time (e.g. of the town hall at Długi Targ) were imported from outside, namely either from Tczew (from the local municipal brickyard or from the Teutonic vogt?), or from Grabiny (certainly from the brickyard located at the vogt's castle which was being erected there), or from the village of "Damerow". In the latter case, it would be either Dąbrówka Tczewska or Dąbrowa in today's Lichnowy municipality.¹⁶⁰ Therefore, at the end of the 14th century, a brickyard (municipal or Teutonic?) of impressive capacity would have had to be located there, about which, by the way, nothing is known.

For sure there was a municipal brickyard in Malbork in the first half of the 15th century, or perhaps even earlier. It was located in the southern suburb, by the Nogat River, at the junction of today's Bażyńskiego and Zapolskiej streets.¹⁶¹ Unfortunately, nothing is known of any co-operation in the late Middle Ages between this facility and the brickyard of the capital Malbork Castle. On the other hand, a noteworthy reference is contained in a fragment of accounts from July 1448, drawn up by the Teutonic cellar superintendent then in charge of the central Malbork treasury: it records the payment to the town of Malbork of 151 marks for the purchase of 151,000 bricks.¹⁶² They were probably produced in the aforementioned brickyard.

Production and sourcing of bricks for the construction of churches and chapels in rural areas

At the beginning of the 20th century in Narzym (south-east of Działdowo), in the vicinity of the parish church there, researchers discovered a 7 × 6 m brick kiln that could hold around 5,000 bricks,

¹⁶⁰ *Najstarsze księgi kamlarskie Głównego Miasta Gdańska z XIV–XV wieku*, wyd. M. Grulkowski, Warszawa 2016, pp. 105, 118, 155.

¹⁶¹ W. Długokęcki, W. Sieradzan, *Malbork. Historia i rozwój przestrzenny*, in: *Atlas historyczny miast polskich*, t. 1: *Prusy Królewskie i Warmia*, red. A. Czacharowski, R. Czaja, nr 5: *Malbork*, Toruń 2002, p. 7.

¹⁶² K. Neitmann, *Der Hochmeister...*, Anhang [Appendix], no. 3, p. 146.

with the contents still unbaked inside. It was dated to the beginning of the 15th century and linked to the local church, which was erected at the same time.¹⁶³ However, having examined the late medieval written sources from the Prussian area, a conclusion can be drawn that the Narzym kiln would have been a truly unique object, as when any brick churches were built in rural areas, dedicated brickyards were generally not erected in their vicinity and building materials were brought from somewhere else.

To illustrate this thesis, it is worth referring to the Malbork treasurer's book. At the turn of the 14th and 15th centuries, this source records some information about the construction of a brick chapel by a Teutonic vogt from Bratian at a pilgrimage site in Łąki Bratiańskie (north of Nowe Miasto Lubawskie).¹⁶⁴ In March 1399, the Malbork treasurer, on the recommendation of Grand Master Konrad von Jungingen, donated the considerable sum of 22 marks to the vogt of Bratian for the purchase of bricks for the erection of the local chapel.¹⁶⁵ They are far more likely to have been imported from outside (the question is where from?) than produced locally. Another delivery of bricks and other building materials took place there a year later (1400), but again there is no record of where they came from.¹⁶⁶ Fortunately, a handful of more detailed information on the subject was recorded under the year 1401. Firstly, the burghers of Nowe Miasto were paid over 13 ½ marks by the treasurer to supply 27,450 bricks and tiles for the construction of the chapel in Łąki Bratiańskie.¹⁶⁷ Were these building materials produced in the Nowe Miasto brickyard (about which, by the way, nothing is known) or were they imported by the burghers from somewhere else? It is impossible to answer this question in a satisfactory manner, but it is a fact that the bricks intended for the

¹⁶³ For a detailed discussion of this finding, see M. Arszczyński, *Organizacja...*, pp. 39, 96–98.

¹⁶⁴ On Łąki Bratiańskie as a place of pilgrimage in the late Middle Ages, see W. Rozynkowski, *Omnes Sancti et Sanctae Dei. Studium nad kultem świętych w diecezjach pruskich państwa zakonu krzyżackiego*, Malbork 2006, pp. 198–199.

¹⁶⁵ "Item 22 m. deme voithe zum Bratthean vor zigil zur capellen zur Lubenicz von des meisters [geheisel]" – M. Tr., p. 20.

¹⁶⁶ *Ibidem*, p. 72.

¹⁶⁷ "[...] zur capellen zu Lubenicz: zum irsten 13 ½ m. 5 scot. unde 1 sch. den burgern vom Nuwenmarkte vor 27450 muwersteyns und dachsteyns" – *ibidem*, p. 106.

construction of the chapel in Łąki Bratiańskie were brought there from somewhere.¹⁶⁸

In 1397, the construction of a parish church was underway in Zantyr (probably today's Biała Góra at the bifurcation of the Vistula and Nogat Rivers). Given that the carting of bricks there is recorded in the expenses in the book of the Malbork convent,¹⁶⁹ it can be assumed that they came from the brickyard of the capital castle. In September 1399, the consecration ceremony of the parish church in Zantyr, already built by then, took place.¹⁷⁰

It is not easy to interpret the source references recorded in the income and expenditure registers of the Elbląg commander Heinrich Reuß von Plauen, dating from 1446 to 1449. For, in 1446, this Teutonic dignitary gave almost 10 marks to the parish priest in Marianka (Mergenfelde; north of Pasłęk) for 12,580 bricks and 3,400 tiles.¹⁷¹ How should this information be interpreted? Did the commander of Elbląg reimburse the parish priest in Marianka for the cost of obtaining building materials for the extension of his church¹⁷² or did the latter simply sell bricks and roof tiles (produced in his church brickyard?) to the Teutonic official? It appears that in the same year (1446) the commander of Elbląg again transferred some resources to the parish priest in Marianka: this time over 4 marks for 7,000 bricks.¹⁷³ The matter is further complicated by a reference from 1447/1448. This time, the Teutonic official gave the local parish priest more than one mark for 2,000 bricks,

¹⁶⁸ "Item ½ m. und 2 sch. zigil zu furen zur capellen zur Lubenicz" – *ibidem*, p. 106.

¹⁶⁹ "Item 21 sc. die crippe vom Czanter czu brengen und czigel werdir ken dem Czanter czu furen" – A. Sielmann, *Die Reste des Marienburger Konventsbuches aus den Jahren 1395–1398*, "Zeitschrift des Westpreussischen Geschichtsvereins" 1920, Bd. 20, p. 71.

¹⁷⁰ M. Tr., p. 30.

¹⁷¹ GSPK, OF, no. 200b I (Allerhand Rechnungen der Komthurei Elbing), f. 357.

¹⁷² The church in Marianka, which has survived to the present day, was essentially built in the 14th century; on this subject see C. Herrmann, *Mittelalterliche Architektur im Preussenland. Untersuchungen zur Frage der Kunstlandschaft und -geographie*, Petersberg 2007, pp. 588–589; J.M. Arszczyńska, M.R. Gogolin, *Church in Marianka by Pasłęk. The Results of Analysis of the Inner Face of the Walls Carried Out During Research and Conservation Works on the Mural Paintings*, "Architectus" 2009, nr 1–2, pp. 3–7 (the authors were not aware of the source references cited in the present paper).

¹⁷³ GSPK, XX HA, OF, no. 200b I (Allerhand Rechnungen der Komthurei Elbing), f. 363.

which were transferred to Rieczna (Weißenhouffe; northwest of Pasłęk).¹⁷⁴ Nothing is known about any church located there in the Middle Ages. The question of interpreting the references cited here therefore remains open.

Secondary use of reclaimed bricks

Analysing the globally preserved late medieval written sources from the area of the Teutonic Order state in Prussia, it is possible to draw the cautious conclusion that bricks obtained from older, demolished and dismantled buildings were used relatively rarely in the local construction industry, although the occasional occurrence of such practices can be proven.

By virtue of a document issued on 7 May 1388 in Königsberg, the members of the local cathedral chapter allowed the two builders of the new Hospital of the Holy Spirit, under construction in that city, to use lime and brick kilns (located in the urban area?) and building materials from the demolition (of the previous hospital?).¹⁷⁵ However, it is uncertain whether bricks would have been among the latter, as it is not known whether the demolished older building was built using this construction material.

According to an entry from the Malbork treasurer's book under the date 24 December 1400, some part of the bricks used in the construction of the new stables in the Teutonic procurator's fortified mansion in Małowy (within the borders of the Malbork commandery)¹⁷⁶ came from the demolition of the old stables (located in the same building complex?).¹⁷⁷ It is not easy to understand the reference made in the expenditure book of the Malbork castle commander under the year 1412. It seems, however, that the two helpers obtained bricks from the demolition of a brick shed for storing charcoal located in the second bailey of Malbork castle, and that

¹⁷⁴ "Item 1 marc 4 sc. dem pfarrer zcu Mergenfelde gegeben vor 2000 mauersteyn gekomen in den Weißkenhouffe" – *ibidem*, f. 385v.

¹⁷⁵ *Urkundenbuch der Stadt Königsberg i. Pr.*, bearb. v. H. Mendthal, Bd. 1: 1256–1400, Königsberg i. Pr. 1910, no. 114.

¹⁷⁶ For a summary of knowledge on this stronghold, see M. Knyżewski, *Siedziby...*, pp. 262–263.

¹⁷⁷ "[...] 1 ½ m., den alden zigil vom alden stalle zu furen widdir zum nuwen stalle" – M. Tr., p. 95.

they were to be used for the construction of the roof structures of one of the six castle churches.¹⁷⁸ One of the provisions of the peace treaty ending the Polish-Teutonic war, concluded on 27 September 1422 on Lake Mełno, obliged the Teutonic side to demolish the commander's castle in Nieszawa. After various political perturbations, the demolition work was carried out between late April and mid-June 1423. Interesting information on the subject is contained in a letter that the Teutonic treasurer, Jost von Struppberg, sent to Grand Master Paul von Rusdorf on 14 June of that year. Namely, the dignitary learned from the Dzierżoń commander, Niklaus von Görlitz, who was staying with him as a guest, that the castle of Nieszawa had already been completely demolished. The demolition brought 150,000 reclaimed bricks, which were transported to the other side of the Vistula. Moreover, an additional 100,000 bricks were donated to the city of Toruń.¹⁷⁹ Unfortunately, it is not known for the erection of which buildings these 250,000 bricks from the demolition of the Nieszawa castle were used afterwards. The account book of the Old Town of Elbląg under the year 1414 mentions the demolition of several buildings in the urban space, which brought 86,400 reclaimed bricks.¹⁸⁰ It is not known whether they were used secondarily in construction work but it seems they were. Otherwise, there would be no need to count them accurately.

Writing probably in the third decade of the 15th century, an anonymous Polish author reporting on the Polish-Teutonic relations at the turn of the 14th and 15th centuries, when referring to the events of the first phase of the war in 1409, mentioned that after the Order's army had captured the castle in Złоторia in the Dobrzyń Land (south-east of Toruń) on 2 September of that year, the occupants completely demolished the fortress, and sent the bricks obtained from it to Toruń to be used for the erection of the church of St John.¹⁸¹ The information contained

¹⁷⁸ "Item 40 d. 2 knechten, dy czygel abelysen von der koleschune, dy man off die kirche dachkthe" – AMH, p. 61.

¹⁷⁹ GSPK, XX HA, OBA, no. 4124. On the circumstances and course of the demolition of the Nieszawa castle, see S. Józwiak, *Zburzenie zamku komtureckiego w Nieszawie w latach 1422–1423*, "Rocznik Toruński" 2003, nr 30, pp. 19–33.

¹⁸⁰ *Nowa księga rachunkowa Starego Miasta Elbląga 1404–1414*, wyd. M. Pelech, cz. 2: 1411–1414, Warszawa–Poznań–Toruń 1989, pp. 81–82.

¹⁸¹ "[...] castrum predictum Zlothorium funditus everterunt, lattersque castrum in Thorun deducentes pro fabrica ecclesie beati Iohannis baptiste in dicta urbe

in this source requires further comment. The fact is that no other account from the period confirms *expressis verbis* that the reclaimed bricks from the castle in Złotoria were used secondarily in the erection of the Toruń's church of St John, but a number of additional source indications support the idea that this cannot be excluded. The Teutonic forces actually captured this stronghold between 29 August and 2 September 1409 using projectile throwing machines and firearms.¹⁸² The devastating effects of these actions were recounted in a letter drafted on 13 September of that year in Toruń by the local castle commander to his immediate superior, commander Albrecht von Schwarzburg. According to the contents of this source, the castle commander of Toruń, together with the commander of Bierzłowo, had just carried out a visitation of the castle in Złotoria (probably at the request of the Teutonic leadership). On this occasion, they noticed that one of its walls running from the gate to the great tower and the bay window (*erckir*) towards the Vistula and the wall on that side were collapsed. On the other hand, the great tower and part of the wall towards the village were barely standing and, just before the officials parted, the Bierzłowo commander expressed the view that they would collapse the same day.¹⁸³ It can be suspected that, based on this opinion, the Teutonic authorities decided to demolish the walls of this castle. The work probably started as early as the end of September and appears to have been carried out and paid for by the local government of Toruń's Old Town. This is mentioned in surviving accounts dated between September and November 1409. They record quite substantial sums for, among other things, tools for demolishing the walls and tower of the Złotoria castle, as well as food and wages for the craftsmen and labourers working there (at least 56 labourers of various working hours).¹⁸⁴ It appears that this stronghold was indeed largely dismantled in a relatively short period of time, as can be inferred from the contents of

constitute assignaverunt" – *Dopełnienie szamotulskie*, wyd.. A. Bielowski, in: MPH, t. 2, Lwów 1872, p. 864.

¹⁸² For more on this subject, see S. Józwiak, K. Kwiatkowski, A. Szweđa, S. Szybkowski, *Wojna Polski i Litwy z zakonem krzyżackim w latach 1409–1411*, Malbork 2010, pp. 123–124.

¹⁸³ GSPK, XX HA, OBA, no. 28086.

¹⁸⁴ I. Janosz-Biskupowa, *Materiały dotyczące udziału Torunia w wyprawie krzyżackiej na ziemię dobrzyńską w r. 1409*, ZH 1960, t. 25, z. 2, source text, pp. 91–98.

a letter from the commander of Toruń dated 11 March 1417. This official, conveying to the Grand Master the reports of his spy from the Kujawy region about the Polish war preparations, mentioned, among other things, that the opponents intended to capture the Teutonic castle in Nieszawa and demolish it to its foundations, just as the Order had done at one time (i.e. in 1409) with Złotoria.¹⁸⁵ And how credible is the information contained in the Polish source from the third decade of the 15th century cited above, that bricks from the demolition of the castle in Złotoria were reused for the erection of the church of St John in Toruń? Its veracity cannot be excluded given the events of 1406 widely reported in the narrative sources. At that time, specifically on 30 May of that year, the tower of the church (in large part?) collapsed.¹⁸⁶ It was later demolished relatively quickly, since already on 3 August 1407, the foundation for the new tower was laid at a depth of around five metres (“wardt der grundt gelegt zu dem neuen Thurm, der ist 9 ellen dick”).¹⁸⁷ It can therefore be assumed with a high degree of probability that the bricks from the Złotoria castle, which was demolished in the autumn of 1409, were in fact reused in the erection of the new tower of the church of St John in Toruń, even though it is not possible to confirm this thesis with absolutely certain evidence.

¹⁸⁵ “[...] und das sy sich dor uf richthen, das sy das haus Nessaw gewinnen, und das so brechen bis in dy grunt, gleich als wir der Sloteryen haben gethan” – GSPK, XX HA, OBA, no. 1055. On the dating of this source, see S. Józwiak, A. Szweda, *Dyplomatyczna aktywność rycerza Janusza Stembarskiego z Sokolowa w politycznych stosunkach polsko-krzyżacko-litewskich w pierwszej połowie XV wieku*, KMW 2009, nr 1, p. 5.

¹⁸⁶ It was a spectacular disaster, which is presented somewhat differently by the sources. From the surviving copies of the minutes of the meetings of the council of Toruń’s Old Town, it appears that on that day (30 May) at around eleven o’clock, a third of the tower collapsed. And since the foundation for the new tower was laid on 3 August of the following year (1407) (*Thorner Denkwürdigkeiten von 1345–1547*, hrsg. v. A. Voigt, Thorn 1904, pp. 36–37), it is possible to formulate the thesis that the old one had to be demolished in its entirety in the meantime. Moreover, the Pomesanian official’s chronicle, edited in the second decade of the 15th century, mentions that on 30 May 1406, the tower of the church of St John in Toruń “tore” from the top down to the foundations, so that it had to be demolished. Incidentally, the author reported that most of the city’s residents were in church at the time of the disaster. However, he did not mention any casualties – *Johann’s von Posilge, officialis von Pomesanien, Chronik des Landes Preussen*, hrsg. v. E. Strehlke, in: SRP, Bd. 3, Leipzig 1866, p. 283.

¹⁸⁷ *Thorner Denkwürdigkeiten...*, p. 37.

Clay harvesting for the construction of Teutonic castles in Prussia in the late Middle Ages in the light of geological, archaeological and petrographic studies

The issue of how building materials were sourced in the Teutonic Order state and what were their characteristics, particularly the clay for brickmaking, has not been the subject of much interest. It is therefore worth noting that archaeological and petrographic research carried out in recent years on several castles from the Chełmno area provided new interesting information on this subject.¹⁸⁸ In the study of Teutonic (especially defensive) architecture, these modern methods have only been used on a larger scale for a few years.¹⁸⁹ The analysis of bricks retrieved from eight castles: Malbork, Toruń, Nowe, Papowo Biskupie, Kowalewo Pomorskie, Lipienek, Starogród and Unisław brought particularly interesting conclusions.¹⁹⁰ And it must be clearly emphasised here that the need to recognise the type of clay used in their manufacture and

¹⁸⁸ See, for example: *Environment, Colonization, and the Baltic Crusader States. Terra Sacra I*, ed. A. Pluskowski, Turnhout 2019; *Castra Terrae Culmensis. Na rubieży chrześcijańskiego świata*, t. 1–2, red. M. Wiewióra, Toruń 2020; W. Bartz, J. Łukaszewicz, M. Wiewióra, K. Witkowska, *Pochodzenie surowca do produkcji cegieł z zamków krzyżackich w ziemi chełmińskiej*, Toruń 2022 (typescript held at the Institute of Archaeology, Nicolaus Copernicus University in Toruń, Department of the Middle Ages and Modern Times).

¹⁸⁹ The list of the most recent studies on the subject would include: K.M.J. Hayward, S. Black, *Resources for Castle Building in Medieval Prussia and Livonia*, in: *Ecologies of Crusading, Colonization, and Religious Conversion in the Medieval Baltic. Terra Sacra II*, ed. A. Pluskowski, Turnhout 2019, pp. 35–60; K. Witkowska, J. Łukaszewicz, *Comparative Studies on Masonry Bricks and Bedding Mortars of the Fortress Masonry of the Teutonic Order State in Prussia. Malbork, Toruń and Radzyń Chełmiński Castles*, in: *Science and Art. A Future for Stone. Proceedings of the 13th International Congress on the Deterioration and Conservation of Stone*, vol. 1, eds. J. Hughes, T. Howind, Paisley 2016, pp. 621–629; K. Witkowska, *Badania nad średniowiecznymi materiałami budowlanymi z zamku w Radzynie Chełmińskim*, “Zabytkoznawstwo i Konserwatorstwo” 2017, t. 48, pp. 37–56.

¹⁹⁰ The research was carried out during conservation and archaeological-architectural works between 2005 and 2022. From the studies summarising their results, it is important to point out: A. Momot, B. Wasik, M. Wiewióra, *Zamek krzyżacki w Papowie Biskupim: nowe odkrycie i nowe interpretacje*, “Rocznik Grudziądzki” 2014, t. 22, pp. 65–97; K. Witkowska, J. Łukaszewicz, *Comparative Studies...*, pp. 621–629; K.M.J. Hayward, S. Black, *Resources...*, pp. 35–60; *Castra Terrae Culmensis...*, t. 1, pp. 132–161; t. 2, pp. 7–257; W. Bartz, J. Łukaszewicz, M. Wiewióra, K. Witkowska, *Pochodzenie surowca...*

the possible source of the clay is all the more necessary, as it is extremely rare to be able to indicate the location of clay outcrops, brickyards or kilns associated with the construction of Teutonic castles on the basis of historical written records.¹⁹¹

The Chełmno Upland and proglacial valley of the Vistula are rich in clay raw materials that can be used to make bricks, roof tiles and other building ceramics. These include Pleistocene glacial till, varved clay and silts, and Neogene clay (variegated clay, Poznań clay). In particular, those clay raw materials characterised by a certain degree of homogeneity and suitable plasticity properties after flooding are of practical use. These characteristics can vary depending on the mineral composition, such as the ratio of clay and non-clay minerals, including the plasticity-reducing content of quartz as well as calcite and rock chips in the raw material. In addition, plant detritus may be present in the clay raw materials, which, after baking, causes porosity and deformation of the products.¹⁹² Glacial tills are common throughout the Chełmno Upland and their surface layer reaches a considerable thickness, sometimes up to several dozen metres. Depending on the sedimentation conditions and post-sedimentation processes, their physico-chemical characteristics can be very different, hence the distinction, for example, into sandy, clayey and decalcified clays. Glacial tills are a heterogeneous raw material, usually of poorer quality. Varved clays and silts and variegated clays, which are usually a higher quality raw material, occur locally on the surface or underground throughout the area under consideration, including in the vicinity of the castles analysed.¹⁹³

Analyses of the sampled bricks carried out in recent years clearly indicate that readily available glacial till was not used for their production. This was the case primarily because it is a poor-quality raw material. On the basis of an analysis of geological maps and descriptions of clay rock resources located within a radius of about 20 km from the individual Teutonic castles, it can be concluded that there are deposits of post-glacial varved silts on the

¹⁹¹ On this subject, see above.

¹⁹² G. Kociszewska-Musiał, *Surowce mineralne czwartorzędu*, Warszawa 1988, pp. 99–100; P. Molewski, *Próba rekonstrukcji stanu środowiska geograficznego miejsc położenia i otoczenia zamków w czasie ich budowy w XIII–XIV wieku*, in: *Castra Terrae Culmenis...*, t. 2, pp. 7–28.

¹⁹³ P. Molewski, *Próba rekonstrukcji...*, pp. 7–28.

surface or under a small overburden of earth, which are an oily ceramic raw material, lacking major amounts of sand fraction.¹⁹⁴ These are deposits well suited to the production of construction ceramics. They were probably cooled by the easily accessible sands present around all the castles analysed.

What conclusions can be drawn from the analyses of the chemical composition of the brick samples taken from the above-mentioned sites so far? The location of contemporary clay deposits juxtaposed with the location of the Teutonic Knights' stronghold indicates, for example, that for the purposes of building the castle in Toruń, the clay was most probably harvested in the nearest outcrop, located in the Vistula escarpment in the western part of the city. To the north of the castle in Bierzgłowo, at a distance of about 1.5 km, in the slope of a subglacial trough and on the upland at a distance of about 3.5 km in the vicinity of the village of Łubianka, early exploited Pleistocene clays and varved silts can be found. In some areas of the alluvial terraces in the Vistula valley, grey clays occur on the ground surface or under the cover of river sands up to 2 m thick.¹⁹⁵ Evidence of the exploitation and use of their deposits in the Bierzgłowo castle area can be seen in the name of the village of Cegielnik (*cegła* is the word for "brick" in Polish), located about 4.5 km south-east of the castle. The surrounding meadows on Schrötter's map of 1802 were called Ziegelwiese (Brick Meadows). Also in the vicinity of the Starogród and Unisław castles, in the slope of the Vistula valley, there were Pleistocene varved clays and silts, and on the upland, 3.5 km west of the Starogród castle, in the area of Brzozowo and Dorposz Szlachecki, there are still varved clays of the same age deposited under a 3–5 m thick layer of sand and silt.¹⁹⁶ They were easily accessible and located close to the Teutonic buildings.

¹⁹⁴ W. Bartz, J. Łukaszewicz, M. Wiewióra, K. Witkowska, *Pochodzenie surowca...*

¹⁹⁵ K. Wrotek, *Szczegółowa mapa geologiczna Polski 1:50000. Arkusz Ręczkowo (320)*, Warszawa 1988; K. Wrotek, *Objaśnienia do „Szczegółowej mapy geologicznej Polski 1:50000. Arkusz Ręczkowo (320)”*, Warszawa 1990, pp. 49–51.

¹⁹⁶ M. Kozłowska, I. Kozłowski, *Szczegółowa mapa geologiczna Polski 1:50000. Arkusz Unisław (281)*, Warszawa 1988; M. Kozłowska, I. Kozłowski, *Objaśnienia do Szczegółowej mapy geologicznej Polski 1:50000. Arkusz Unisław (281)*, Warszawa 1990, pp. 55–57; P. Molewski, *Próba rekonstrukcji...*, p. 19.

In the case of the Malbork castle, there are no good raw materials for brick production available on the surface in the immediate vicinity. In the 19th and 20th centuries, Pleistocene clays were extracted in the vicinity of Kałdowo and Nowy Staw, located respectively 4 and 13 kilometres from the castle. Similar deposits of raw material could also be harvested in the vicinity of Sztum (14 km) and Gniew (45 km), where there are numerous, large surface outcrops of easily accessible varved clays. Thus, in the 14th century, clay raw material or finished ceramics could be transported to Malbork. What is mysterious, however, is the origin of the clay used to erect the first buildings of the Malbork castle (late 13th century).¹⁹⁷ It was only possible to establish that quartz sand, identified in bricks from the Biała Góra (Zantyr) stronghold, is present in samples obtained only at this site, and in bricks from the vaults of the Malbork high castle dating from the late 13th century.¹⁹⁸ It is also interesting to note that there were differences in the composition and texture of the bricks in each of the investigated castle sites from the area of Gdańsk Pomerania. This may support the idea that the local clay was harvested specifically for the erection of each, with a small proportion of the material redistributed from larger outcrops. At the same time, studies of the bricks from the Malbork castle showed a visible change in their geochemical characteristics, which was undoubtedly related to the locations of clay deposits used for the production of bricks for the successive phases of the construction of this fortress. In the bailey structures dating from the mid-14th century onwards, a much finer lake clay, richer in iron, appeared, replacing the siliceous clay previously used (late 13th and 14th century) in the high castle and at the beginning of the 14th century in the so-called middle castle.¹⁹⁹

As far as the area of the Chełmno Land is concerned, on the basis of analyses of geological maps, it can be concluded that in the vicinity of Lipienek and Papowo Biskupie there are no surface outcrops of clays and silts.²⁰⁰ Assuming that the bricks for the construction of these castles (which in Papowo Biskupie were

¹⁹⁷ K.M.J. Hayward, S. Black, *Resources...*, pp. 35–60.

¹⁹⁸ *Ibidem*.

¹⁹⁹ *Ibidem*.

²⁰⁰ M. Drozd, M. Trzepla, *Szczegółowa mapa geologiczna Polski 1:50000. Arkusz Chełmża (282)*, Warszawa 2005; *idem*, *Objaśnienia do „Szczegółowej mapy geologicznej Polski 1:50000. Arkusz Chełmża (282)”*, Warszawa 2006, pp. 7–8; P. Molewski, *Próba rekonstrukcji...*, p. 19.

used only to a small extent), were made locally, the raw material may have been glacial till.²⁰¹ However, it cannot be ruled out that clay of better quality was transported from outcrops close to the castles at Unisław and Starogród, or that raw material or products of building ceramics were obtained from other, neighbouring construction sites. It is worth remembering that the process of erecting fortresses in Lipienek and Papowo Biskupie began at the end of the 13th century, i.e. during the period when the construction of the masonry castle in Starogród (which had probably begun in the middle of that century) and in Toruń was being completed. An additional argument supporting this hypothesis is that both the castle in Papowo Biskupie and Lipienek were built largely of erratic stone.²⁰² Considering the entire area of the Chełmno Land, the issue of why the building material used in Papowo Biskupie and Lipienek was different is of understandable interest. Both castles are located in the marginal zone of the last ice sheet, with terminal moraines and moraines of dead ice, where the highest concentrations of erratic boulders are found. This was undoubtedly beneficial for construction, but was a significant obstacle to land cultivation. It cannot be ruled out that, in the case of the neighbouring castles at Lipienek and Papowo Biskupie, the reason for the difference in the building material used compared to other Teutonic Order strongholds erected in this period, for which bricks were mainly used, was precisely the poor quality of the clay used in its manufacturing. In Lipienek it was still relatively good, but this was not the case in Papowo.²⁰³

An analysis of the written sources (see above) indicates that, for understandable reasons, brickyards were generally located on the site where the raw material was exploited and as close as possible to the construction site of the building in question. This reduced the costs of purchasing materials and transport. Once the construction was completed, the brickyards were decommissioned. For this reason, little information about them and even fewer material remnants have survived to the present day. There was no good raw material available directly on the surface in the vicinity of the

²⁰¹ P. Molewski, *Próba rekonstrukcji...*, p. 19.

²⁰² M. Wiewióra, *Studia nad średniowiecznym warsztatem budowlanym zamku krzyżackiego w Papowie Biskupim*, "Ochrona Zabytków" 2013, t. 66, nr 1–4, pp. 179–198.

²⁰³ P. Molewski, *Próba rekonstrukcji...*, p. 19.

castle in Kowalewo Pomorskie. The clay used to bake the bricks for its construction at the beginning of the 14th century was either imported from outcrops further afield (possibly from Toruń), or there was no production at all on site, but the finished bricks were imported from outside.²⁰⁴

Conclusions

The analysis of written sources on the production and sourcing of bricks in the Teutonic Order state in Prussia in the 14th and the first half of the 15th centuries allows some important conclusions to be drawn. For example, that in the case of Teutonic fortified buildings, a brickyard, if necessary, even two, was often erected in the vicinity of the constructed buildings, and their production (bricks, roof tiles) was largely used on site, although the needs were often greater (Grabiny – in the years 1403–1408 more than 2,600,000 bricks and roof tiles, Klaipėda – in the years 1402–1404 about 3,000,000 bricks and roof tiles, Puck – in the years 1391–1407 – 2,300,000 bricks). Clay was also mostly extracted in the vicinity. The Teutonic castles in the cities (Toruń, Gdańsk, Elbląg, Königsberg), which were being extended at this time, could only rely on bricks and roof tiles from outside (either from the city brickyards or from Teutonic brickyards in the provinces, e.g. Zimmau or Rossiten), as it was difficult to build a new brickyard in the dense urban development surrounding the fortress (including the bailey) to satisfy the needs of the stronghold. However, in Malbork, for example, the brickyard, at least from the end of the 14th century working for the continuously expanding castle, was located in close proximity to the capital fortress, to the east of the defensive walls of both baileys. It produced even up to 400,000 bricks a year, so it was one of the particularly large facilities of this kind. Brickyards in the Teutonic Order state in Prussia used between one and as many as 32 brick kilns with capacities ranging from 5,000 to as many as 40,000 bricks. It is not uncommon for the surviving source data from this period to estimate the annual production volume of some brickyards at between tens of thousands and even over 300,000 bricks and tiles. Extraordinary orders (“Flemish floor bricks” in Grabiny) were brought

²⁰⁴ M. Arsyński, *Organizacja...*, p. 38; P. Molewski, *Próba rekonstrukcji...*, p. 19.

in by sea via Gdańsk. Historical records show that the preferred method of transporting the bricks and tiles produced over longer distances was by water, which is why brickyards were most often built beside rivers or on the banks of the Vistula Lagoon. The information contained in the sources confirms that, around the middle of the 15th century, for works carried out on the reconstruction or extension of bailey buildings, Teutonic officials no longer erected their own brickyards, but bought bricks from such facilities, which were in operation on a regular basis, mainly in the cities and towns.

Probably already from the end of the 13th century, large cities and towns (Königsberg, Elbląg, Toruń, Chełmno, Braniewo) had their own brickyards (usually two), but in small urban centres (Malbork, Brodnica, Morąg, Pasłęk, Miłakowo) such facilities with an annual production of less than 100,000 bricks and tiles were also established. References in written sources from the late 14th and the first half of the 15th centuries indicate that when the rural parish churches were built, building materials were generally brought in from outside. The only known small brick kiln (5,000 pieces) from the early 15th century at a church of this type was discovered in Narzym. The same source accounts allow the conclusion to be drawn that bricks from demolition were only used secondarily in construction in the Teutonic state in Prussia in exceptional cases and in limited quantities.

To date, the study of bricks on a larger number of samples (especially from Prussia and Pomerania) showed considerable variation in their physical and chemical composition, which is mainly due to the different geology of the substrate.²⁰⁵ The differences noted at the local level are more important, as they provide an opportunity to answer specific questions related to the construction of castles. Analyses carried out on samples from the Chełmno area allow to draw the following conclusion: varved clays, i.e. the best plastic clay deposits, were used for the construction of the castles in Unisław, Starogród and Nowe. These sites have in their vicinity precisely such deposits. In contrast, their absence was recorded in the vicinity of Toruń, which resulted in using for brick production there materials with a significant amount of chips. On the basis of the observed features, it is difficult to give a clear answer to the question whether the bricks from the castle

²⁰⁵ K.M.J. Hayward, S. Black, *Resources...*, pp. 35–60; W. Bartz, J. Łukasiewicz, M. Wiewióra, K. Witkowska, *Pochodzenie surowca...*

in Papowo Biskupie are similar to those from the castle in Lipienek. Some differences may be due to local variations in the deposit of raw material used in their manufacture. On the other hand, similarities to the bricks from Papowo Biskupie can be seen in samples obtained from the castle in Starogród. However, there are certain differences in their petrographic features.²⁰⁶ Looking at the brick samples studied so far, in terms of the grain size of the grain skeleton, the bricks from the castle in Papowo Biskupie seem to be the most similar to the bricks from the castle in Toruń, containing components of a rather large size, mainly the sand fraction. It is therefore possible to assume that these bricks came from a brickyard that produced for the construction of the castles in Papowo Biskupie and Lipienek, which are located in close proximity to each other. From the analysis of historical sources and the results of archaeological research to date, it appears that both sites represent the oldest examples of regular Teutonic fortresses, the construction of which would date to the late 13th century.²⁰⁷

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²⁰⁶ For example, samples of bricks from Starogród have non-plastic components more finely grained compared to those from Papowo Biskupie; see W. Bartz, J. Łukaszewicz, M. Wiewióra, K. Witkowska, *Pochodzenie surowca...*

²⁰⁷ *Ibidem*.

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Streszczenie

Pozyskiwanie gliny i produkcja cegły w państwie zakonu krzyżackiego w Prusach w XIV i pierwszej połowie XV wieku.
Próba syntezy

W artykule przedstawiono najnowsze wyniki badań dotyczące jednego z najważniejszych materiałów budowlanych wykorzystywanych w państwie zakonu krzyżackiego w Prusach – czyli cegły. Zaprezentowano, na podstawie późnośredniowiecznych źródeł pisanych, nie tylko zagadnienia związane z rozpoznaniem lokalizacji wychodni gliny, jej rodzajów oraz procesu produkcji cegły na potrzeby budownictwa – w kontekście architektury zamkowej, miejskiej czy wiejskiej w państwie krzyżackim w Prusach – ale także wyniki najnowszych badań archeologicznych i petrograficznych kilku zamków z terenu ziemi chełmińskiej (Starogród, Lipienek, Unisław, Toruń, Papowo Biskupie, Kowalewo Pomorskie) i Pomorza (Nowe, Malbork). Analizując źródła historyczne, wykazano, że cegielnie znajdowały się zazwyczaj w pobliżu placów budowy. Zamki pozbawione bezpośrednich złóż gliny były prawdopodobnie zaopatrywane w materiał rozbiórkowy lub niewykorzystywany w innych budynkach. Na podstawie badań petrograficznych stwierdzono, że pozyskiwanie gliny wiązało się ze świadomym wyborem materiału najlepszego pod względem plastycznym. Wśród glin przeważały osady ilaste, których wychodnie znajdowały się w sąsiedztwie tylko niektórych zamków.