

## 14 Phase 4b Late medieval city wall 1350–1550 AD

### 14.1 Results

The presentation of the remains from Phase 4b will be given from two perspectives. Firstly there will be an account of the different feature types that form the city wall together with related scaffolding (Tab. 25). After the overall description the features are placed in a structural and historical context. Recorded robber pits in connection with the city wall are presented under time Phase 6, since these truncations represent secondary activities in the 17<sup>th</sup> century.

Group	Type of feature	Subarea	Basic interpretation
470	Cut and fills	Phase 45A, 45B and Trench 24, 51	City wall
598	Cut, fills, stones and bricks	Phase 5B-1, 5B-2 and 45B	City wall
592	Cut and fill	Phase 5B-1	Posthole

Tab. 25. Late medieval city wall.

#### 14.1.1 City wall – building material and construction details

The construction cuts for the city wall had vertical, straight sides to the east and irregular sides to the west (Fig. 79 and 80). Depth varied, but recorded in section this was between 0.5-2.0 m, and deepest in the area where the wall was best preserved outside Lille Kongensgade. Measured width was at the most c. 4.0 m and much wider than the wall itself (see below). The maximum length was 19.7 m (5.3 + 4.0 + 4.3 + 6.1 m) – a length that must be seen together with later disturbances and larger truncations within the excavation area. The base was variously concave, flat or irregular, dependent on the imprints from the overlying foundation stones.

To the east at least two stepwise ledges (1.0 + 2.8 m) were recorded, probably dug to simplify work when placing the large boulders in the construction pit. This construction work must have happened from the west, since the moat constituted an obstacle when working on the stone structure.

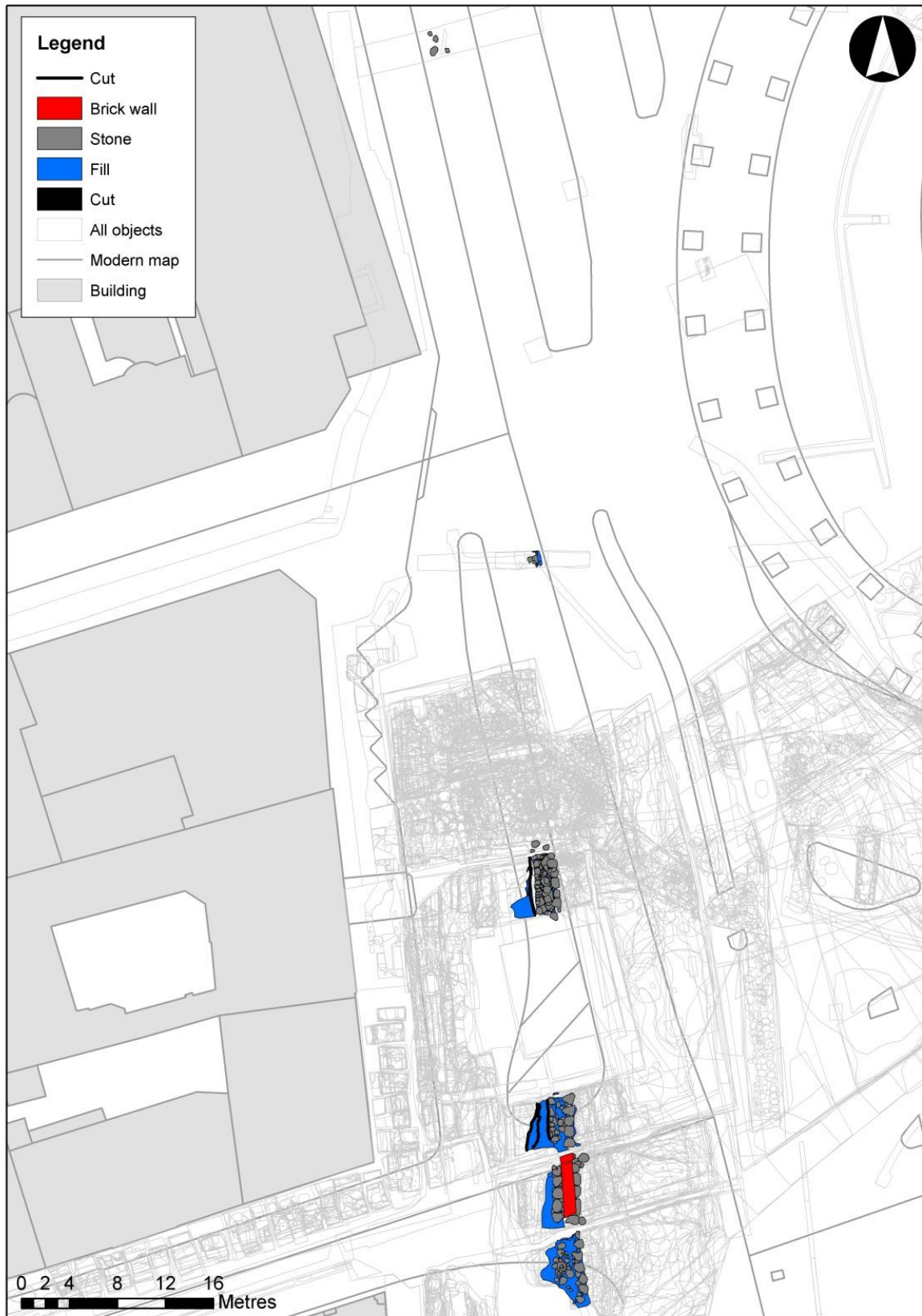


Fig. 79. Overview of investigated medieval city wall with construction cuts, foundation stones, limestone ashlars and brick walls outside Hotel D'Angleterre and between Lille Kongensgade and Østergade.



Fig. 80. Details of medieval city wall with construction cuts, foundation stones, limestone ashlar and brick walls investigated outside Hotel D'Angleterre and between Lille Kongensgade and Østergade.

The foundation consisted of three layers of unfinished granite boulders (Fig. 81). The foundation had a length of 39 m from north to south, a width of 2.3 m and a height of at least 2.0 m (based on the difference between the top of the stones and the base of the construction cut). The courses and the rampart layers had been built “step by step”, where the purpose of the rampart primarily had been to stabilize the foundation and brick wall, where the upper coursing was placed 0.6 m west of the underlying foundation stones. The tops of all the boulders were almost level which suggests that great care was taken to ensure their stability. At least two of the boulders exhibited tool marks in terms of chisel marks and wedge holes (Fig. 82).





Fig. 81. The eastern face of the city wall foundation with two courses of boulders and intermediate stones and backfills, facing NW. To the right – part of the sloping moat. The structure was truncated by the shoring to the north and the Transformer Station to the south. Photo: Museum of Copenhagen.

The upper eastern faces of the boulders exhibited soft and hard, white-beige sandy lime mortar bonding in some of the joints between the stones and occasionally in small quantities on the actual faces of the stones. The appearance of hard white lime mortar up to 1 cm thick on the east face of the upper two courses could perhaps represent some sort of render. Where mortar was found in the joints between the stones, it was covering small pieces of red brick, up to 3 cm long, which had been rammed into the gaps.



Fig. 82. Foundation stone (SS146448) with chisel marks, facing north. Photo: Museum of Copenhagen.

The infill in the gap between the east and west facing courses consisted of sand, pebbles and flint together with bigger and smaller stones. Some of the stones seemed to have been arranged intentionally in a line behind the face of the wall to the east, whilst others were placed in randomly in the core of the foundation (Fig. 83). The purpose was to strengthen the structure and inhibit later movement or slippage.



Fig. 83. The lower part of the foundation together with (SS90812) filling the core between the lower east and west facing courses, facing west. In front – part of the moat, behind the built rampart. Photo: Museum of Copenhagen.

The remaining part of the curtain wall consisted of five courses of medieval bricks (“munkesten”), mortared together with sandy lime and a lower course of rectangular limestone ashlar on the eastern side facing the moat (Fig. 84). The bricks general size was 0.28 x 0.12 x 0.09 m, but there were also bricks with varying sizes between 0.27-0.29 x 0.10-0.13 x 0.07-0.11 m. In the base of the wall some of the bricks were cut into size. To make the coursings fit better,



some of the bricks were placed upright so the top of the bricks were facing front. One brick had also been halved lengthwise (so-called “mesterpetring”).



Fig. 84. General view of brick wall and foundation, facing east. Photo: Museum of Copenhagen.

The facing mortar was destroyed, so the finish could not be determined with certainty. The mortar consisted of yellow-grey lime and sand with occasional inclusions of charcoal, small 2 mm stones and gravel.

The brick wall had originally been c. 0.9 m wide (1.5 cubit or three tiles thick, where one Zealand cubit = 0.6326 m). The brick wall was built in monk bond, i.e. two stretchers between every header with the headers centered over the perpendicular joint between the two stretchers in the course below, in the bond's most symmetric form (Fig. 84).

No certain maintenance work could be detected on the brick wall with the exception of a smaller area close to the gate building and an isolated posthole interpreted as part of scaffolding placed 0.5 m from the stone foundation. No putlog holes from scaffolding or damage from cannonballs were recorded either, nor were the remains of reinforcements in form of stiffeners, castellations, parapets or traces of a wall elevation.

The lowest course of limestones on the west side had been laid with limestones (Fig. 84) whose length was up to 0.28 m with a thickness between 0.09 and 0.16 m. The limestones were mainly rectangular, but a few of the stones were also quadratic. Most of the limestones were coursed in the medieval manner, but there were some irregularities occurring where there was a need to adjust the overlying, mostly linear courses on the underlying very irregular granite boulder base. Therefore it had been necessary in several places to vary the width of the limestones as well as place them on edge. The limestone course acted as a transition zone, between base and wall, where it passed on regularity to the overlying brick courses.

The limestone blocks and the bricks used in the wall construction looked reused. This indicates that the wall, at least in the lower foundation parts, was made by reused materials.

Different parts of the city wall were also recorded among the demolition material and backfills in the Late medieval moat and reused in a 16<sup>th</sup> century structure:

Context (SS21934) consisted of a monk bonded double faced brick wall of mid red bricks (“munkesten”) and rubble fill (Fig. 85). It seemed to be lying on its face, but to the north there was also a brick face, indicating that this was the corner of a wall. It also looked as if there had been an angle 45 degree here – perhaps a cut corner. Some of the bricks, mainly in the fill, were badly fired. The finish of the mortar was smooth. The wall was 1.60 m long, 1.65 m wide and with a depth of 0.50 m.



Fig. 85. Collapsed and partially truncated brick wall (SS21934) in the Late medieval moat. Photo: Museum of Copenhagen.

SS22335 consisted of a small part of a fully laid brick wall of four courses. Some of the bricks had a light red colour with a size of 26.5 x 13.5 x 7.5 cm. Other bricks were of a more brownish-red colour. None of the bricks were complete and the mortar was uneven. The brick type differed from the bricks in walls (SS21934) and (SS24827) in SG-404 and could represent repair work on the city wall.

Due to the Transformer Station only part of the face of SS24827 was seen and the feature remained unexcavated. It consisted of five courses of mid orange medieval bricks, fully laid with an uneven finish of mortar. Distinct from the other two brick walls (SS21934) and (SS22335), this structure consisted of monk bonded bricks with two stretchers for every header (Fig. 86).





Fig. 86. Monk bond. Part of brick wall (SS24827), facing west. Photo: Museum of Copenhagen.

Masonry reused and documented in the 17<sup>th</sup> century dam can perhaps tell something about the city wall's upper parts. Square blocks (SS311725) and (SS311734) consisted of 3 courses of red bricks ("munkesten") with white tuck mortar within foundation (SS503426). The features are interesting – the shape and the finished edges suggest that these represent the lower part of merlons, reused as building material when the city wall was demolished in the early 17<sup>th</sup> century, the latter dated by building material in the Late medieval moat (cf. Kristiansen 1998:65, 77 and 78; 1999b:165 and 176).

A crenellated parapet can be seen on the northern part of the city wall between Vesterport and Nørreport on Braun and Hogenberg's prospect over the city from 1587 AD (Braun and Hogenberg 2008).





Fig. 87. Close-up photo. Part of an interpreted merlon (SS311725) probably from the former city wall between two of the stones in foundation (SS503426), facing north. Photo: Museum of Copenhagen.

Outside Danske Bank's facade foundation stones from the former city wall had been reused as foundations for a later brick wall, probably part of the building seen on Geddes elevated map from 1760 replaced by Peschiers Gård (Danske Bank) in 1796. Seven large boulders of at least 2 courses forming a U-shape were documented in an area of approximately 2.7 x 1.4 m surrounding an open area with a buried bucket (Fig. 88). Post-excavation interpretation concludes that the boulders (SS205148), or at least some of them, were part of the city wall after comparing these with the city wall foundations investigated in 1996–1998 (Fig. 92 and cf. Kristiansen 1998:73 et seq.; 1999b:162-165). Further investigations were not done in the trench due to the excavation limit.

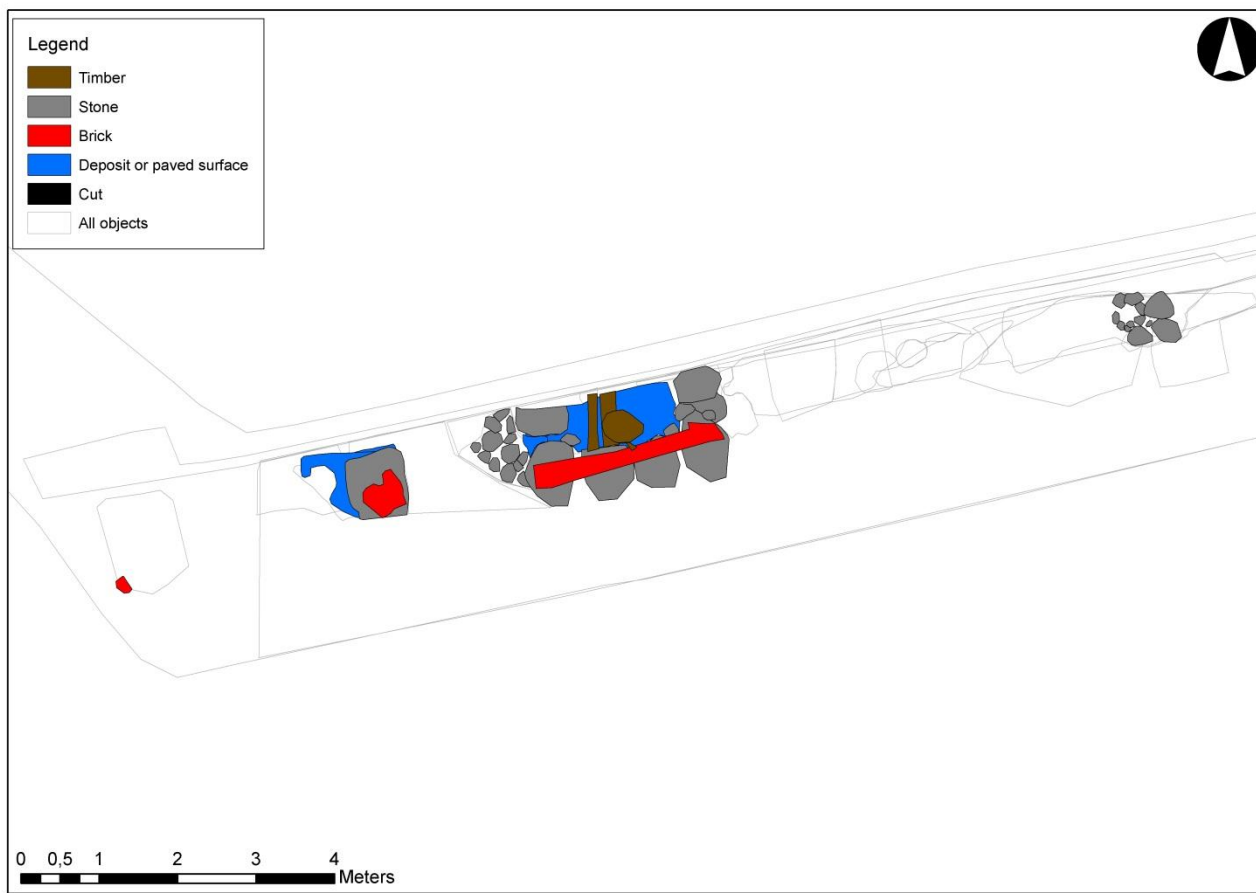


Fig. 88. Part of the former city wall incorporated in a later building outside Danske Bank’s facade.

#### 14.1.1.1 Dating

Based on stratigraphical observations the city wall is later than the bulwark and rampart dated to the early 13<sup>th</sup> century, but no stratigraphic relationships can date the city wall more accurately. The matrix shows that the wall truncates the embankment and is placed above the 13<sup>th</sup> century bulwark. In connection with the city wall the rampart was reinforced on the outside covering the first High medieval moat with finds dated between 1100–1400 AD, at some time before the wall is finally destroyed in the early 17<sup>th</sup> century in conjunction with the new defences (Østervold).

Only a few datable finds were collected in connection with the city wall consisting of ceramics; Late redware (1450–1660 AD) and a cannon ball. Both of these finds represent maintenance work on the wall and do not represent the first building phase of the brick wall. As a complement C14-analysis was made on different materials from the brick wall itself and from deposits belonging to the construction phases. AMS-analysis of material from foundation layers both north and south of the modern Transformer Station dates the wall to between the mid 13<sup>th</sup> and the first part of the 15<sup>th</sup> century (Tab. 26).

Lab. No.	<sup>14</sup> C year BP	Cal. 1 $\sigma$	Cal. 2 $\sigma$	Context No.	Negligible own age	Material
Lus 11350	780±35	1220–1270 AD	1190–1285 AD	SD90625	Y<1	Elder, <i>Sambucus nigra</i>
LuS 11348	620±40	1295–1395 AD	1285–1405 AD	SD82075	Y<1	Elder, <i>Sambucus nigra</i>
Lus 11352	530±35	1325–1435 AD	1315–1445 AD	SD91478	Y<1	Elder, <i>Sambucus nigra</i>

Tab. 26. <sup>14</sup>C results from SG-423.



The three different AMS-datings require an explanation: both SD90625 and SD91478 represent bedding layer and packing fill among the foundation stones close to Østerport north of the modern Transformer Station. The samples were collected in the middle of the stone structure where the height for the first sample was kote +1.67 m. The height for the second sample from SD91478 was kote +1.55 m, thereby the later sample was collected further down in the structure than the earlier – so the different dates cannot be explained by later intervention in the masonry through for example maintenance work, etc. Soil sample from SD82075 was collected from the same type of packing between boulders at kote +1.2 m.

To get a more precise dating of the city wall several samples were collected from the structure (both from the limestone foundations and the brick wall) by separating charcoal from the mortar samples. AMS-analysis of charcoal (young trunk) from mortar in two different courses of the limestones dated the structure to the late 11<sup>th</sup> century (Tab. 27).

Lab. No.	<sup>14</sup> C year BP	Cal. 1 $\sigma$	Cal. 2 $\sigma$	Context No.	Old-wood effect	Material
Lus 11720	915±40	1040–1165 AD	1025–1210 AD	SS89652	Y<30	Hazel, <i>Corylus</i>
Lus 11721	905±35	1040–1170 AD	1030–1210 AD	SS89294	Y<30	Hazel, <i>Corylus</i>

Tab. 27. <sup>14</sup>C results from SG-449.

Although the city wall can have been erected at the same time as Østerport in the early 1200s, the mentioned C14-datings are 50–100 years too old (based on the 2 sigma results and a maximum old-wood effect of 30 years). The best (and only?) reasonable explanation for the old dates are that the chosen charcoal represents wood from older building material, (fences or timber frame?) reused when burning limestone to produce mortar (cf. Rundgren 2015; Ringbom 2015).

Based on stratigraphical observations, finds and uncertain AMS-results the oldest part of the city wall is therefore dated to the mid 14<sup>th</sup> century – a suggestion that should be seen together with the fact that the oldest part of the city wall at Vesterport is dated to 1372 AD (cf. Lyne and Dahlström 2015:189; see also further discussion in Chapter 14.2 below).

#### 14.1.1.2 Dating and bricks as building material

The art of firing bricks was introduced to Denmark in the 1160s under Valdemar the Great. An inscription plate on his grave says he was the first to use "baked stone" (ex *lateribus coctis*) while working at Dannevirke (cf. Johannsen & Møller 1974; Ekroll 2006:149). With the exception of Dannevirke and the tower on Sprogø, the first buildings made of brickwork were large churches and monasteries as cf. Sankt Bendts in Ringsted and Sorø, Roskilde, Aarhus, Kalundborg and Vitskøl. During the Late Middle Ages bricks were also used, besides churches and monasteries, in fortifications and city walls and at administrative centres for the king or his local bailiff (Hinsch et al. 1993:23).

The size of the bricks ("munkesten") was the size normally used in the medieval period, but the brick size is also dominant in Post medieval buildings, due to reused materials (see e.g. Vandporten; Chapter 4.4). A medieval "munkesten" is approximately 9 x 14 x 28 cm (Lidén 1974), but neither during the Early medieval period or later is there a normal size. Gerard Lynch (1994:4) and Vesth (1987:148) argue that size cannot be used as a historical guide for dating bricks since size has varied right up to recent times. Even before the 1200s there are both larger and smaller formats than the norm and colour is totally dependent on the temperature and the composition of the used clay.

No in-depth studies of the mortar joints were made on site besides certain quotations about composition. It is therefore impossible to use these observations as dating evidence and the images also provide limited illumination (cf. Fig. 89). Older brick joints are often characterized by smoothed, edge swept joints replaced by swept joints with prismatic shape and sharp middle back – one Late medieval variant has a rounded bisection. The Gothic joints are

either wiped, levelled at the bottom and top, or smoothed, whereby all joints are flat and smooth. Within traditional brickwork it was also common to use weak mortar types to be able to take down a wall without damaging the stones (Nordby 2009).

Construction with a solid wall was very rare. Brick walls in the Middle Ages were mainly double faced walls with a ½ brick skin thickness towards the outside and a core with different types of rubble (Andersson & Hildebrand 1988:54).

Monk coursing was used in Denmark up until the 17<sup>th</sup> century. Looking at the images together with construction details the masonry can be dated from the Early Middle Ages to the mid 16<sup>th</sup> century (cf. Bertelsen 2016). The Danish builders used bricks of a different size compared with their German colleagues with a size of c. 28.0 x 12.5 x 8.5 cm (cf. Kirkebygning i middelalderen 2015), which could argue that the construction work was done by local labour.

#### **14.1.1.3 An indirect dating of the city wall using older contexts**

A proposal for a High medieval date can however be supported indirectly by looking closely at the nearby Early medieval features. From clay lined pit (SG-332) and (SG-657), there is actually information about CBM- and lime fragments in the deconstruction layers, which like the pits themselves should be dated to the early 1200s as these fishing activities must have ceased when creating the overlying rampart. Similar observations of brick- and lime fragments were also made in pit (G-658), external surface (SG-500323) and ditch (SG-500917).

CBM was also recorded at the Metro excavations in 1996–1998 where several of the ditch fills consisted of red bricks (cf. Kristiansen 1998:65). A brick kiln investigated in 1996 had been used for brick production connected to the construction of the city wall and covered by a later phase of the rampart. TL-dates of bricks in the kiln were dated to 1210±60 AD and 1310±60 AD. Charcoal from the fire pit was C14-dated to 770±50 BP or 1161–1297 AD (cal 2  $\sigma$ ) which could argue for a High medieval date for the city wall (cf. Kristiansen 1998:65 and 93-95; 1999b:156, 157, 159, 169 and 176 and C14-datings from KBM 1410. 2012).

Some citizens began to build houses of brick from the 1200s, as a substitute for natural stones (Helle 2005:195). In Germany, which was a pioneer with its "*Backsteingotik*", bricks were used in the city halls at this time including in Rostock, Stralsund, Frankfurt and Lüneburg (Hauptwerke where Backsteingotik 2014).

#### **14.1.1.4 Mortar analysis**

The mortar was not very strong and looked and felt like Post medieval mortar, but this texture could be related to the fact that the wall had been under ground and the mortar therefore had been washed out.

Two mortar samples from brick wall SS64030 (SG-431) were analysed for microscopy and wet chemical analyses. The purpose of the analyses was to compare these samples with other mortar samples from the medieval fortification and nearby Østerport with respect to use of material, dating, etc. Sample H had certain similarities with mortar samples from the 16<sup>th</sup> century dam structure (sample A) when it comes to CaCO<sub>3</sub>, aggregates and acid soluble material (Rask og Christensen 2015), but it is highly uncertain whether this single sample can argue for construction and dating since the second mortar sample (mortar sample I) from the same brick wall shows completely different morphological and chemical characteristics.

## **14.2 Overall discussion and interpretation**

Copenhagen is one of the few Danish medieval market towns which get a fortification with wall and towers (the other two are Kalundborg and Vordingborg). Already in Copenhagen's first town privileges the city walls are mentioned (1254), but it is possible that this is a fixed expression which means fortification rather than an actual wall and should be seen together with the fact that Ingvar Hiort thanks the citizens for fortifying the city in the year 1289 (KD I:18; Skaarup 1998a:26). Not until mid year 1400 is the wall mentioned in a way that cannot cast doubt on its existence.



The building of the city wall must therefore have started before this time. The first stage is initiated on the city's eastern borders from the shoreline south of the medieval Østerport at the end of Østergade.

The walls are first mentioned in Jacob Erlandsen's town privileges in 1254; "...*infra muros et fossata ciuitatis...*" and later in Bishop Johannes Krag's town privileges in 1294 (KD I:18). In 1298 a plot belonging to Nicolay parish between "... *fossatum curiæ suæ orientale et mare juxta murum...*" is mentioned (KD I:64; Thorsen 1926:217).

The fortification wall ran along the current Gothersgade, Nørre Voldgade and Vester Voldgade. There were several towers built along the wall, and the names Kattetårn, Hanetårn, Kringelen, Smørhætten and Løvetårn are known from contemporary sources from the second half of the 15<sup>th</sup> century. Jarmers Tårn at the corner of Vestervold and Nørrevold is not mentioned before 1529 AD, but would probably have also been part of the fortification's 11 original towers.

It has not been possible to determine the medieval fortification's relationship with the contemporary shoreline which should have reached by the end of Vingårdsstræde (cf. Kristiansen 1999b:158). Written sources point to a wall along the beach, from "Byens Tårn" past Østergård until Nikolaj Church – though such a wall has never been proven through archaeological investigations (Christoffersen 1985:67; cf. Roesdahl 1969; 1970).

During the 14<sup>th</sup> century the country was affected by the Danish central power's total solution, of German expansion and Swedish interventions. In 1249 the city was burnt down by the Lübecks and the city wall was not completed in 1259 AD when Jaromar the 2<sup>nd</sup> of Rügen conquered the city through the plank fortification in what we know today as "Jarmers Gab" and where Jarmers tower exists today. If "Byens Tårn" is identical to Kringelen by Østervold this part of the city should have been walled already in 1289. In 1329 the king pledged both castle and city to Johan of Holstein who retained power for over 10 years and the prerequisite for major construction activities on the fortification must have been extremely limited. The same repeats itself in the year 1341 AD when King Valdemar Atterdag pledges the city to Marquard Stowæ the Elderly and in 1368/1369 when the city was conquered by the Hanseatic League and Copenhagen Castle demolished by Hanseatic stonemasons. The castle was rebuilt in 1387 AD, and perhaps this also led to extensive building activities on the city fortification? The construction of the city wall was a costly project that the average city could not pay for itself. In cases where the citizens themselves contributed on the funding one can assume that capital came from the dominant merchants.

To this comes the Black Death which must have hit the growing cities harsh including the city of Copenhagen. The written sources do not illustrate in more detail the harmful effects of the plague, but clearly there was economic stagnation extending from the 1330s until the end of the century. The king did not fully take over the supremacy of the city and castle from the Roskilde diocese before 1416/1422 – so construction of various fortifications, city walls included, was the citizens' responsibility and primarily based on private initiative (cf. Thorsen 1926:221).

The use of firearms in the 14<sup>th</sup> century can explain why the rampart defences were increased with walls and fortification towers. The Hanseatic League used cannons ("bøsser") at the storming attempt in 1428 AD and in the middle of the 1400s a definite wall is mentioned and it is likely that this was built using bricks and stone, which was standard at the time.

Based on this information there are clear similarities between the city wall investigated in 2010 and earlier documentations, both in respect to building material and techniques and to stratigraphical relations to the original embankment. The width of the brick wall varied from 0.86 m to 1.20 m placed on 2-3 courses of large granite boulders where the width of the foundation was 1.1-2.2 m. The construction cut truncated the salt marshes and the foundation stones had been placed step-wise. Limestone ashlar were later placed at the base of the wall to level the masonry built using monk coursing and with brick size 27.0 x 12.5 x 9.0 cm (Fig. 89).



Fig. 89. Detail of brick wall and limestone coursing, facing east. Photo: Museum of Copenhagen.

Lassen (1855:20) describes a 4-5 cubits high wall between the former Østerport and the guard house, though without mentioning the precise location. Approximately 17.3 m outside Hotel D'Angleterre part of the medieval rampart and city wall consisting of two courses of granite boulders, a 1.2 m wide brick wall with lime dressed masonry and the moat with 16<sup>th</sup> century fill have been recorded (Fig. 90). The underlying salt marsh layer was visible in the section (Linde 1929; Berlingske Tidende 1929; Ramsing year unknown).



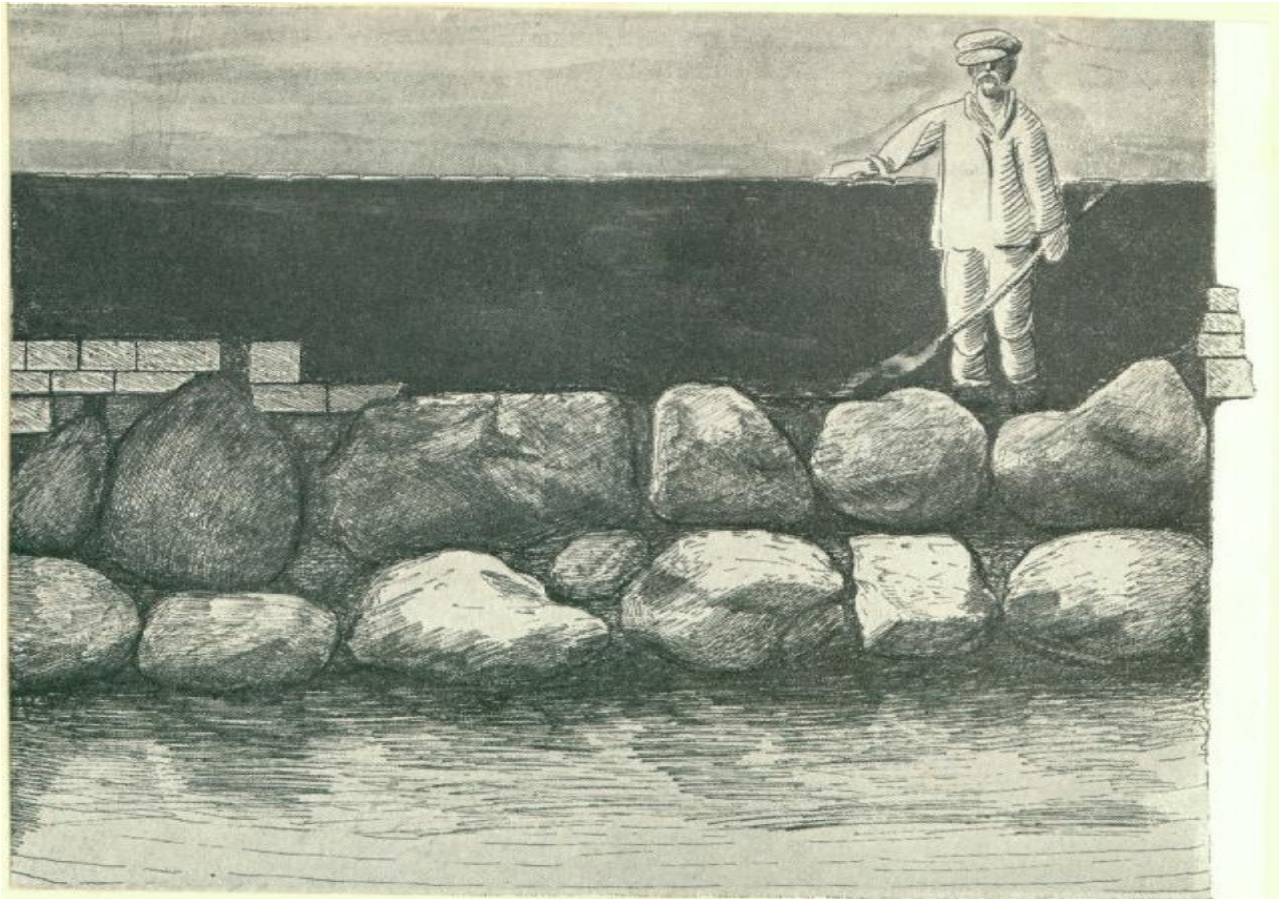


Fig. 90. Medieval city wall exposed outside Hotel D'Angleterre. From Linde 1929.

In connection with the construction of a Transformer Station in 1941 part of the rampart and stones belonging to the city wall was documented (Fig. 91). The foundation appears on several images and drawings as a c. 11.25 m long and 2.00 m wide NW-SE orientated line of boulders consisting of at least two courses lying between kote +1.60 and +2.08 m. East of the boulders part of a collapsed brick wall and seven stones were recorded. What the proposed dating to 1490 AD is based on is unclear (Berlingske Tidende 1941; Jensen 1941).

At the end of Lille Kongensgade at the corner of former a'Porta, approximately 15.3 m from the building, a 0.86 m wide masonry structure consisting of 7-10 courses of medieval bricks and limestones on granite boulders was recorded (Fig. 91). This was recorded together with several rubbish layers (Kayser 1961), and the brick wall investigated must be seen as part of the city wall. Not far away – at Magasin's northern corner at Østergade (should be Lille Kongensgade), in association with excavation in the street, part of the city wall was visible, consisting of boulders and a brick wall of Renaissance bricks together with ceramics dated to c. 1570–1580 AD and later (Frederiksen 1981).

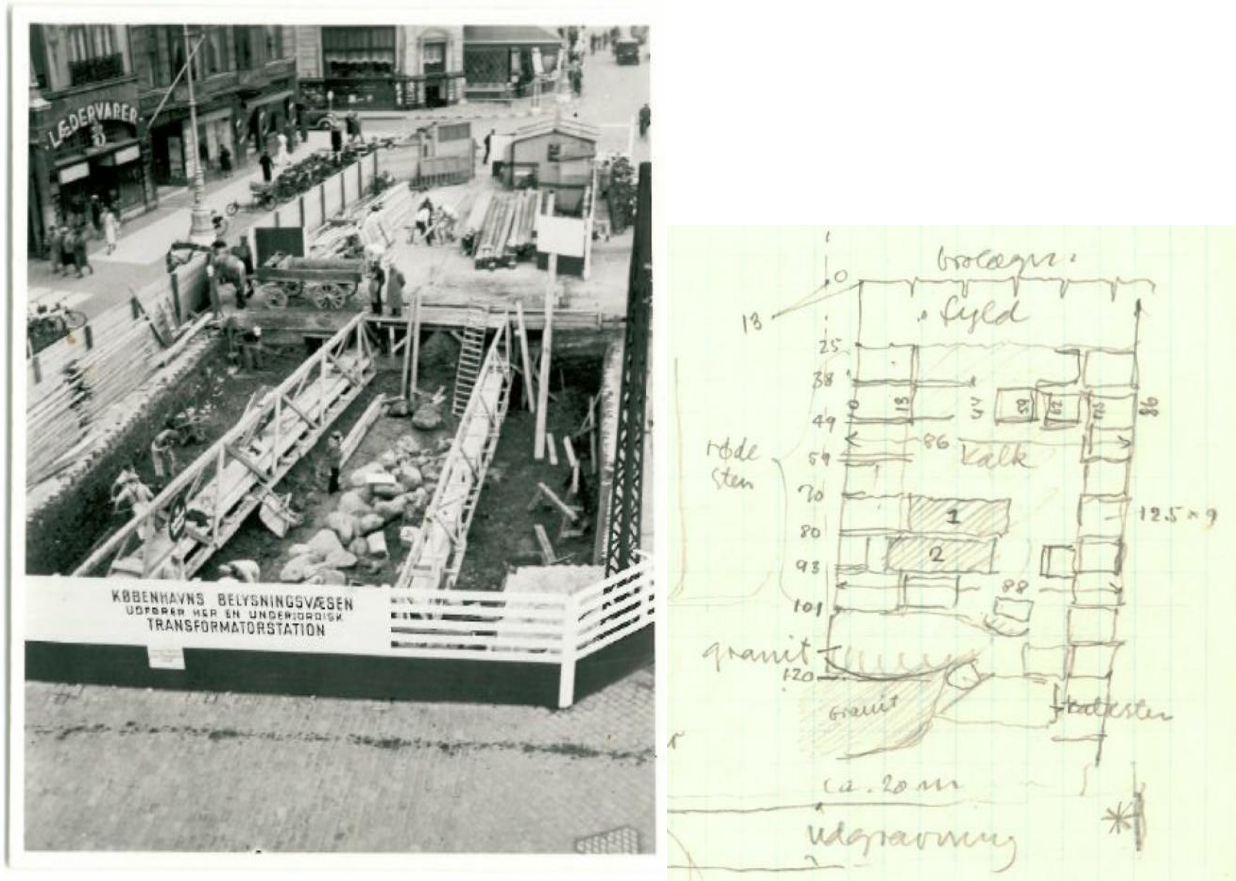


Fig. 91. Earlier investigations of the city wall at Kongens Nytorv. Section through the brick wall and foundation stones documented between Lille Kongensgade and Østergade. From Jensen 1941 and Kayser 1969.

At the Metro investigations in 1996–1998 the city wall was preserved as three foundation courses consisting of two rows of stones with a width between 1.1-1.7 m and a height of at least 1.4 m (Fig. 92). The top of the foundation was not preserved and no mortar was recorded on the stones. The courses and the rampart layers had been built “step by step”, where the purpose of the rampart primarily had been to stabilize the boulders. Part of the wall was also found as decomposition layers of bricks and ashlar limestone above the mud layers in the former moat (Kristiansen 1998:73 et seq.; 1999b:156-158, 161 and 162). This destroyed part of the city wall consisted of a continuous remnant of a brick wall, at least 1.8 x 1.2 m with monk coursing together with bricks and limestone ashlars. The remnant was interpreted as part of the parapet. The wall had been 0.42 m thick with unfilled joints. No reused bricks were identified in this part of the brick wall. The suggestion of a new city wall was based on the orientation and traces of mortar scar by masonry of 0.42 m thickness on the surface of the foundation stones and demolition material and robber trenches, but it is worth mentioning that this interpretation was rather uncertain. Since there were no traces of the brick wall itself, this was explained by the fact that the wall could have been standing on higher placed sill courses. Suggestions that the city wall was restored at some time could also be explained by functional differences within the new structure (cf. Kristiansen 1998:108-110 and 115).



Fig. 92. Foundation for the city wall investigated in 1996, facing west. Photo: Museum of Copenhagen.

During this archaeological excavation three samples from mortar connected to a wall remnant were TL-dated to  $1227\pm 60$  AD,  $1255\pm 60$  AD and  $1230\pm 60$  AD (Kristiansen 1998:65, 77 and 78; 1999b:165 and 176).

A brick kiln built in several phases (stove, brick floor, two brick benches, six heating channels and brickwork of “munkesten” preserved in six courses) was recorded west of the oldest rampart line (Fig. 93 and 94), interpreted as being used for brick production connected to the construction of the city wall and covered by a later phase of the rampart. TL-dates of bricks in the stove were dated to  $1210\pm 60$  AD and  $1310\pm 60$  AD. Charcoal (*Fagus silvatica* and unknown, unknown old-wood effect) from the fire pit was C14-dated to  $770\pm 50$  BP or 1161–1297 AD (cal 2  $\sigma$ ) (Kristiansen 1998:65 and 93-95; 1999b:156, 157, 159, 169 and 176 and C14-datings from KBM 1410. 2012).



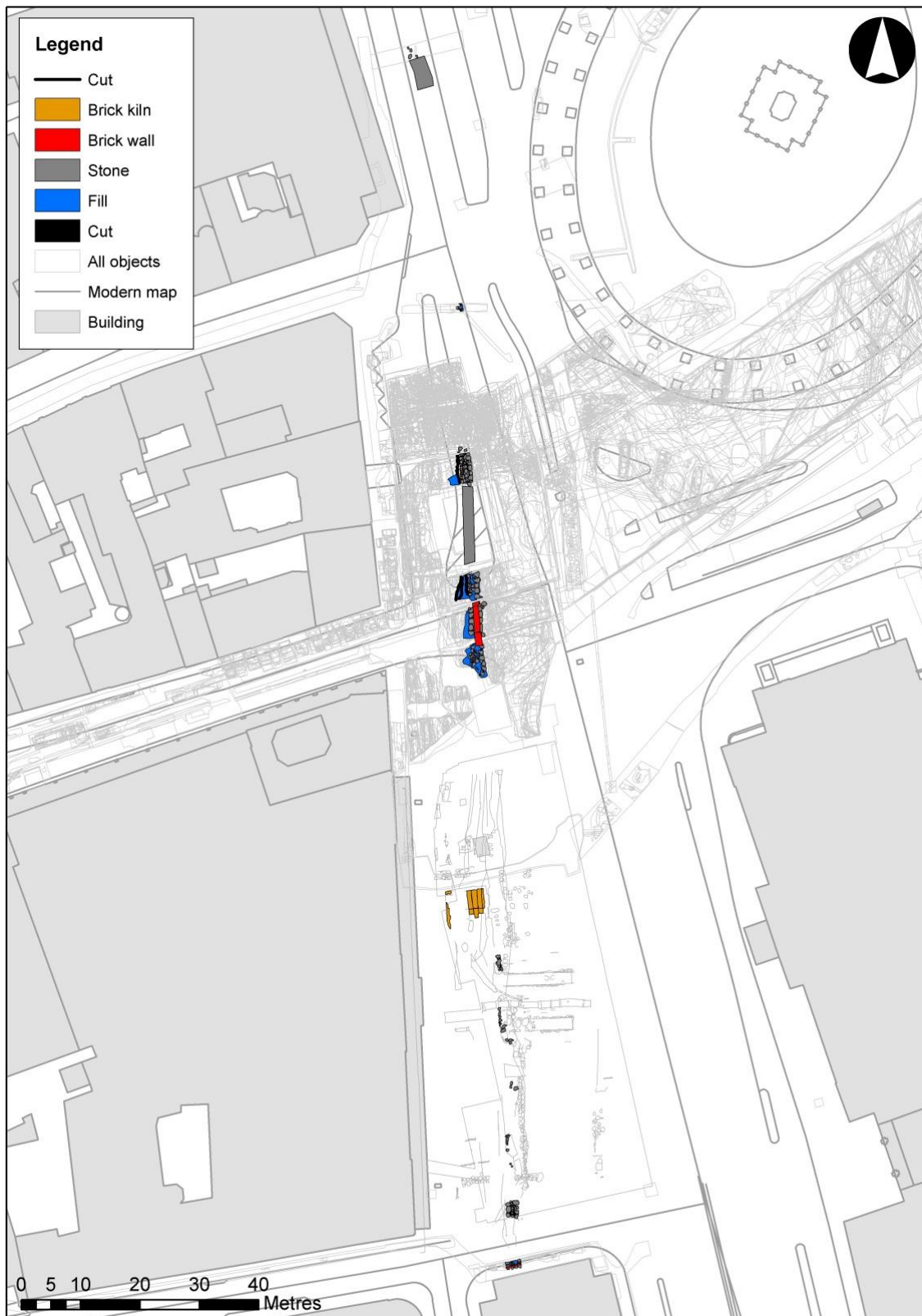


Fig. 93. The medieval brick wall investigated in 2010 together with earlier traces of the city wall and a brick kiln suggested to be the same age as one of the wall phases. The location of the latter is based on information from Linde 1929, Jensen 1941, Kayser 1969 and Kristiansen 1999b:156.

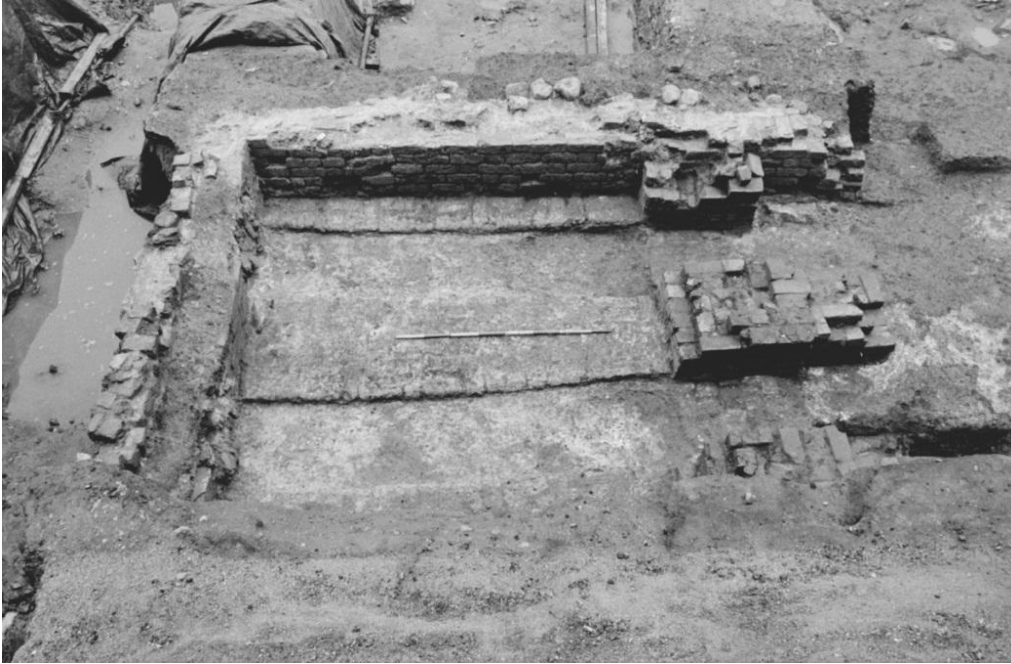


Fig. 94. Tile stove investigated at the Metro excavations 1996–1998, facing east. Photo: Museum of Copenhagen.

The wall had probably been 9 cubits high (5-6 m) with an earthwork lying behind. During the time of Frederik the 1<sup>st</sup> the fortification was straightened with an inner embankment as high as the city wall and with a width of 16 cubits – though it is uncertain if the latter is valid for the area around Østerport (cf. Thorsen 1926:226 and 234). In comparison the city wall in Malmö, Scania from the early 15<sup>th</sup> century would have been 9 cubits high – c. 5.5 m with a width of “three stones” (c. 0.9 m) standing on a one metre high foundation of natural boulders (Rosborn 1984:37; Reisnert 1998:32 et seq.; Olsson och Ödman 2009 and Fig. 95 and 96).



Fig. 95. Foundation of the so-called “strandmur” facing east in Norra Vollgatan in Malmö. Photo: Malmö Museer, Rapport 2009:047.





Fig. 96. Part of the medieval "strandmur" investigated in Norra Vollgatan in Malmö. Photo: Malmö Museer, Rapport 2009:047.

The ring wall in Absalon's castle was 1.5 m wide and Valdemar's wall in Dannevirke from the second half of the 12<sup>th</sup> century was between 6.0-7.0 m high and c. 2.5 m wide, Vordingeborg's city wall was 8.0 m high, etc.

Both Ramsing (1940, Vol. III:10) and Engqvist (1951:9) believed that there should have been a city wall south of "*Byens Tårn*" and Østergård based on an old deed from 1298 (DD 2:4:284), and "*thend gamell mantellmwr*" is mentioned in a deed from 1546 (KD I:288; Thorsen 1926:233), though neither describes a wall along the shoreline or Vingårdsstræde. Based on the foundation north of Danske Bank the original masonry must have continued south of Vingårdsstræde (cf. Fig. 93), and probably continued along the beach as a so-called "strandmur" similar to the city walls in e.g. Malmö and Visby.

So is it possible to estimate the amount of bricks needed for the city wall in this part of the city? The season for brick firing is short, and it is limited by what it is possible to produce with just one tile stove in a year. A proposed calculation of six firings per year with 12 150 bricks per firing gives approximately 72 900 bricks per year (cf. Nordeide 1983:107). For the Romanesque church of Maglarp in Scania, Sundner calculates for a capacity of up to 11 000 bricks for every burning (Sundner 1982:62). Based on these suggestions the amount of bricks needed for the outer curtain wall with monk coursing and not including the core itself, would have been c. 75 000 bricks, from the estimated beach at Vingårdsstræde to the gate building at the end of Østergade – and possibly equivalent to one year's production in the brick stove investigated in 1996.

#### 14.2.1 Maintenance work and final demolition

The results from the latest Metro excavation prove that the investigated city wall is a later addition to the 13<sup>th</sup> century fortification and probably dated to the first half of the 14<sup>th</sup> century. This interpretation is based on stratigraphical



observations and relations with identified construction cuts into the Early medieval rampart, several reinforcing deposits placed against the foundations stones and at the same time covering the original moat. Similar construction details were also recorded at the former Metro excavation in 1996–1998 where the High medieval rampart layers were placed up against the foundation stones, although some stones were also recorded as dug *into* the rampart, which the responsible archaeologist interpreted as a local phenomenon (cf. Kristiansen 1998:75). The city wall probably also had a watchman's gallery or top corona of stone to avoid frost damage on the top courses.

With one exception (SG-194979), all rampart layers with inclusions of CBM were placed *behind* the city wall. A further assessment and separation of the potential construction phase has not been possible on the basis of height values due to the structure's oval design.

At the former Metro investigations some of the interpreted rampart layers had a great quantity of brick rubble in the fill (cf. Kristiansen 1998:66 et seq.). The medieval city wall had probably been torn down, whereupon the demolition material of limestone ashlars, rubble (both “munkesten” and smaller 16<sup>th</sup> century bricks), and large pieces of the city wall combined with other materials had been re-used in a new foundation front. The rampart had partially been made of peat and was made taller and wider, covering at least 1.4 m of the wall base (Kristiansen 1998:108 et seq.; 1999c:188). Over the rampart a straw layer was documented, interpreted as remains after a growth horizon on the rampart's surface (Kristiansen 1998:107).

In the area from the beach at Kringelen, along Østervold and all the way to Nørreport, it was replaced by a wall with several towers. One of these towers was built in 1511 and used as the gate tower of Østergade's estuary (Østerport). In the turbulent years from 1520 and up to the siege of Copenhagen in 1536 the last section of the city wall was built from Nørreport to Vesterport and on to the beach south of the current Vartov.

From 1496 to 1515 construction work was carried out on the fortification, especially in 1510 when the mayor and aldermen took out a large loan for the (re)construction of the city wall. Further work was implemented by Frederik the 1<sup>st</sup> (1523–1533 AD) and Christian the 3<sup>rd</sup> (1534–1559 AD), who both carried out a considerable modernization program for the state defence during their reign.

The state and need of maintenance work on the city wall in the mid 16<sup>th</sup> century is clarified by the information from 1543 where the citizens of Copenhagen went as far as asking the King if they could tear down the wall:

*“Sammeledes bede Vi Eder endnu og begiærer, at I aldeles ingen Flid eller Umage sparer, at de Volde og Befæstninger baade imellem Østerport og Bremerholm og desligeste der ved Slottet – eftersom Vi baade Eder, Joackim Beck og Peder Godske, alle tre tilhobe, tilskrevet haver - mue blive færdige, overveiende hvad Magt derpaa liggende er, det Gud forbyde at Noget paakommer.”* (Eremit.dk 2012-10-04).

On the other hand one should not forget that in relation to the Reformation in 1536 a number of Catholic symbols disappeared from the cityscape – monasteries were demolished, also several churches, and in the void left by the clergy's loss of power, the city government now had the opportunity to seize building materials from the demolished institutions, such as bricks and tiles, which could be reused later.

As a nearby example, the medieval city of Malmö was not fortified until 1393, after the ravages of the Victual Brothers. The construction work was carried out in stages – notes are made in Registrum three times and there is a significant time difference between the two former. In 1419 the city borrowed 300 silver marks from the church for the building of a brick wall without delay by order of Eric of Pomerania, which should have been finished in three years, though the construction took a considerably longer time than that. As late as 1434 Eric of Pomerania again commanded all citizens to contribute to the city's new fortification, but not before 1517–1519 AD was the last part of the city wall completed (Reisnert 1998 and see also Fig. 97).



Fig. 97. Example of a Late medieval brick wall. Stockholm's city wall dating from c. 1530 AD. Photo: Morten Steineke.

At the former Metro investigations inclusions of smaller 16<sup>th</sup> century bricks together with medieval bricks in the decomposition layers in the medieval moat and within the new rampart in the southern part of the excavation area, were seen as an indication of repairs and extensions of the city wall. Comparing the surviving brick wall outside Lille Kongensgade with part of the collapsed wall exposed in the Late medieval moat shows different types of bricks, which could argue for maintenance work, though no closer timing can be made. There is also information about Renaissance bricks in the interpreted city wall investigated in 1981, but this brick type provision has not been further clarified (cf. Fredriksen 1981).

The final demolition of the city wall was completed in connection with the Østervold bastion in the early 17<sup>th</sup> century when the Late medieval moat was backfilled with rubbish including a large amount of demolition material from the wall itself together with the excavated soil from the new and larger moat. These observations fit well with the results from the Metro investigation in 1996–1998 where the backfill included demolition material of limestone ashlar, rubble (both "munkesten" and smaller 16<sup>th</sup> century bricks), and larger pieces of the city wall combined with other materials reused in the new foundation front. At the former excavations there was an interpretation that the city wall mainly had been demolished in connection with Valkendorf's work on the fortification in the late 1500s (cf. Kristiansen 1998:73 et seq.; 1999b:162-165), but this suggestion could not be proven at the later investigations in 2010, and the written sources including selected items from *Rentemesterregnskaberne* from 1608 and 1609, describe the demolition and reuse of bricks from "the old wall at Østerport" in the construction of the new fortification (cf. Lassen 1855:20-21; Kristiansen 1998:13 and Appendix 8; Westerbeek Dahl in press).