Fig. 159. Bastion foundation stones and construction cut with smaller stones in front used as backfill, facing NW. Photo: Museum of Copenhagen.

The different courses consisted of mid grey unfinished granite boulders and stones. Some stones had been formed to fit within the bigger structure and a large flat boulder had been placed at the corner of the foundation (Fig. 158). With one exception the internal core of the bastion consisted of redeposited firm light greenish grey sandy clay with inclusions of CBM (red brick fragments) and pebbles (Fig. 160).

Fig. 160. Section, facing SW showing the bastion's core with different types of internal fill of lensed brown clay, firm greenish grey sandy clay and brown deposit with brick fragments at the base above the natural moraine. Photo: Museum of Copenhagen.

Like the previous bastion line wooden posts were recorded among the stones, suggesting that these were placed in order to mark the outline of the bastion during the building process (Fig. 161).

Fig. 161. Internal corner with vertical post, facing south. Photo: Museum of Copenhagen.

Finds from the internal core of the bastion consist of ceramics (Jydepot; 1550–1850 AD, Late redware; 1500–1575 AD and Earthenware), green glazed stove tile fragments (16th century) and a bone toy (further information missing).

A concentration of smaller stones and large boulders, laid in a rectangular shape of roughly 4.5 x 2.8 m, directly outside the main bastion line (Fig. 162).

Fig. 162. Stones in front of the main bastion line, facing NE. Photo: Museum of Copenhagen.

The stones were evenly deposited and covered by a brick layer. On site the feature was first thought to be separate from the main bastion, perhaps acting as some kind of "helping" construction while building the fortification.

The construction cut represented two separate 0.3 m deep cuts for the lowest stones extending out from the south of the bastion. However, these stones extended beyond the cut on the southern side, lower down the slope of the moat. It may be that the stones higher up the slope needed to be cut into the slope (while the lower ones did not) to create a more level structure. The sides were straight and the base was flat. Finds among the stone consisted of clay pipes and bones. During further documentation, a brick deposit on top of the stones appeared to extend partly over one of the lowermost layers of boulders within the bastion´s wall, and therefore should be seen as part of the same construction phase as the rest of the bastion – although a satisfactory explanation for this accumulation of stones has not been achieved.

Curtain

The foundation of the curtain consisted of two courses of boulders, stones and layers running in a N-S direction at a length of 16.5 m. The width varied, but was approximately 2.5 m (Fig. 163). The purpose of the structure was to severely limit the erosion of and to form a solid foundation for the rampart material and structures built on top of it, in the same way as the foundation stones incorporated in the construction of the bastion.

Fig. 163. North-south running curtain with construction cut, two courses of stones and boulders together with foundation layers. Part of the contemporary moat to the right.

The construction cut for the curtain was rectangular in plan with slightly curvy edges, concave sides and a flat base. It appeared to have been cut into natural moraine on the west side and through excavated moat material (natural clay and sand) on the east side. The foundation consisted of large rounded and randomly shaped naturally formed boulders. The top course of stones had a rubble/stone mix behind the inner face of the stones (Fig. 164 and 165). The first course of foundation stones consisted of a double row of similarly sized boulders, but also with smaller stones and some CBM infill between the stones.

Fig. 164. Upper part of the 17th century curtain. Foundation stones and rubble infill with the inner construction cut to the left, facing north. Photo: Museum of Copenhagen.

The rubble infill and foundation layers were amalgamations of large stones up to 30 cm in diameter, smaller stones with small fractured pieces of CBM, but no identifiable bricks or half bats. The deposits were mixed with yellow/grey sand and natural clay – possibly consisting of removed natural moraine from the original construction cut.

Fig. 165. Investigating the 17th century fortification step by step. Part of the exposed curtain, facing north. In the middle – staff working on one of the bridge pillars. To the right – the excavated 17th century moat. Photo: Museum of Copenhagen.

Other features in relation with the bastion

Some investigated structures have been interpreted as part of the 17th century bastion, despite the fact that the features were exposed by machine (Watching Brief 2014) with unclear dating and stratigraphical relations.

Subgroup (SG-503795) consisted of five mid grey stones with a flat surface facing upwards (Fig. 166). The two separate rows of stones were situated in and covered by rubble fill and the stones might well not have been in situ, but could also have ended up in the rubble layer later. It should also be stressed that the area around the stones had been truncated by modern trenches such as concrete cable boxes and a central heating duct. The stones were approximately 1.0 m higher than the curtain, so the structure is not a continuation of this structure. Group (G-503427) consisted of a row of seven stones running in a NE-SW direction between the road surfaces to the north and the 17th century moat to the south. These were of different sizes and none of them were flattened on top. The shape and surface of the stones showed no signs of wear, suggesting that they were either related to earlier road(s) to hold back soil on top of the slope as a stabilizing structure, or were part of a limit to an unknown stone structure (part of the 16th century roundel? – see Fig. 166 and further discussion below).

Fig. 166. Stones with unclear purpose documented in association with the 17th century fortification. Be aware that the estimated edge of the moat is measured a little far to the north due to machining.

Moat – construction, usage and deconstruction

Parts of the 17th century moat were investigated at two locations at Kongens Nytorv (Fig. 167). Group (G-4998) consisted of a NE-SW and N-S running construction cut. Part of the moat recorded in the Transformer Station (2010) was later added to subgroup (SG-961). The exposed part of the moat could be followed for approximately 65.0 m with a width of between 21.0-23.4 m. The depth was at the most 2.1 m from the top of the construction cut to the middle of the base – though this could be something greater since the whole area was machined.

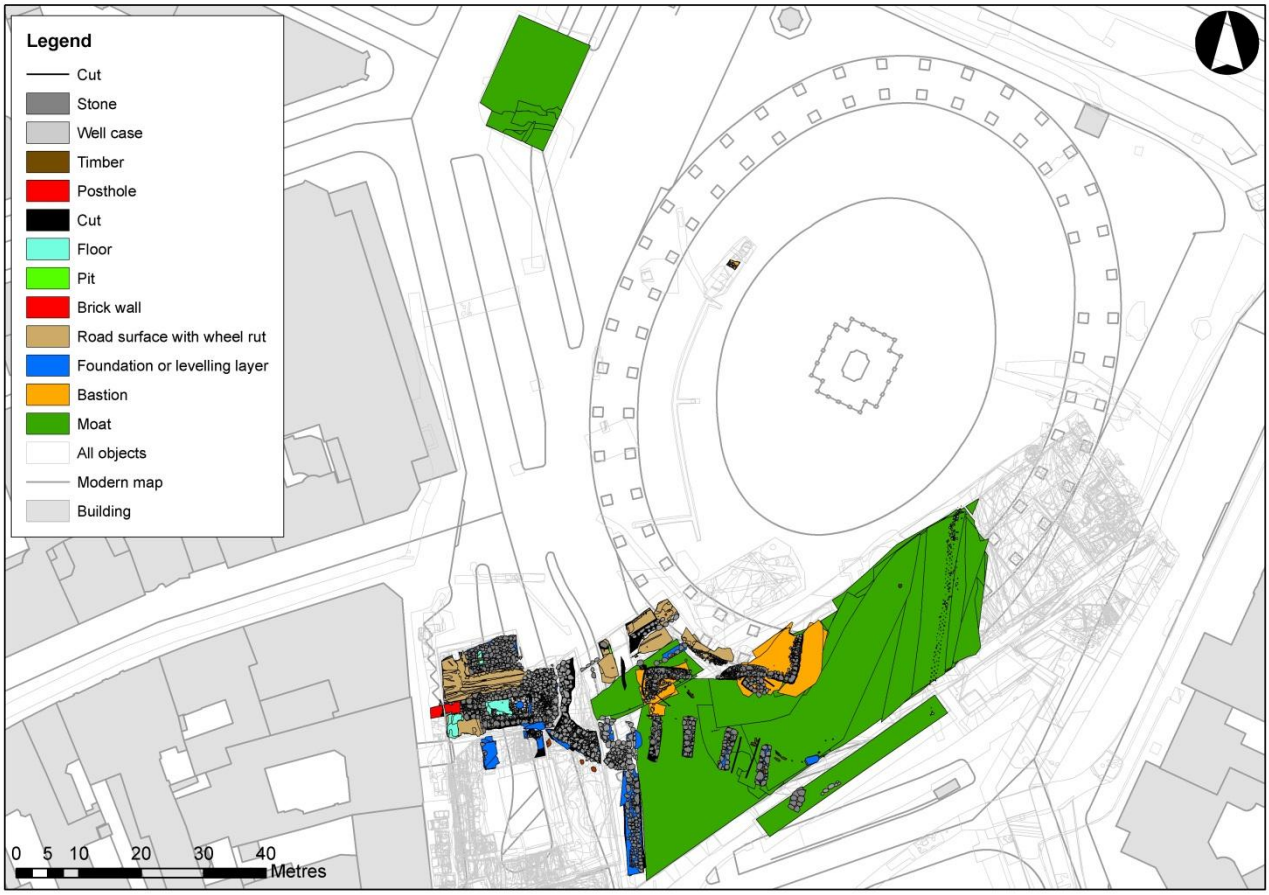

Fig. 167. Investigated parts of the 17th century moat around Krinsen.

The sides had an angle of 45 degrees and with a gradual break of the slope to the concave and flat base. At the eastern side of the moat a separate step was recorded close to the base (Fig. 168). It is uncertain whether this ledge was created as a pathway while building the fortification or should be seen as part of the defence system.

Fig. 168. Exposing and cleaning the eastern stepped side of the 17th century moat, facing south with the Royal Theatre in the background. Photo: Museum of Copenhagen.

In the middle of the moat a N-S oriented, rectangular construction cut was recorded at the base of the moat cut, into the natural substrate (Fig. 169). This was interpreted as a cunette (a trench dug in the moat to allow drainage, or as an extra obstacle for attackers). The width varied from 5.2-6.6 m with a depth of 0.15 m. The base was flat and the sides steep.

Fig. 169. Part of interpreted cunette in the 17th century moat, facing NE. Photo: Museum of Copenhagen.

The sedimentation in the moat varied in thickness from 0.1-0.5 m and consisted of lensed dark brown and black decomposed peat with lenses of white sand and different types of finds (Fig. 170). Some of the finds must be connected to the later deconstruction phase pressed into the underlying soft deposits, but overall this assumption does not affect the dating of the deconstruction phase to the mid 17th century.

Fig. 170. Trench cut showing darker alluvial sedimentation at the base of the moat, facing west. The white layer represents natural moraine and the post is part of timber structure (G-240090). Photo: Museum of Copenhagen.

In the mid 17th century the fortification was demolished and the moat filled up mainly from the curtain side (south and SW) (Fig. 171). The dumped material consisted of several deposits of different colour, composition and homogeneity. Some layers contained large amounts of urban, household waste (animal bones), decomposed, organic material (manure) and demolition material (CBM). No clear evidence of industrial activity can be seen within the dumped material, except for a significant number of leather off cuts and concentrations of horn at some places. However, the moat was excavated by watching brief only (machined), so the finds retrieval is far from being as detailed as that in a full excavation (e.g. compared with the moat and finds from other Metro investigations such as Rådhuspladsen).

Fig. 171. Excavation of the Transformer Station in 2010. Different dumps and moat backfills seen in section, facing SW. Photo: Museum of Copenhagen.

An axe found in the natural accumulation in the 17th century moat is a broad axe with asymmetrical bevelled edge (Melin 2014:12-13). Axes with an asymmetrical bevelled edge are sometimes called single bevel and/or side axes. Since these types of axes more correctly have one clear bevel and one less clear, the author prefers to call them asymmetrical. As the name side axe implies they are specialized tools to be used for hewing the sides of timbers, etc. to accomplice a smooth surface. The axe is made for a right handed craftsman who stands with his left leg close to the timber when hewing. The owner's initials (KI) can be seen on the blade (Fig. 172).

Fig. 172. Broad axe from the original sedimentations in the 17th century moat, after conservation. Photo: Museum of Copenhagen.

Bridge

The bridge in the moat consisted of five NNE-SSW orientated bridge pillars, slightly curving to the south (G-500892) (Fig. 173). The length and width of each were roughly equivalent (L: 6-7 m and W: 1.5-1.8 m), and the distance between the pillars was between 3.5 and 4.5 m.

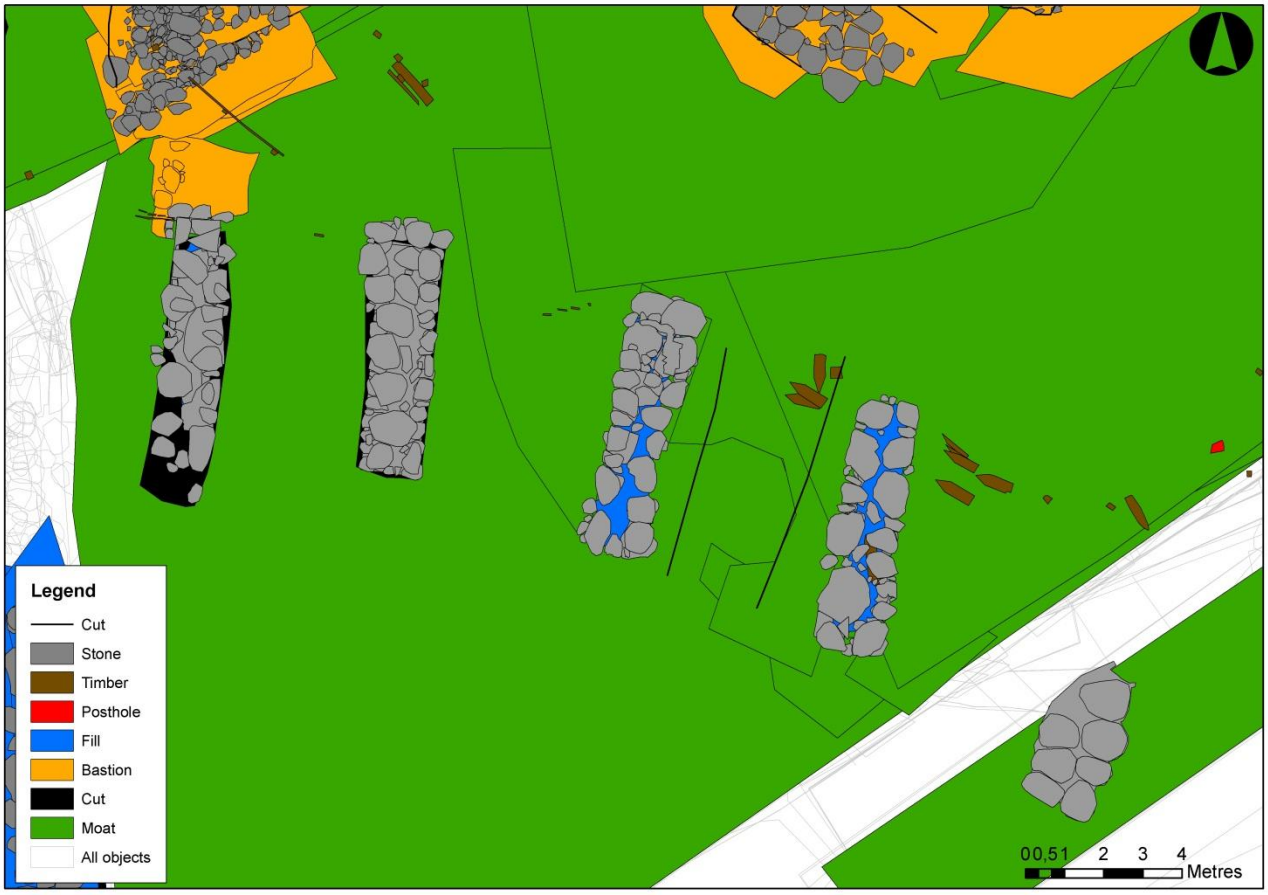

Fig. 173. Bridge pillars in the 17th century moat starting with pillar No. 1 to the left. Notice the weak curve between bridge pillars Nos. 1 and 2 and bridge pillars Nos. 3, 4 and 5, probably done for defence considerations. Compare with bridge in prospect Fig. 200, below.

Bridge pillar No. 1:

This pillar was documented in two stages in connection with a Guide Wall trench in 2012 and the Station Box in 2014.

The foundation consisted of two uneven courses of mid grey, unfinished boulders and medium size stones (Fig. 174). The structure was two stones wide and the gaps in between were filled with grey clay and yellow compact and coarse mortar, red brick material, red tiles and minor grey smooth stones of 10-20 cm. It appeared that the 1st stone layer was much longer north to south, so the stones had been placed so as to create a stepped foundation. The foundation stones/boulders all had a smooth surface on every side and had not been cut or shaped. The northern extent of the boulders was covered with blue clay related and belonging to the nearby bastion foundation (SG-813).

Fig. 174. Foundation stones and ashlar stones documented in part of the Guide Wall trench 2012, facing SE. In the middle – a test pit to investigate the depth of the stone structure. Photo: Museum of Copenhagen.

On top of the foundation two courses of well finished, rectangular, upright mid grey ashlar and regular blocks of different size were recorded (Fig. 175). The structure was faced externally and had a solid core of red brick fragments and with smaller stones, bricks and mortar in between. The bricks were probably reused, medieval “munkesten”.

The NW end of the first course was represented by a single stone and two red bricks mortared in position. Mortar on the top of the second course stone showed that the structure was previously at least three courses high. The joints of the stone and brick elements were rendered over to give a smooth finish. This was light grey, without inclusions, and very hard. The SW part of the structure was missing and probably was robbed out in the mid 17th century when the bridge went out of use.

Fig. 175. Continued investigations. Exposed bridge pillar No. 1 (2014) with ashlar stones and cemented core of yellow-white mortar, facing SW. NW part not fully exposed due to Station Box limit. Photo: Museum of Copenhagen.

The upper part of the core consisted of strongly cemented yellow and white mortar and lime with inclusions of stones, bricks, charcoal, shell and possibly volcanic ash as a binder. The rest of the core consisted of bricks bonded with cemented mortar and placed in rows (Fig. 176). There was a structure in the placement of the bricks – yet the coursing was uneven and the main purpose had been to fill the gaps in a suitable way. Mortar was later poured into fill any remaining gaps/spaces. Furthermore it appeared that a significant amount of mortar had been poured on top of the 2nd row of foundation stones prior to placing the faced stones and bricks, probably to create an even platform and to hold the structure together. Like the ashlar stones, the south and SW corner was missing and had been probably robbed out.

Fig. 176. Exposed bridge pillar No. 1 with foundation, cemented brick and mortar core together with ashlar stones, facing NE. Photo: Museum of Copenhagen.

The foundation had been placed in a rectangular construction cut with convex/vertical sides and irregular base.

Bridge pillar No. 2:

The foundation in the second bridge pillar consisted of two to three rows of regular and uneven, mid grey, unfinished boulders and medium size stones. The gaps in between had been filled with smaller stones, red brick and mortar rubble. The northern part of the structure was a bit wider than the southern end (2.0 m and 1.4 m respectively). The foundation stones/boulders all had a smooth surface on every side and had not been cut or shaped.

The rectangular box and dry stone structure consisted of a faced outer wall of upright, flat and rounded mid grey natural stones. Smaller stones had been placed in the gaps where the corner stones were a bit larger than rest of the stones in the structure. The bonding material consisted of smooth, yellow-grey cemented mortar.

The upper part of the bridge consisted of well finished upright, rectangular light grey ashlar and regular blocks with a length from 0.5 m to 1.0 m (Fig. 177). The rectangular structure had a well laid outside face and a solid core of red brick fragments and smaller stones, bricks and mortar in between. The bricks were probably reused medieval bricks ("munkesten") as also seen in pillar No. 1. The joints of the stone and brick elements were rendered over to give a smooth finish. This was light grey, without inclusions, and very hard. The SW part was missing and probably had been robbed out.

Fig. 177. Upper part of bridge pillar No. 2 represented by ashlars and infill, facing SE. Photo: Museum of Copenhagen.

The core consisted of 3 separate layers of mid yellow white cemented sandy silt with inclusions of red brick fragments, stones, pebbles, wood and mortar. The bricks did not lie in order, but had been pushed and jumbled together. The bricks varied in size (0.08 x 0.06 x 0.04 m) representing medieval so-called “munkesten”. One layer had parts where the bricks had been deliberately placed intact in position – in other parts the bricks had been mixed with stones and mid yellow smooth mortar. The upper part of the core consisted of a rectangular box of red bricks (“munkesten”), with cemented grey/yellow mortar with inclusions of charcoal (from burning limestone) and pebbles (Fig. 178). The bricks were placed as a header course above the first layer of foundation stones to create a smooth surface for the next level of ashlar stones. The lower part of the context (not separated on site) consisted of cemented white/yellow mortar with crushed brick fragments between and above the foundation stones.

Fig. 178. Foundation stones and mortar core, facing south. Photo: Museum of Copenhagen.

The foundation had been placed in a rectangular construction cut with convex/vertical sides and irregular base. Finds collected in connection with the pillar consist of ceramics (undated), window lead and bones.

Bridge pillar No. 3:

The rectangular foundation was built of natural grey stones and boulders of very varied size with the smallest stones in the middle. The structure seemed to have been built as two uneven rows of stones, east and west, with only the outside faces at all straight. At the south end, the gap between the two rows was filled with a short western line of stones. At the north end, this was not needed as the two northern stones were big enough to fill the full stretch of the northern face. The bridge pillar was not as well preserved as pillars No. 1 and 2 with only one course of systematically placed boulders, although there were a few stones in a lower layer (separated with two different context numbers) (Fig. 179). As noted, the boulders were uneven in size and shape. They consisted of unworked, natural boulders, either beach stones or glacial erratics. The boulders' heights were quite uneven, and there may once have been another course of boulders atop the shortest of these (or dry stone flags, on bridge pillar No. 4 (see below), but if so, this was not preserved.

The core consisted of mortar and two short courses of bricks, registered separately from those in the brick structure. The mortar was mixed with crushed and broken bricks and placed atop the foundation.

Fig. 179. Overview. Bridge pillar Nos. 3 and 4 surrounded by dark waterlogged moat sedimentation, facing SW. Photo: Museum of Copenhagen.

Bridge pillar No. 4:

The rectangular foundation was built as a dry stone structure of natural grey stones and boulders of very varied size with the smallest stones used in the middle. The structure seemed to have been built as two uneven rows of stones, east and west, with only the outside faces at all straight. The gap between the two rows was filled with smaller stones.

As with bridge pillar No. 3 the structure was heavily robbed of its building material, but the principle of construction seemed to be that two rows of boulders were laid, running roughly north-south, with smaller stones in the middle and with straight outer faces (Fig. 180).

Fig. 180. Bridge pillar No. 4 with foundation and mortar core surrounded by dark waterlogged moat sedimentation, facing west. Photo: Museum of Copenhagen.

The first of two drystone courses within the bridge pillar foundation was apparently natural stone slabs, although the edges may perhaps have been worked to create straighter surfaces. The slabs were remarkably close to being square in shape. However, the upper and lower faces seemed to be natural, unworked faces formed when the stones broke. The western part of this layer contained five stones, two of which overlay a natural boulder in the foundation, while the other three overlay a smaller natural stone in the foundation. One more stone was fitted into this surface behind (to the south of) these other stones. The stone was lying within the mortar infill and did not seem to serve any structural purpose, but was clearly part of this level and of this construction detail. On the eastern face of the foundation, six stones lying at the same level were included in the context. Two of these were naturally flat slabs (to the southwest), the others (to the southeast) were rounded and very unevenly coursed.

The second and uppermost courses of stones exposed atop the foundation covered stones both on the east face and the west face, placed at the same level. The western structure consisted of two bricks and six stone tiles. These may have been worked on the sides to produce a straighter surface, but seemed to be made from naturally flat slabs of sedimentary rock. To the south this course abutted the CBM and mortar infill of the pillar base, which also covered it. There was some mortar stuck to the sides of some of the stones, but this seemed to come from the infill, not from the construction of the wall. Thus, these stones were laid as a dry stone foundation, and mortar was only added later. The mortar was very coarse, sandy and greyish yellow. On the eastern face of the pillar foundation, there was another stretch of dry wall, all built of natural stone slabs (no bricks). Again, some sides of these stones may have been worked. The two parts of this phase were not continuous, but had been included under the same number, as they seemed to be contemporary.

The courses of stones, north and south, seemed deposited at the same time, after the boulders, but over the top layer of mortar. The purpose seemed to have been to level the uneven rows of boulders to an even height. These slabs were used only atop the lowest of the boulders. The slabs were placed with their straightest faces facing outwards and their more uneven sides hidden within the wall. The purpose of this construction probably was to bring the top of the foundation up to the same horizontal level everywhere, despite the uneven height of the boulders used for the foundation.

The core comprised strongly cemented yellowish/grey mortar and CBM preserved atop the bridge pillar foundation within the stone shell construction. Presumably, the pillar had once been faced with brick atop the stone foundation, though if this was the case, these bricks were not preserved and size is therefore unknown.

Finds collected in relation to bridge pillar Nos. 3 and 4 consist of ceramics (Late redware; 1500–1750 AD), stove tiles, a leather shoe, a flint blade, unspecified wood and bones.

Bridge pillar No. 5:

Bridge pillar No. 5 was exposed approximately 5 metres east of pillar No. 4 and consisted of a rectangular foundation built of natural grey stones and boulders of very varied size, where the smallest stones had been used in the core. The structure (c. 4.0 x 2.2 m) was built as two uneven rows of stones, running NE-SW, with only the outside faces straight (Fig. 181). There seemed to be only one course of systematically placed boulders, although there were a few stones in a lower layer (recorded on site before machining). The boulders were uneven in size and shape and varied from 0.7-1.4 m. Some smaller stones could be seen on top of the boulders making the surface on top flatter. The building material was unworked, natural boulders, either beach stones or glacial erratics. A total of seven boulders were recorded, but there were more, since the structure continued beyond the trench to the north. Due to measuring problems (the bridge pillar was exposed deep down in a narrow Ventilation Shaft) records for all stones and boulders were created later in IntraSiS based on measurements on site and from images.

Fig. 181. Bridge pillar No. 5 with foundation stones and mortar/brick core, facing NE. Photo: Museum of Copenhagen.

The bridge core consisted of cemented mortar with crushed and broken bricks with inclusions of charcoal and some soot placed within and on top of the foundation. The centre of the deposit was more like a solid layer of bricks. The demolition material recorded in relation to the bridge foundation consisted of mixed mortar with frequent inclusions of fragmented red bricks. No construction cut could be connected to the stone structure, but this lack of information must be seen together with the removal of the boulders by machine.

Dam with barrier tower

The dam constructed in association with the gate building regulated the water level in the moat and extended in a NW-SE direction for a length of c. 14 m (G-502973). It consisted of construction cuts, three courses of light, grey unfinished stones and boulders, fills in between the stones, together with foundation- and destruction layers (Fig. 182). The upper part of the stone structure had been destroyed by looting (robber pits) in the 17th century and by a modern NW-SE running central concrete heating duct from 1956.

Fig. 182. Dam with semicircular barrier tower placed SW of the gate building in the Late medieval moat. The lack of stones in the middle and within the tower is due to the modern shoring and a concrete pillar erected in conjunction with the new Guide Wall. The measured moat cut to the left, inside the building should be moved two metres to the right based on later re-interpretations.

The interpreted upper construction cut for the dam could only be documented in the SW part of the structure running in a north-south direction (c. 3.8 m) with straight, steep sides and an irregular base. The lower construction cut was 10.1 m long, approximately 4.0 m wide and had straight, steep sides and a concave, flat base to a maximum depth of 0.5 m cutting the natural substrate.

The dam consisted of a double faced dry stone structure with rubble fill (Fig. 183). The dimensions of the stones were not uniform, where the diameter varied from approximately 0.1 m to 1.0 m, of which the largest stones had been placed as a course of outer facade stones, and where the southern course consisted of even larger stones/boulders than the northern walling.

Fig. 183. Dam structure. Excavation of upper course, facing SW showing carefully placed boulders to the north and south. Photo: Museum of Copenhagen.

The bonding material in between the boulders consisted of strongly cemented CBM (mostly red brick rubble mixed with mid grey mortar and sand). On top of the outer course at the eastern end it was still possible to identify remnants of prober bonding mortar in situ.

Like the gate building and bridge pillars, the dam had been plundered for building materials. The demolition deposits consisted of light and mid yellowish brown, grey and white sandy mortar with inclusions of charcoal, pebbles, stones and fragments of red brick (Fig. 184). The CBM consisted of large medieval brick fragments (“munkesten”) and a few bricks of Renaissance size; small Dutch, from the 17th century.

Fig. 184. Part of dam structure with overlying demolition material and rubble, facing NW. Photo: Museum of Copenhagen.

South of and parallel to the dam foundation four posts and postholes interpreted as part of a scaffold cut the moat's alluvial layers, which prove that the dam was a later addition within the Late medieval moat. Finds collected from the stone structure and foundation layers consist of ceramics (Late redware; 1450–1800 AD and 1550–1650 AD), limestones, bricks, iron, slag and bones, which argue for a date for the dam of around 1600 AD.

Attached to the eastern end of the dam a semicircular or B-shaped structure was investigated. This was interpreted as part of a barrier tower to prevent access into the city over the dam. The tower consisted of a brick wall, deposits, stones and construction cuts (see Fig. 182 above). Some of the recorded stones and boulders in the structure were a continuation of dam structure (SG-296) to the west. However, part of this structure was placed beneath a curved brick wall which had obvious similarities with the tower to the north, and is therefore integrated and grouped with the main tower construction. Some of the stones in foundation were also probably part of the northern end of the curtain (SG-503797). This uncertainty and interpretation is due to missing stratigraphical relationships obscured by modern shoring in 2010 and by machining in 2014. One should also be aware that this is the place were three different structures were interconnected – the 17th century bridge, the curtain and the dam.

The tower was heavily disturbed by a couple of modern disturbances (Fig. 182 and 185). A cable box ran straight through the structure in a N-S direction and a big concrete pillar for the Guide Wall had been drilled down through the middle and probably moved some of the boulders aside. A wooden water pipe, dated to the 19th century, had been placed straight across the feature from NW-SE. The gap resulting from missing boulders/stones (triangle) close to the modern shoring is due to machining and for safety reasons which prevented a complete survey.

Only 0.78 m of the facing was seen in the SW corner of the section. The remainder had been robbed, represented by cut or alternatively truncated away. The structure was first interpreted as a corner of a dressed stone plinth consisting of three dressed stones and masonry of so-called “munkesten” and lime mortar on a foundation of boulders and demolition material from the 16th century or later. The dressed stones were sloping 15-20 degrees.

To the SW approximately three courses of brickwork were recorded. This may have been laid in three steps, but the truncation made it hard to tell. Mortar bonding the bricks consisted of hard white lime mortar with inclusions of small stones. In the NE corner of the section there may have been another course of bricks, but the same truncation and robbing made this hard to determine.

The bricks were placed on a course of grey, rounded and unfinished boulders used as a foundation layer. The one mostly visible stone was 0.6 x 0.9 m and at least 0.3 m deep. The boulders were loosely mortared together with yellow sandy mortar which contained some crushed CBM.

Only a small section of the original construction cut for the barrier tower could be seen to the north in the excavation, due to the working conditions (modern truncations, bad weather and machining), but at the excavation in 2010, just west of this, a cut for the dam/bridge was recorded. These cuts were probably connected and a continuation of the same feature.

In 2014 the rest of the barrier tower was fully exposed (Fig. 185). Foundation consisted of a semicircular structure of unfinished mid grey granite boulders and stones with infill of mortar and CBM. Two of the stones, facing east, had worked surfaces similar to the worked stones seen in the bridge pillars further to the east.

Fig. 185. Barrier tower from above pierced by a modern concrete pillar to the east. Photo: Museum of Copenhagen.

The brickwork consisted of a curved part of a well laid brick wall where parts had been laid in Dutch coursing (Fig. 186 and 187). The wall was thicker towards the base, probably for stabilization. With the exception of the northern part, consisting of a single, 0.44 m thick brick wall, the bricks had been placed on top of and between the large foundation stones, and the wall structure was recorded in a couple of separate sections. The brick construction had an L-shaped form, but the main direction of the structure was north-south. It was first associated with the 17th century curtain which ran in the same direction, but was later grouped with the tower as part of SG-809 investigated in 2012 (see above). The exposed part of the wall consisted of a header course where the bricks had been laid flat either side on, or end on to the face of the wall.

Fig. 186. Remains of the barrier tower with foundation stones and curved brick wall, facing north. To the right – section through dark alluvial deposits inside the structure. Photo: Museum of Copenhagen.

Fig. 187. Close up of brick wall of Dutch or English cross bond, facing NW. This bond has alternating stretcher and header courses, with the headers centred over the midpoint of the stretchers, and perpends in each alternate course aligned. Photo: Museum of Copenhagen.

Structure (SS311742) consisted of a curving wall of fully laid medieval bricks and a single rectangular ashlar. The brick wall was 1.2 m long, 0.4 m wide and 0.5 m high with mid red bricks (“munkesten”) and yellow/white tuck mortar. The bricks had been placed stepwise (5 cm) in the lower part (Fig. 188), and one got the impression that the structure sloped slightly to the NE, but this probably was done to stabilize the construction. The brickwork consisted of both headers and stretchers, but no coursing technique could be determined on site. The bricks and ashlar stone had been placed on and matched to the foundation stones.

Fig. 188. Curved brick wall placed on and matched to boulders, facing NW. Photo: Museum of Copenhagen.

Two separate square blocks consisted of three courses of medieval red bricks (“munkesten”) with white tuck mortar within the foundation (Fig. 189). The blocks 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 17th century. A merlon is the solid upright section of a battlement or crenellated parapet in medieval architecture or fortifications.

Fig. 189. Overview. Continuation of curved brick wall to the left, foundation with reused merlons from the former city wall in the middle (within the red squares) and brick wall to the right. Photo: Museum of Copenhagen.

The construction and foundation layers consisted of mortar and firm greyish blue clay mixed with a large amount of CBM. Levelling layer in the interior of the tower structure was disturbed by a modern concrete pillar in the centre (see Fig. 185 above), so only a small portion of the layer was visible and preserved.

Fills within the barrier tower consisted of a lensed layer of firm dark blackish brown sandy silt. Some small fragments of what could have been the remains of a wooden floor were recorded. One side of the wooden plank looked almost polished while the other side was more decomposed and in bad condition. A lot of burnt material; charcoal, burnt wood and soot where recorded in the deposit. Alluvial deposit, investigated in 2012, was highly lensed, with lighter grey sandy lenses to the NE, and yellower lenses with iron panning to the SW. The lensing suggested a stepwise, natural accumulation.

The deposits were first interpreted as usage deposits inside the tower – although there are questions as to the accumulation process, the layers were clearly alluvial, hence to the lenses. There is therefore a slight possibility that the layers could have been created after the structure was abandoned. The demolition material associated with the tower consisted of mixed red/grey silt with inclusions of stones, pebbles, CBM and charcoal.

Finds from the surrounding deposits and the stone structures date the dam and barrier tower to first half of the 17th century. There is also clear evidence that the two features cut sedimentations and usage layers in the Late medieval moat which reinforces this dating (cf. Fig. 182). Dutch or English cross bond used in the tower has a Flemish origin and

was first used late in or after the Middle Ages. The defence tower was short lived and probably was destroyed and replaced with another dam called *"Kammen"* that included a barrier tower in 1629 further to the south.

Temporary bridge in the Late medieval moat

The bridge (G-446) consisted of 44 circular vertically set and tilting posts with removed branches and stripped bark which varied in length from 0.92 m to 2.80 m and horizontal planks laid edge on (Fig. 190).

Fig. 190. Temporary bridge in the Late medieval moat with the medieval city wall to the left.

The posts had been knocked/driven into the ground, and the tops had originally been flat. The points were 4 sided and tapered (0.4-0.5 m long), shaped by axe and with frayed base, probably from being rammed into the ground.

Fig. 191. Bridge structure, facing west. Photo: Museum of Copenhagen.

Parts of the bridge consisted of a sharp slender post and two planks, both of which showed evidence of earlier use for another purpose (Fig. 191). The structure was orientated in a rough east-west direction. The post had been created by splitting a round timber with an axe creating a tangentially faced post with a narrow tapered point up to 0.29 m in length. The post might have been used in a roof construction (Melin 2013:21). Two substantial iron nails were noted on the exterior of the post, which had been bent downwards and upwards after they had been hammered through. They may have been used to fasten the post to the two timber planks adjoining it to the north.

Some of the posts were related to a cut, due to variations in the soil around the posts, and were initially thought to be cuts with fill differing from the surrounding layers. One of the timbers had a producer's mark consisting of a double cross (Fig. 192).

Fig. 192. Producer's mark on one of the posts in the 17th century bridge. Photo: Museum of Copenhagen.

Based on dendrochronological dating of horizontal plank and the presence of alluvial deposits, it is assumed that the bridge was built in the early 17th century when the moat went out of use, as a temporary substitute for the eastern gate and related bridge. Part of the medieval city wall was preserved adjacent to Lille Kongensgade as a bridge head while the rebuilding and construction work was ongoing (cf. Fig. 201).

Other features in the moat – revetment, sluice and part of a bulwark

A total of four different wooden structures were recorded in the 17th century moat on the occasion of emptying this of its backfill by machine.

Group (G-240090) represents an alignment of several wooden posts with stones running N-S along the eastern side/slope of the moat with the purpose of stabilizing the edge. Most of the structure was recorded in the Station Box in 2013 with a few additions in the Ventilation Shaft in 2016 (Fig. 193).

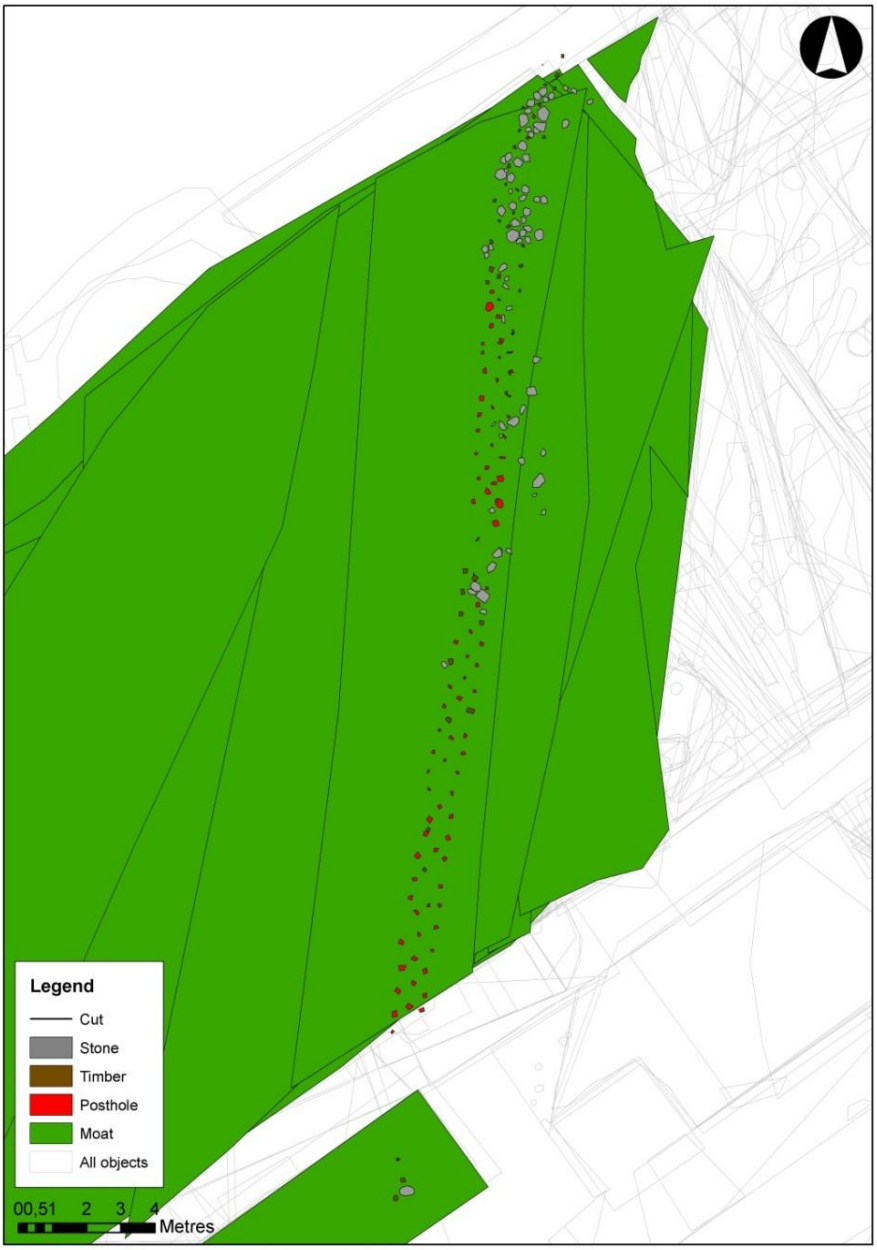

Fig. 193. Alignment of wooden poles, stones and postholes running N-S along the edge of the 17th century moat.

The vertically set posts were 0.75-1.37 m long with four sided tips. As a continuation of this, N-S running group (G-6571) was later recorded representing an alignment of a total of 82 vertical postholes with tapered bases. The overall length was c. 22.0 m and width 1.0 m (Fig. 194).

Fig. 194. Part of revetment. Wooden posts and stones, facing NW. Photo: Museum of Copenhagen.

The fills in the postholes were composed of overlying material filling the void after the removal of the post and has therefore not been given a separate number. Together with the timbers the features formed a revetment or palisade, possibly to protect the outer edge of the moat from erosion.

Group (G-503381) represents part of a 5.4 m long and 4.0 m wide wooden structure consisting of eight vertically set box hearted posts and five planks of different size and depth/thickness recorded close to stone structure SG-503400 and bridge pillars (G-500892) at the base of the 17th century moat (Fig. 195).

Fig. 195. Interpreted sluice of timber posts and planks partly underlying the 17th century bastion.

Horizontal plank was 5.4 m long and 0.2 m wide and placed parallel to a planking in a NW-SE direction. The NW end was clean, sawn cut, whereas the SE end was broken – possibly the result of a modern break. The timber structure was destroyed in the middle by modern concrete forming the Guide Wall. A plank further to the west had the same orientation, was 3.12 m long, worn and slightly ripped at the ends. The plank was placed right up against two upright posts, but no fixings were visible (Fig. 196).

Fig. 196. SE part of wooden structure (G-503381) consisting of vertical posts and horizontal planks at the base of the moat, facing SW. Photo: Museum of Copenhagen.

Since the features were exposed by machine (Watching Brief 2014) without clear contextual relations the interpretation is difficult, but the suggestion is that the construction could represent some sort of small sluice in the 17th century moat used to power a waterwheel. However – one should note that a sluice is depicted on Thorsen's reconstruction drawing of the 16th century fortification and Østerport, despite the existence of obvious inaccuracies (cf. Fig. 114 above) – so there is a possibility that the feature could represent remains of this timber structure.

Bulwark (G-500891) was recorded in connection with the bridge and consisted of eight rectangular and vertical beams and one deconstructed posthole (Fig. 197).

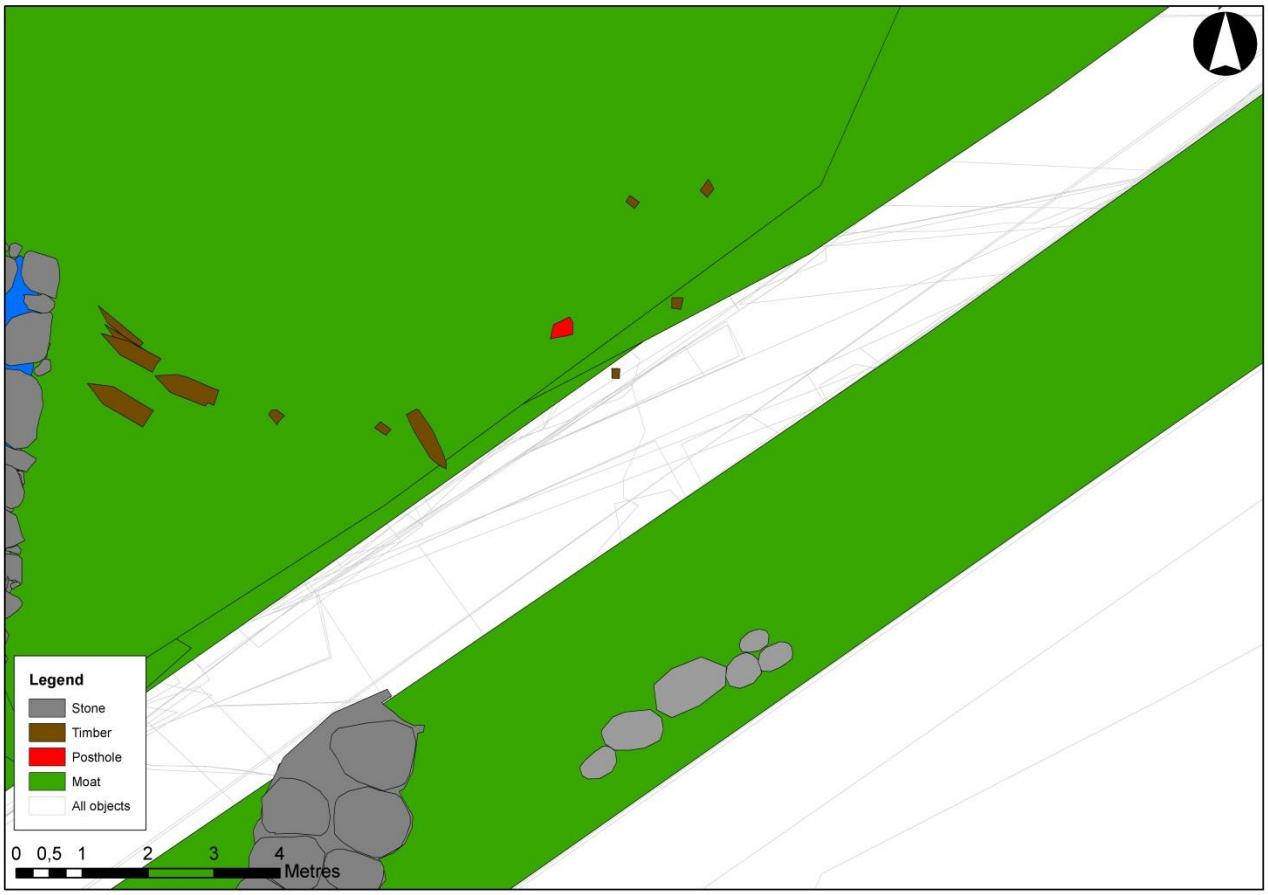

Fig. 197. Vertical posts and bulwark for a larger nearby structure (?) documented at the base of the moat in the natural substrate. The planks belong to another and later timber structure; G-810.

The beams were driven into the natural substrate at the base of the moat cut. Only four posts could be removed from the ground. Two posts were disturbed, possibly by machine, and recorded as lying flat approximately where they were originally placed. The posts might represent a bulwark for the 17th century bridge construction or a nearby structure, although the latter suggestion is very uncertain.

Christian the 4th and the rebuilding of the new fortification

Østerport

The archaeological excavations show that the old gate was partly demolished and a new building was erected at the same location. This confirms the written sources mentioning nothing about the main gate being moved. The inner gate building, re-built 1607–1611 AD, was placed at the same location as its medieval predecessor midway between today's Østergade and Lille Kongensgade. In 1608 *"det gullandske sten-arbejde til den nye Østerport"* is mentioned

consisting of fine decorated adornments in lime- and sandstones from Jutland. *Rentemesterregnskaberne* also inform us that the new vault of the inner gate building was completed in 1604 (Lassen 1855:13; Thorsen 1926:243-245). The roof was covered with slate (Lassen 1855:27; Thorsen 1926:201 and 245) and several finds of roof slate both in the Late medieval moat and its 17th century successor can confirm the use of this building material.

In tandem with the construction of the new moat, an outer gate was also constructed. This faced to the south-southeast, approximately at a right-angle to the main gate building, in itself a defensive layout (Fig. 198).

Fig. 198. Part of Johan van Wijck's painting and prospect from 1611 showing Østerport including inner- and outer gate buildings and drawbridge. The Spangenberg's characteristic bastion just north of Østerport is just visible behind the new gate building and is shown as a large, earth-filled plateau with surrounding parapets. A berm is shown by the moat.

The two buildings probably had two floors, their further appearance, however, is unknown. In 1638–1639 AD the inner gate building was equipped with a powder tower (Lassen 1855:22-27). Southeast of the inner gate a dam was constructed in 1607–1608 across the moat with two block towers in the middle.

The new gate building was larger than its predecessor with an eastward expansion into the Late medieval moat, partially filled with stones and boulders. The extension, although this is not completely settled, should have finished a couple of metres from the well and moat edge, immediately east of the old city wall, and beside a portion of the road and entrance where the latter makes a slight bend to the south (see Fig. 76 above).

It has not been possible to find any reasonable explanation for the bulwark's dendrochronological dating to 1642–1652 AD, which coincides with the (partial) destruction of the inner gate building. In the written sources there is information about bulwark work in connection with the rampart and ditch outside Østerport. These also record the ordering of boulders to fill the moat (cf. Lassen 1855:26-27), and one should assume that the poles were pushed into the ground before these were covered by the new gate building.

Based on the destruction and lack of construction details, the inner gate building from the 17th century can in some degree be compared with another gate called Vandporten further south, which served as a transportation route into the city for goods unloaded from the ships in Holmens Kanal. The gate was 11.6 m long with a west facade 0.8 m thick. The gate room was 5.8 m wide, the side walls 1.9 wide with slightly wider foundations. The preserved height varied from 1.78 m to 2.75 m of an estimated total height of 6.0 m. The foundation of the facade was 13.0 m long and stretched respectively 1.8 m and 1.5 m beyond the rest of the structure's dimensions. In relation to the gate room's width the facade was twice as wide based on the total length of the structure. The foundation was partially made of medieval bricks from the ruined medieval city wall, and this had survived up to present street level (Kristiansen 1998:124, 130, 131 and 136; 1999c:176, 194 and 195).

No clear evidence of an outer gate related to the drawbridge on the other side of the moat (pictured on Johan van Wijck's painting and later prospect from 1611) could be proven, except for a bulwark at the base of the moat, probably used to stabilize a larger and unknown structure – outside the excavation area. Big boulders were recorded in the backfill in 2016 and could represent remants of a destroyed building (G-504240), but to prove this requires further archaeological excavation.

Østervold

In 1606 Christian the 4th bought all the gardens and plots outside Østervold, i.e. the area between Østerport and the beach, as well as the area between the fortification and the shoreline to the northeast (KD I:438-439; Nielsen 1885:381; Ramsing 1940, Vol. III:4). A comprehensive modernization of the city's ancient fortifications started the same year, which came to extend for over 20 years (Christophersen 1985:61; Westerbeek Dahl 1996).

The construction work began in February 1607 and lasted until 1624 interrupted only by the Kalmar War. The remnant of the outdated medieval defence system was removed and replaced instead with a system of ramparts of earth with bastions at regular intervals, curtains to flank the terrain and water filled moats surrounding the city, as it was then known throughout Europe (Fig. 199). At the same time the eastern part of Bremerholm was included in the new fortification, the city's three gates were renewed, and the suburbs were regulated (Westerbeek Dahl in press).

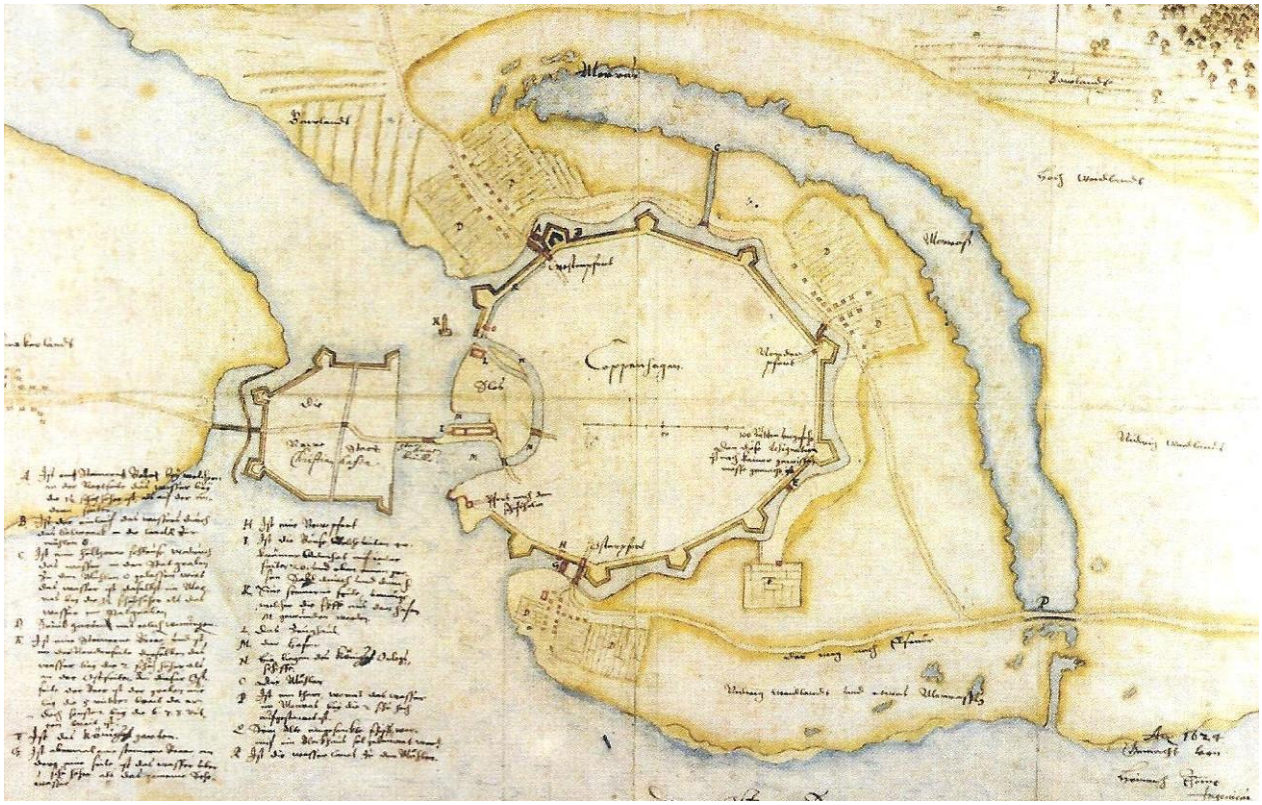

Fig. 199. The new fortification surrounding Copenhagen based on Dutch and Italian models, drawn by Swedish engineer Heinrich Thome in 1624. From Krigsarkivet – War Archives, Stockholm.

In the process of rebuilding the fortification based on Dutch and Italian models, the former roundel north of Østerport was transformed into a spear-edged bastion, physically connected to the rampart in the semicircular fortification. The possible reasons for this – apart from general defensive needs – may relate to a desire to keep up with current trends in urban defence, as well as an increased need for defence. These constructions would again have been organised centrally, either by the king, or by his administration, requiring significant planning and organisation, and a large expenditure of labour, time and money (Westerbeek Dahl in press).

Jan Dircksen's prospect of Copenhagen from 1611 based on van Wijck's painting is the only source that suggests that the city's fortifications might have been covered with bricks (Fig. 198). No brick structure could be traced in connection with the bastion at Kongens Nytorv as was seen at the Metro excavation at Rådhuspladsen (cf. Lyne and Dahlström 2015:206) and nothing in the demolition material from the fortification or the subsequent filling of the moat suggests this. Here, in the southern part of Østervold, from Østerport in the north to Vandporten to the south, the outer slope was almost vertical and it would have been very difficult to maintain this fortification if the works outside were lined with bricks. It is also unclear if the reproduction represents soil or masonry. Since there are no records in the written sources mentioning the purchase of bricks and/or work with masonry, nor later repair around the bastions, it seems be clear that it was intended that the fortifications from Vandkunsten in the west to Bremerholm in the east would have been built as earth works in the "Dutch style" (Westerbeek Dahl in press).

Rentemesterregnskaberne mentions the ramparts and roundels to be 7 cubits high, the parapet 3 cubits high with a cannon bench inside, the embankments width – without parapets and berm facing the moat – should have been 20 cubits. The written sources also mention that a person named Corneliussen was required to place stones along the inside of the moat, and he should even pay for supplies of turf for the rampart. Only by Nørreport did the rampart

reached the height up to 11 cubits. Moreover, the rampart was equipped with a two metre wide berm (Westerbeek Dahl in press).

Huge amounts of turf from Amager were used in the construction of the new fortification (cf. Lassen 1855:29 et seq.; Thorsen 1926:248). This building material was also identified at several locations in the excavation in connection with the bastion. The embankment had to "sit" for a time before the structure was finished with a covering of turf. This work was finished two to three years after the embankment was completed, when Jost Spangenberg and Anders Nielsen in 1613 provided the turf used to clothe the earthwork (Westerbeek Dahl in press).

Christian the 4th demanded the new moat to be 62 cubits wide and 5 cubits deep. A map from 1629 shows that the moat surrounding the bastion and containing southwards had a width of c. 50 cubits. The moat's width from Østerport's bastion to Rosenborg and Nørreport was in 1615 approximately 62 cubits (Thorsen 1926:250-251).

The new Metro excavations at Kongens Nytorv show that the bastion's throat was in the immediate extension of Østerport and its two facades met roughly where l'Amoureux's statue of Christian the 5th is today. The moat's width was between 21.0-23.4 m south of the bastion and the depth at most 2.1 m from the top of the construction cut to the middle of the base. This could be something greater if one compare it with the results from watching brief trench ZT1196 close to Ny Adelsgade (c. 2.7 m). These measurements are anyway much less than the moat depth measured at Vesterport, being 5.0-5.5 m (cf. Lyne and Dahlström 2015). There were no indications that the moat sedimentations had reached all the way up to the foundation stones, arguing for a higher water level.

A combined moat and canal (Holmens Kanal) was built in front of the rampart, which was so deep that ships could go up to a pier. From here a gate called Vandporten (built 1608/1609 AD) provided access to the city (Kristiansen 1998:116 et seq. and Appendix 8; 1999c:185 et seq.).

A new stone and brick arched bridge was constructed in 1608 in order to span the outer moat and link the outer gate to the area outside the city (cf. Lassen 1855:27-28). The bridge, partly walled, partly a drawbridge in wood, led through an outer gate building to the place in front of Sejlhuset and Reperbanen on the northeast side of Bremerholm. The bastion was located north of the bridge, so this could be protected (Hartmann & Hartmann 1988:6 et seq.).

Five vertical brick pillars or bridge piers were investigated in the moat. Part of this bridge structure was also recorded in 1994 consisting of a dressed stone plinth with three dressed stones and masonry of medieval bricks and lime mortar on a foundation of boulders and demolition material from the 16th century or later, revealed in the street outside Kongens Nytorv No. 21. The dressed stones were sloping 15-20 degrees (Skaarup 1994).

The width was c. 7 m, similar to the 17th century bridge investigated at Vesterport (cf. Lyne and Dahlström 2015:208) and details/construction method compare closely with later versions outside Østerport (Fig. 200).

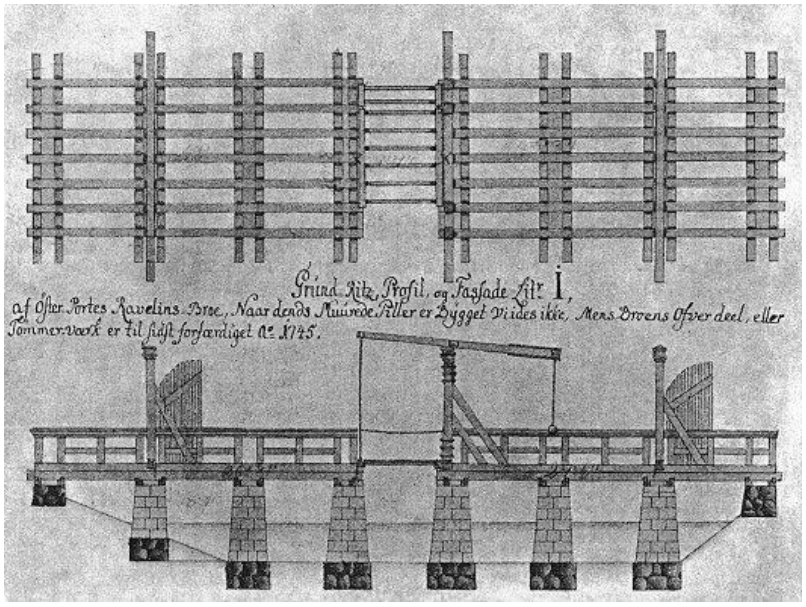

Fig. 200. Comparable example of a bridge structures in the 17th century. The last bridge at Østerport with stone pillars and draw-bridge. From Pontoppidan 1936.

In connection with the new bridge one needed a temporary entrance into the city. In 1618–1619 a 30 fathoms bridge entering through an arch down to the beach opposite Slotsherrens gård at Østerport is mentioned (Thorsen 1926:237 and 247), which is presumably the same bridge investigated at the end of Lille Kongensgade in 2011 (Fig. 201).

Fig. 201. Overview of the bridge structure in the Late medieval moat, facing west. Photo: Museum of Copenhagen.

Part of a dam and barrier tower was documented SE of the inner gate building and located at the southern side of the bridge. Dams with sluices across the moat were necessary in order to achieve an adequate water level in the moat and a dam also appears on the prospect based on van Wijck's painting from 1611.

The water was collected both from the surroundings and from the lakes north of the city. From the lakes, the water was diverted into the moat by a trench from Peblingesøen to the moat at Jarmers Gab. The water reservoir also had a drainage later named Rosenbækken south of Kalvebodløbet. This system was expanded in 1526 AD with the excavation of Rosenbækken, which ran from Emdrup into the sound at Hellerup. In this way Emdrup Lake was created. From here the water was discharged probably through Lersøen into Ladegårdåen and into the lakes whose surface area thereby considerably increased.

The barrier tower previously had been documented without any clear interpretation (Skaarup 1994). This brick structure was interpreted as a tower in connection with a dam structure just south of Østerport and dated to 1608–1609 AD. This hurdle is also seen on Thorsen's drawing of Østervold and includes two small towers to prevent passage over the moat (Fig. 280; Lassen 1855:28; Thorsen 1926:246; Westerbeek Dahl 2016; in press). The interpretation as a tower is also based on its internal structure and a similar, still existing tower in Nyborg (Fig. 202).

Fig. 202. Small whitewashed tower from c. 1660 AD on top of the dam at "*Kongens Bastion*" in Nyborg. From: Den hvide jomfru 2016.

In association with these dams several watermills were built to utilize the height difference created in the water table. How many mills there had been along the fortress terrain is unknown, but a watermill close to Østerport is mentioned in 1511/1512 AD (Skaarup 1996:36) and a water wheel is also displayed on the prospect from 1611 (Fig. 198). One of the first proposals of the circular structure on site was that this represented the remains of a watermill – but no material from a demolished mill (parts of milling stones, wheels, axles, paddle blades, etc.) was encountered. Round structures exist in relation to horizontal mills, but are not known in Denmark, except at Bornholm. A horizontal mill normally operates with a modest (narrow) water flow, but with a big fall and a horizontal mill's performance compared to a vertical mill is so modest that it was hardly part of fortifications of the dimensions that existed at Østerport in the early 17th century (Fischer 2016).

Part of an interpreted sluice can be compared with the mill race at Rådhuspladsen dated to c. 1600 AD, but this feature was highly fragmented.

Some of the deposits in the moat (usage and deconstruction) were seen as older than the bridge pillar foundations (cf. SG-503401 and SG-503423), but later re-grouped and placed under the 17th century fortification (Phase 6) in the matrix. Exposed by machine within the 17th century moat area and without any clear relations, this stratigraphical "disagreement" can either be explained through the construction of the barrier tower on top of the dam within the Late medieval moat with the same type of deposits *or* by other activities – for example when building a roundel north of Østerport, a type of artillery fortification introduced by Christian III in the 1540s.

The backfill and terrain levelling deposits of the 17th century moat consisted of typical waste and building material – similar to earlier observations and excavations at Krinsen. In the 1940s several finds were collected consisting of well preserved iron and metal artefacts related to urban and military culture (Bunkersudgravningen på Kgs. Nytorv 1944). Typological facts combined with observations regarding the decoration and fabric of the other artefacts point towards the second part of the 16th century and the beginning of the 17th century. Part of the building material collected from the 17th century moat originates from the same building. The dating is early 17th century and the ashlars could represent destruction material from the former Østerport, although this proposal is highly uncertain.

The fortification was abandoned in 1647 in connection with the establishment of New Copenhagen and the city's expansion to the east. After the fortification went out of use, this part of the moat outside Østerport was filled in during 1680 and used as a general waste and junkyard.