Phase 5 Decommissioning of the medieval defences; and the mill by Vesterport – A.D. 1600-c. 1670

Main structures: mill, mill race, bastion, gate facade

Introduction to Phase 5

The years between A.D. 1600 and 1670 were perhaps the busiest documented on site, particularly in relation to the short span of time represented. This period overlapped with the reign of Christian IV, who was known for his interest in promoting construction projects, and he was almost certainly the driving force behind several of the large scale changes in this area between A.D. 1600 and 1670. Christian IV was king from A.D. 1596 to 1648, and his reign saw significant re-workings of the urban defences, and the erection of such buildings as Rundetårn (Round Tower observatory), Børsen (the stock exchange) and Holmens Kirke, that still stand today. He also commissioned the construction of the entire Christianshavn suburb; so the work by Vesterport was relatively small scale by comparison. This work included the transformation of the former medieval moat into a mill race, and the construction of a watermill within the former moat. It included the alteration of the ravelin, and its conversion into a more modern bastion. It is also believed, based on historical documentation, that he had the outer gate partially rebuilt, or at least given a new, presumably more ostentatious, façade, some evidence of which was also seen.

Evidence was also found for the demolition of much of the work outlined above (particularly the mill related structures), towards the end of the reign of Frederick III (reigned from A.D. 1648-70). By the late 1660s moves were made to upgrade the fortifications by the western gate once again, in a very large-scale fashion. This may have been because the fortifications were seen as not effective enough during the Swedish attacks of A.D. 1659, or perhaps simply due to trends in fortification construction in the wider region.

This work saw the mill race filled in, removing the last visible traces of the moat built in A.D. 1370. It also saw the deconstruction of the upper parts of the outer gate and associated bastion, and the filling up of the outer moat. All this work was done to allow for the construction – slightly further west – of a new, much broader, more regularly built and more modern set of fortifications. When these were constructed, much of the former defences, including the lower parts of the gate and bastion, were buried beneath the new larger bastion. Hence all of the remnants that survived the deconstruction of the 1660s, were in fact protected by the new bastion, sealed beneath it for the next two hundred years.

Phase 5 Description

The fifth recognised phase of activity at Rådhuspladsen (between c. A.D. 1600 – c.1670), saw progressive developments related to the city's defences and infrastructure, many of which were initiated by Christian IV. It was a time when the medieval defence line in this area was abandoned, and reused instead as part of the city's non-defence related infrastructure.

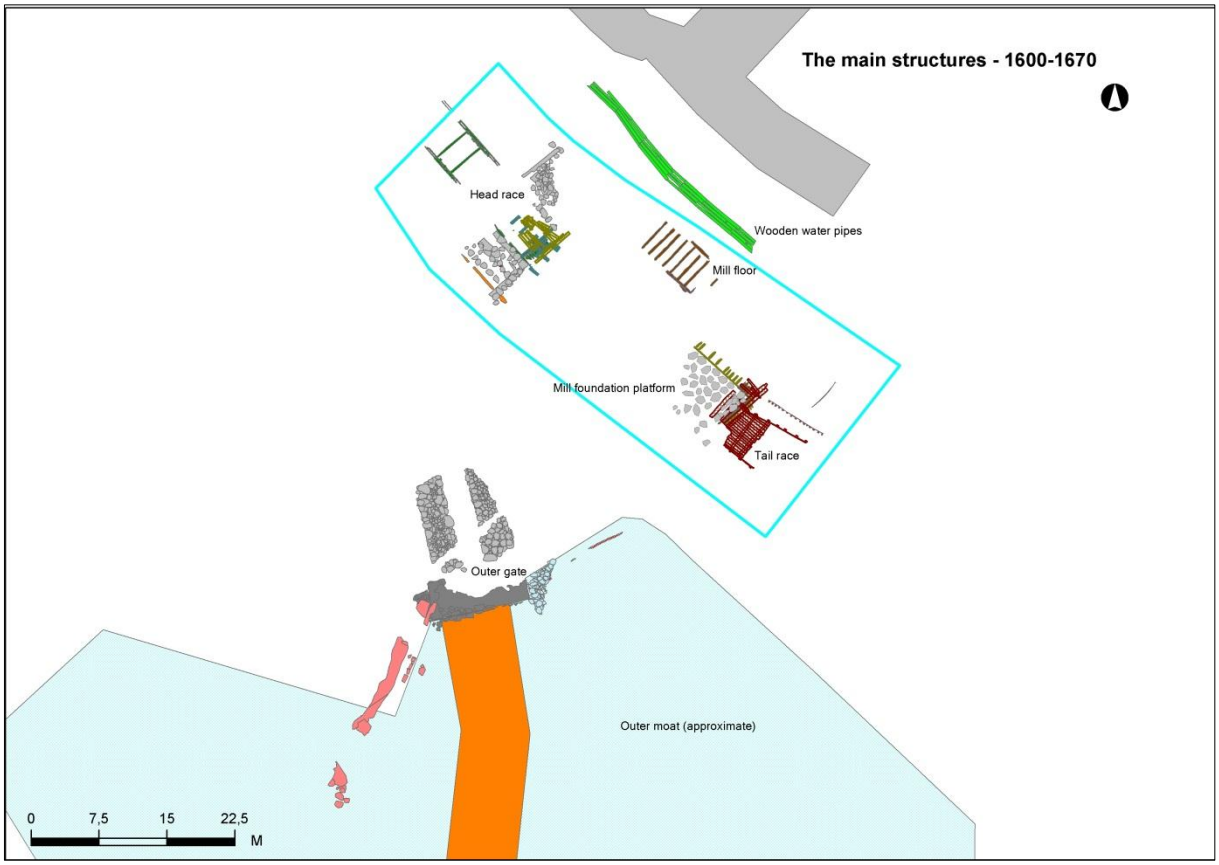


Figure 57 Main structures A.D. 1600 - 1670

The post-medieval remains seen at Rådhuspladsen were heavily impacted by later activities in the area, both archaeological (the placement of the final bastion and moat) and modern. Nonetheless a good deal of material survived, and together with what we know from previous excavations in the area, we can establish much of what happened in the area at this time.

This phase primarily consisted of large structures indicative of industry and infrastructural developments, as well as some defence-related work. Many of the structures built in this phase were established in a relatively short time as part of a major phase of construction, as indicated by the dendrochronological dates received. The types of features excavated dated to this period include several mill and mill-race related structures, possibly a new façade for the outer city gate, and a great deal of in-filling of deeper features in order to facilitate the re-construction of the entire western boundary area.

Land-use Change

Between A.D. 1600 and 1670 a series of successive alterations were made to the inner city moat by Vesterport and in its environs, including its decommissioning – first as a moat, and later as a millrace. These alterations will be outlined in the following sections.

The inner moat partially backfilled

A series of deposits and structures were recorded within the former medieval moat, which have been interpreted as pre-mill backfills, some at least of which were placed deliberately to prepare for the construction of the mill. Some were alluvial in nature, and built up naturally within the moat. The first group of deposits were located under the arch of the former third bridge, and also along the moats eastern edge, under the former mill building (see below). The deposits stretched across an area of some 25 m (northwest-southeast) x 11 m (northeast-southwest).

From the analysis of samples it was seen that several weed species were present in these layers; particularly nettle, buttercup and goosefoot. A wide range of finds were retrieved, including ceramics (Late Redware, faience, Early Redware, Early Greyware, stoneware and Jydepot) metal finds (a padlock, musketballs), flint and bone.

The assemblage shows that the layers were quite mixed, with material of different ages being deposited, supporting the idea of a deliberate dump of material brought in from other locations. The deposits were probably used to raise and level the moat base to enable construction to take place. This would suggest that the layers were deposited by about A.D. 1600 (see dating evidence for mill below).

The more alluvial type deposits were located in the southern half of Area 3, and spread over an area measuring some 12,5 m x 15 m across the base of the moat. Analysis of the ceramics found in these layers shows that there is a wide range of dates represented, from high medieval through to about A.D. 1600. These are mixed within the same layers in most cases, showing that the layers are either relatively late, or that the material has been churned up in situ (due to water action). The stratigraphically deepest layer however, contained a few high medieval sherds, and no later material, suggesting that this layer could potentially be an in-situ medieval layer without later contamination.

The outer fortifications altered (the Christian IV era)

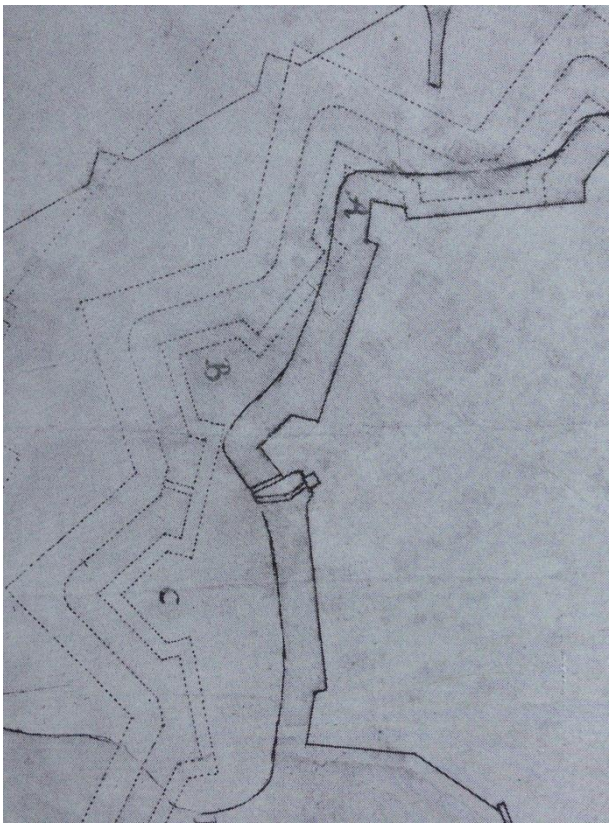
Located in Area 2A to the east of the outer gate, a cut and a series of deposits were interpreted as a reworking of the moat in the region of the outer gate. Originally the outer moat ran past the gate to the east for some distance before turning towards the sea. Later, much of this part of the moat was filled in, and a new 'edge' was created much closer to the gate, where the moat turned southeast toward the sea. This new edge was readjusted at least four times. This reworking probably coincided with some renovations to the gate façade; changes made during the reign of Christian IV about A.D. 1600 or soon after, when the king had many adjustments made to the fortifications.

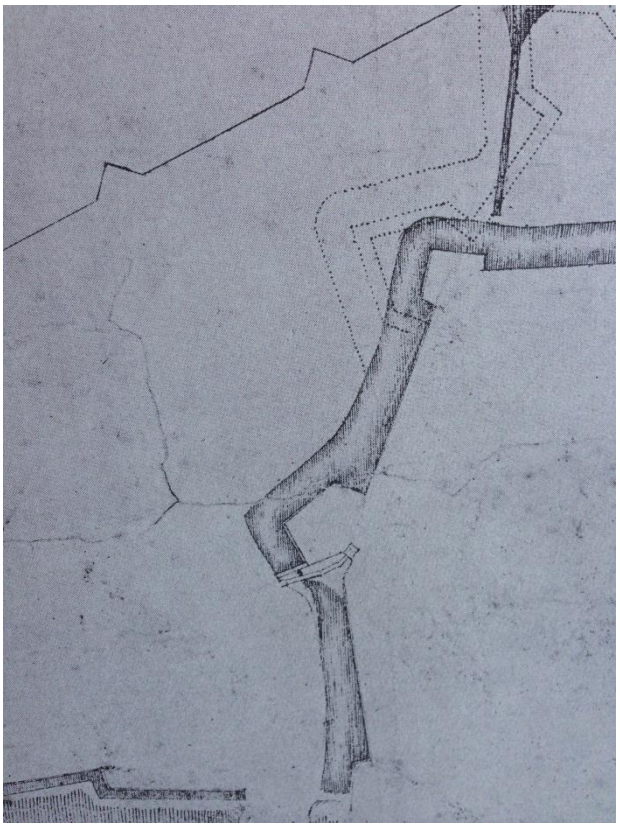
Timbers were also seen which may relate to the strengthening of this rebuilt moat edge. These timbers had lain horizontally, and it is likely they were placed here to stabilise the deposits that had been used to fill up the moat to the east of this new edge.

All the re-workings of the moats edge are thought to have been carried out in a relatively short period of time, perhaps within a couple of decades or less, possibly from A.D. 1596 and onwards, when Christian IV took effective control of the state.

Figure 58 One of the reworked edges of the moat seen from above

Two maps from A.D. 1647-49 (see below) depict planned changes to the fortifications around Vesterport. Based on what was seen at Rådhuspladsen, most of these changes were never made in the area of the western gate. However, the maps are useful in that, based on what was seen on site, they seem to depict quite accurately how the outer gate area looked at that time. The area in front of the outer gate appears to be dry at this stage, and it may be that it was prone to silting up. This could explain the repeated re-workings seen in the area of the southeast corner of the outer gate.





Figures 59 and 60 Two plans of the western gate area, c. A.D. 1647 and 1649 (Lorenzen, 1930)

The mill

Placed within the former moat in Areas 3 and 4, various contexts were identified which have been interpreted as representing the remains of a mill, previously seen in the 1940s during the excavation for the underground toilet, and also known from historical references. The mill had several different surviving elements, including construction levelling layers, structural timber elements, brick and stone structural elements, usage layers, and deconstruction material including rubble. Overall the structure measured 25,6 m in length (northwest-southeast) and 5,75 m in width (northeast-southwest), though the original measurements of the structure are likely to have been ca. 26,5 m x ca. 20 m wide (the entire western side of the building had been removed by the construction of the underground toilet building).

The construction cut for the mill building was seen in several parts. One main cut was identified, comprising a large horizontal scarp cut into the natural clay to receive the majority of the mill construction. Separate foundation cuts were seen which were made for the placement of the various walls.

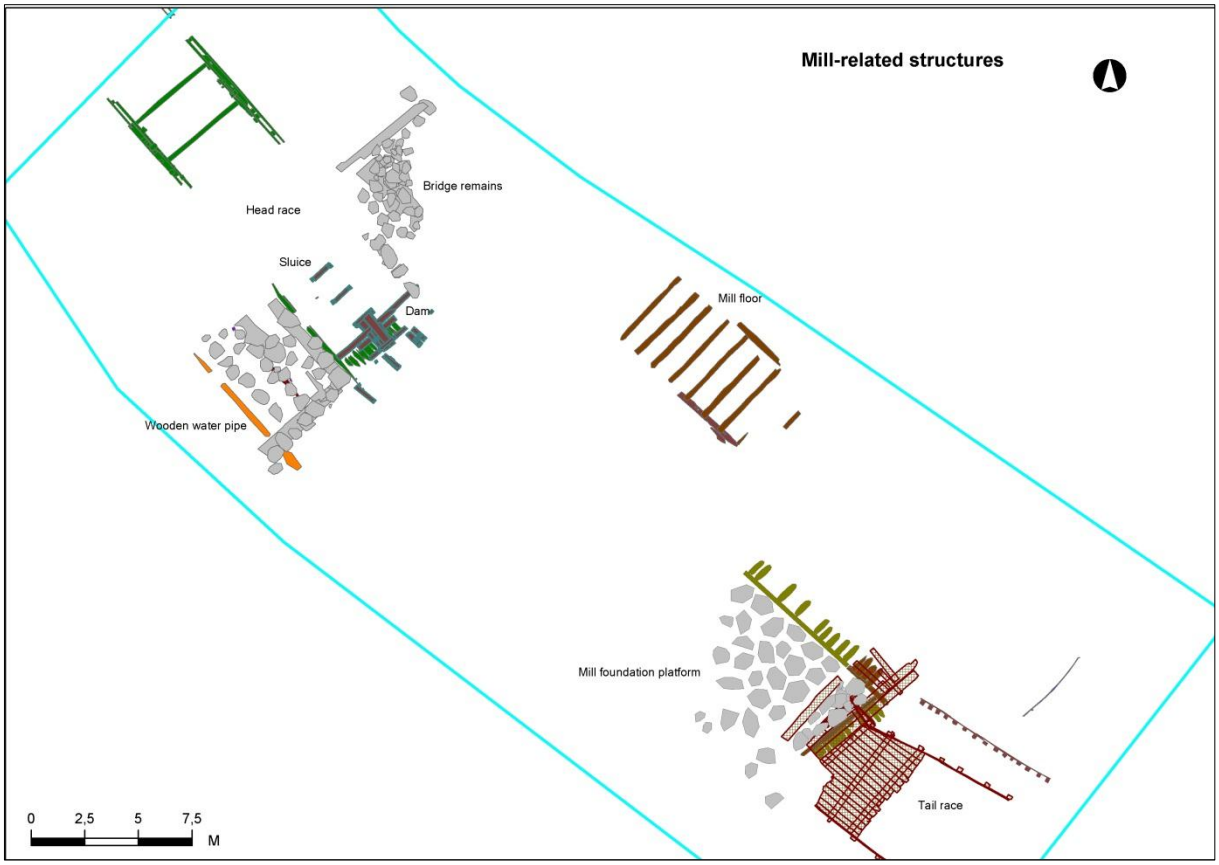


Figure 61 Plan of mill-related structures as they survived

A narrow linear cut that ran along the base of the construction cut probably represented a shallow drain beneath the floor of the mill (see below). It was filled by an accumulation of material formed during the use phase of the building.

Figure 62 The northern end of the main mill cut post-excavation, seen from south

The mill building, based on finds recovered and historical information, was built in the early years of the 17th century. Indeed, thanks to the results of dendrochronological dating of several timber samples, we can now state that the mill was first constructed in about A.D. 1606 or 1607. While it is possible that an earlier mill may have stood on the same location, perhaps dating back to the 1500s, no evidence for this was seen. Based on the available evidence (both artefactual and historical), the building was deconstructed in the late 1660s. This deconstruction was quite thorough, with much of the useful structural material fully removed. Regrettably, much of the surviving mill elements were removed in the 1940s, during an excavation for the placement of the underground toilet building. Very little documentation was carried out, hence we do not know the details of what was seen at this time.

The presence of pieces of millstone (mainly basalt) from the recent excavations supports the view that the building was a mill. The finds recovered from the main mill area are in line with a use period through the late 1600s, and include coins and tokens, iron tools, a large assemblage of stove tiles, ceramics, glass and various other metal and organic objects.

Main construction elements of the mill building

The main structural elements of the mill consisted of a wooden wall to the west, an eastern brick and stone wall, a wooden floor, and a stairs leading into the mill. These will be discussed below.

Foundation cut

A linear construction cut was located in Area 3. This cut was more or less at right angles to the eastern wall of the mill running in a southwest to northeast direction, and was c. 7 m in length. Its base was cut into natural, and had two of the massive mill-related timbers resting on it, and following its edge. Hence, on reaching the base of this cut it became clear that it was a construction related cut for the placement of the large timbers at the south end of the mill.

Mill Construction Platform

Two courses of boulders were seen which were bounded on their upper extent by two beams lying north-east to south-west and north-west to south-east. These would originally have been joined together,

possibly with a peg. These beams were covered by steeply angled planks which appear to have been partly driven into moat silts below. These two sides of this structure form a rough right angle (see Figure 61).

Figure 63 The southern edge of the mill construction platform, seen from southeast

It appears that this structure represents a construction platform, a solid base upon which to erect the mill building. As the structure placed on top (of a quite similar age) was somewhat different in form, it may be that an initial plan for the mill was altered during construction, and this structure is a remnant of the original design, reused as a foundation platform. It is noteworthy that the tops of the angled planks had been chopped off at their surviving height in a fairly crude fashion.

Dendrochronological analysis was carried out on five samples from this structure. The dates received varied from A.D. 1604/05 up to 1609+/-15. Two dates from A.D. 1606 may suggest the actual date of the structure, or perhaps it may have been constructed shortly after this. The timbers were felled in either Østlandet in south-east Norway or Bohuslän in west Sweden.

The wooden floor

A wooden floor was located within the mill building, along the eastern edge of the former city moat, and south of the former inner western gate. It comprised mainly of timber elements, joists and floor boards, as well as some deposits thought to be directly associated with the floor. It measured over 13 m in length, and some 4,4 m in width, but was somewhat irregular in shape. Originally the floor would have been rectangular and considerably larger, but due to modern and historical truncations as well as decay, only part of it survived.

Figure 64 The wooden floor in situ, with the stairs beyond, seen from southwest

The timber floor had been constructed directly on top of a flat scarp (see above) that had been cut into the side of the moat, and also resting on material piled into the lower part of the moat to form a continuous level platform. The joists were laid on this platform (running southwest-northeast), and then the planked floor was nailed on top. It was made predominantly of pine, which had been felled in Småland in Sweden.

The joists were quite well preserved, while the floor boards were quite soft and had been compressed over time to just a few millimetres in thickness. As a result of the differential preservation levels, it was mainly the joists that were sampled for dendrochronological analysis. A range of find material was recovered, including nails, a coin, a token, a buckle, a stove tile, a thimble, a metal mount, and some mortar fragments. The coin was a silver Christian IV 1 skilling from 1621, while the token was dated to 1588. These dates correlate quite well with the dendrochronology dates (see below).

This structure was part of the floor of the mill. It dated to c. A.D. 1632, based on the timber samples taken. In total six samples were analysed. Five of these were dateable, and returned dates of between A.D. 1613 +/- 20 and 1632 +/-3. This is evidence for renovations carried out on the building, as we can assume based on the dendro dates from other parts of the building that this was not the original floor, but a replacement made in c. A.D. 1632. There was some evidence that another floor had predated this one on the same spot, due to the presence of building rubble and structural cuts beneath the floor.

The stairway

A structure of brick and stone was situated along the north-eastern edge of the mill building, in Area 3. It comprised of a set of five steps, which led from ground level down into the mills interior, to where the wooden floor was situated. It appears that this staircase was built directly onto the edge/cut of the main mill building. The steps were constructed of brick, and were partially built into the fabric of the mills brick wall. Each flat surface (or tread) was overlain with a deposit of mortar c. 3cm thick, and this in turn had a timber tread placed on top, to form a walking surface.

The overall dimensions of the steps were 2,1 m wide x 1,6 m long, with a height of c. 1 m. The brickwork of the staircase was generally in good condition, and was still well bonded. The wooden treads however were very soft. Consequently they were not sampled.

Figure 65 Brick and timber stairs, seen from south

Eastern wall

The main east wall of the mill was situated along the eastern edge of the main construction cut, in Areas 3 and 4. It comprised of a linear construction cut, some stone, brick, timber and mortar structural elements, and some deconstruction or packing material (mainly brick fragments). It measured c. 22,5 m in length and maximum 0,77 m in width, with a maximum height of c. 0,7 m.

Figure 66 The remains of the eastern wall being documented. Seen from west

The foundation was constructed of large uncut stones, with some crushed brick and stone packing. Above this the wall had been constructed of brick, but survived only in patches. In some areas only the construction cut and some rubble remained. The majority of the wall did not survive; this appears to have been both due to a phase of deconstruction, as well as a later phase of robbing of material.

Possible internal wall

Another wall was located along the southwestern edge of the wooden floor in Area 3. It comprised of two related timber structures, a horizontal beam, and two uprights. It, measured 3,7 m long x 0,24 m wide and c. 0,3 m high. The horizontal beam was quite substantial, and had two large mortices cut into its upper side, to receive the tenons at the base of the two upright. The uprights only survived to a height of c. 0,2 m. It is not clear if this was solely due to rot, or if they had been deliberately broken/cut off in the past. This structure has been interpreted as the base of a wall, with the horizontal timber acting as the sill plate/beam. As so little survived, it is unclear if it was a timber-framed wall with brick panels, or if it was made solely of timber. It is likely to date to the early 17th century, based on its association with the other elements of the mill.

Pre-construction of the mill

Some pre-construction preparations for the mill building consisted of a levelling layer as a foundation for the wooden floor, located within the area of the mill building in Areas 3 and 4, at a level below that of the wooden floor. The deposits were very find-rich, and contained large amounts of building material (including bricks, floor tiles and many stove tiles). It contained ceramics (Late Redware, late grey ware, stoneware and Jydepotte), glass (both drinking and window fragments), iron nails, slag, window came, coins (where dateable, from between A.D. 1440 and 1513), a glass linen smoother fragment, mill stone fragments, whetstone fragments, an iron knife with bone handle, and a cannonball. Overall, the finds are consistent with a date in the late 16th or early 17th century.

Further mill construction elements

A number of parallel linear cuts were recorded under the mill floor, roughly perpendicular to the cut of the moat and also perpendicular to the brick mill wall. These may have held timbers as part of an earlier construction than the wooden floor, or indeed connected to the working elements of the mill in some way, perhaps containing horizontal wooden beams that would have extended out into the moat or mill pit. Individual cuts measured typically 1,1 m x 0,45 m, and were 0,2 - 0,3 m deep.

Figure 67 Linear cuts under the mill floor, seen from southwest

No timbers remained in situ, and the fill of the cuts is likely to have accumulated here when the beams were removed – presumably when the mill was demolished, or when the final floor was built. Finds recovered included a possible chisel, some nails, a stove tile and a piece of slag.

Located at the southeastern corner of the mill building in Area 3, a large cut (5,5 m x 2,75 m) and seven deposits were recorded. They appeared to represent the former placement of some kind of structure.

Figure 68 The construction cut, seen from northwest. Post-excavation.

Due to a high level of truncation the full extent and purpose of the structure are unclear, however, it does align with the mill building. The southern edge of the cut also appears to align with a short section of wall which was recorded in-situ further to the west. The precise extent of the southeastern corner of this cut is unknown due to truncation by a large pit.

A mortar deposit lined parts of the southern edge of the cut, and may be evidence for a former wall placement. Further mortar deposits spread across most of the base of the cut, and have been interpreted as a possible floor or floor foundation layer.

The upper fills were late 17th century in date based on finds (e.g. Late Redware pottery, window glass, CBM, wooden loom part) and were very similar to all the other waste backfills used to fill up the moat. This part of the mill building then seems to have been slightly deeper/lower than the rest. This may have been for functional reasons, which unfortunately are unclear.

The mill race

Located both northwest and south east of the mill itself, substantial parts of the mill race – or head race and tail race, were found in Areas 3 and 4. The head race is the part upstream of a mill wheel – at Rådhuspladsen this was the part to the northwest of the mill; while the tail race is the part downstream or after the mill wheel – at Rådhuspladsen this was the part southeast of the mill. The various parts of these structures will be outlined in the following sections.

The head race

The main head race structure was first seen in trench Z 6326 just northwest of Area 4, and later in Area 4 itself. It was not fully excavated in the watching brief trench. It was seen that the headrace had a number of phases, which did not function at the same time, but rather superseded each other. Due to the complexity of the structure, it will be described as it was excavated, with the later phase described first.

Figure 69 The mill head race, seen in Trench Z 6326 from southeast

In Z 6326 the head race was seen as a large wooden structure c. 5 m in width and 1,25 m high, with a base of stones set in clay (See Figure 69). The overall length of this structure as seen across all trenches was c. 39 m. The walls were composed of squared timber uprights, sandwiched between two planked faces, the inside one of which was waterproofed with felted textile along its joints. Between the two planked leafs or faces of the walls sand was packed, presumably to add to the structures water-tightness. The base comprised of large timber cross-beams at regular intervals, with the spaces in between packed with large stones set into sticky clay. This arrangement was probably both waterproof and unlikely to come apart.

Each wall was about 0,35 m in width, and the space between the two walls was 4,25 m. The walls survived to a height of 1,25 m, though they were surely taller originally. The base of the head race was c. 2,25 m below present ground level, and at a height of 4,22 m above sea level. It was filled mainly with lensed sand to a depth of c. 0,7 m; sand which was clearly water deposited. Some organic layers were found over this, and produced 17th century finds, including leather, wood and ceramics, as well as a Swedish coin from 1630. These upper layers probably date to when the mill and mill race were decommissioned.

About 3 m to the northwest a small trench was opened as part of the contractors work, and here a further section of the mill head race was seen, in the form of a vault of red bricks. When it was constructed originally, it may have passed under the city rampart, hence the need to be built in brick instead of wood.

Approximately 6 m southeast of Z 6326, the head race was seen again in Area 4. Here the excavation went to full depth, so a more thorough examination of the structure was possible. The upper part of the head race again had a wood-walled structure with a base of stones set in clay. In this area the structure was placed inside the arch of the brick bridge described in Phase 4, so that the water for the mill ran through the bridge. It is possible that the top of the arch was already removed by this time, but it is not a certainty.

Figure 70 The mill head race in Area 4, seen from northwest. Note concrete service truncation.

The dam and earlier sluice structure

At its south-eastern end a further element of the structure was seen, in the form of a brick wall that ran across the width of the head race, with timber planking placed on top (see below). Once the water passed over the top of this wall it would have dropped down vertically, on its way to the mill wheel. Hence the mill would have functioned as an overshot mill.

Figure 71 Brick wall, capped in timber, and slot for water, all placed within the bridge arch. Seen from southeast

The water would have fallen about 1,8 m. It seemed that some of the water may have been diverted through narrow slots in the wall just beneath the timber planking, presumably for reasons related to the

mill wheel (see image below).Upon removing the stone and clay base of the structure, it was discovered that under the wooden side walls there were yellow-brick built walls continuing downwards, of a construction-type similar to the wall crossing the head race, and these three walls appeared to have been built simultaneously. The walls may have been placed directly against the brick and stone walls of the bridge wall in order to guarantee the water-tightness of the channel. This was clearly an earlier phase of the head race to that described above. In order to build the next phase, dumped layers of material were placed within this structure to fill it up to the level of the stone and clay floor above, and in doing so deliberately decommissioning this earlier version.

Down the centre of this area between the walls, ran a narrow timber-built sluice, measuring c. 0,9 m in width and c. 0,6 m in height, and which passed through the dam. This sluice was constructed of pointed wooden uprights that were driven into the ground, with horizontal timbers connecting them in pairs. The remainder of the structure had been removed, but its original form could be seen where it passed through the brick wall or dam. Here it was more intact, and it had heavy wooden planks lining its base and sides, and also the top of the sluice, so that it was completely boxed in originally. Rubble material topped with sticky clay had been deliberately filled in around the sluice, up to the height of the top of the sluice, and then sloping upwards slightly upwards to where it met the brick head race walls (see photo below).

Figure 72 The lower sluice element of the head race exposed within the bridge arch. Seen from northwest

When the sluice was intact it would have been possible to close it off, allowing the water in the upper larger part of the head race to fill up to the top of the dam, where it would then spill over the top of the wall, and enter the mill from a height.

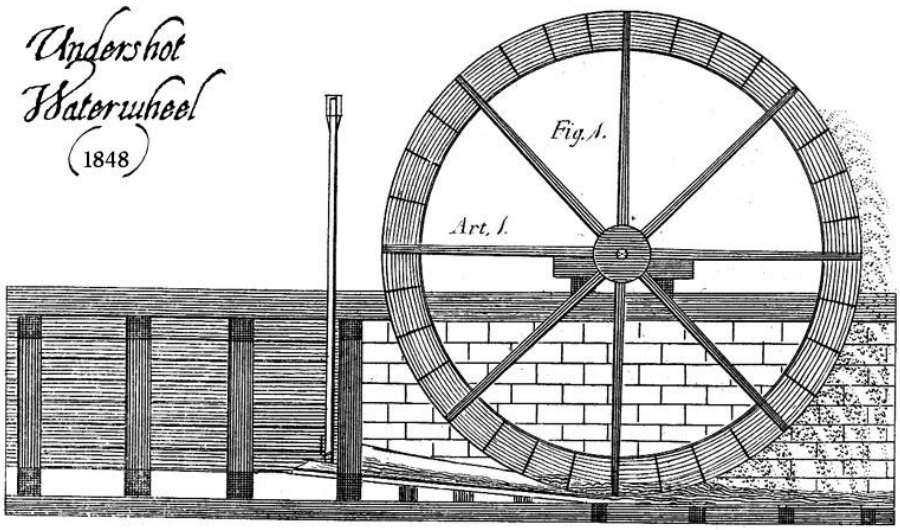


Figure 73 A depiction of an undershot millwheel from 1848 (http://www.engr.psu.edu/mtah/essays/threetypes_waterwheels.htm)

On opening the sluice, the water built up in the upper area would presumably be forced through the sluice with some force in a smaller jet, in order to power an undershot mill wheel. It seems that this system was not satisfactory however, and so at some point the narrow sluice was largely dismantled as we have seen. The opening in the dam was blocked with two upright planks, and the head race back-filled up to the level of the top of the dam, with the addition of the new stone and timber head race base. It is worth noting that the height difference between water flowing over the dam or flowing through the sluice was quite significant, at 2,4 m.

Several elements of the head race structures were dated using dendrochronology. Hence it is apparent that the lower sluice structure must have a construction date no earlier than A.D. 1620, and probably not much later than A.D. 1630. The upper larger and stratigraphically later head race, had timbers with possible date ranges from A.D. 1624 to 1693, but taken as a group, they appear to point to a construction date as late as A.D. 1664 or just after. This suggests a relatively short life-span for the earlier sluice-based head race of just 30 to 44 years. It also suggests that there was a significant attempt to improve the mills effectiveness shortly before it went out of use, which suggests either that the plan to upgrade the city's defences was conceived and implemented quite rapidly, or simply that those who ran the mill were not aware of these plans and were allowed to waste time and money upgrading a mill that would be dismantled within about 4 to 10 years.

Southeast of the dam timbers were seen which may in fact have been part of the mill itself. A number of dates were retrieved from these, ranging from A.D. 1612 up to as late as A.D. 1688. Taking the dates *en masse* however, it would appear that the structure in question was first constructed between about A.D. 1605 and 1610, with repairs carried out up to about A.D. 1660.

Figure 74 The lowest timber elements southeast of the dam

Two points should be made regarding the head race structure. It was clear during excavation that the upper head race and the lower sluice did not and could not have operated at the same time. The lower sluice had clearly been dismantled and filled in, along with the walled head race channel above it, prior to the construction of the upper head race; in fact this backfill formed the foundation for the base of the later headrace. It is also worth mentioning that the entire structure, or at the least the upper later version, was placed in a cut made into moat backfills, implying that the moat, in this area at least, was filled up prior to A.D. 1664, and probably prior to A.D. 1630 (the latter date would be considerably earlier than further southeast, downstream of the mill).

Tail Race related structures

A structure understood to be a revetment was located along the eastern side of the former medieval moat in the southern half of Area 3. It comprised of a stout timber structure of large upright posts (about 15 degrees off vertical) and horizontal planks, a construction cut for its placement, and a series of deposits which were upslope of or behind the revetment, dumped into the construction cut, and overlying it.

The structure extended beyond the trench to the southeast, and was truncated to the northwest by the toilet building construction. It was nearly 11 m in length as exposed, and including the deposits it measured c. 6 m in width. The upright posts themselves were quite large, measuring c. 25 cm x 25 cm in section, and on removal were seen to be c. 4 m in height (as they survived). They had been driven into the ground, deep into the natural clay, and were placed quite close together (c. 0,28 cm apart). This combined with the thick sturdy planks placed behind it, suggests that the structure was built for strength.

Figure 75 Revetment Group 317 (left), seen from northwest (see also Figure 77)

The revetment structure overlay the early alluvial fills of the moat. The north-eastern side of these posts was clad with overlapping horizontal planks. This was followed by the placement of a series of dumps and backfills (see below), an external surface stratigraphically post-dating the wooden construction but most likely sharing a contemporary phase of use. Finds from these deposits included ceramics, iron, glass, horseshoe, a whetstone, barrel hoops/staves, slag, clay pipes, knives, a cannonball, and a possible millstone fragment. The finds assemblage is consistent with a date of the late 16th/17th century.

Of 3 dendro samples taken unfortunately just one, from the planking, returned a date. This returned a date of A.D. 1616/17. The planking may of course have been replaced more often than the upright posts, so it may be that the overall structure is somewhat older than this date suggests. It is likely that it dates to about the same time as the original mill, to c. A.D. 1606. It is not clear if this structure at some point formed the side of the tail race along its eastern side, or if it was built to allow for the construction of the lighter canal/tail race structure to its west, retaining the clay and soil dumps of material which had been dumped in to the moats eastern side, to narrow down from a moat to a mill race.

A walkway or external surface was located along the east side of the former medieval city moat, south of the mill, in the southern part of Area 3. It extended beyond the trench to the southwest, and it seems likely that it would have lead up the side of the moat/tail race to street level. This surface was bound on its western side by the revetment structure. It measured 10,5 m (exposed) by 7,8 m.

Figure 76 The walkway, seen from west

Finds from these layers (Late Redware, Jydepot, stoneware, late light fired, knives, flint flakes, clay pipes, glass, stove tile, thimble, buckle, musketball, Christian IV coin) indicate an early to mid 17th century date, which would be contemporary with the construction and use of the mill.

A wooden structure was located downstream of the mill, on the eastern edge of the moat within Area 3, running down the side of the moat towards its centre, and measuring 3,85 m in length, and c. 0,5 m in height. It was solid enough to allow a sample to be taken for dendro analysis. It consisted of a just single plank and two stakes, and was oriented in a northeast to southwest alignment. While there were various attempts at water management and erosion prevention, this was the only structure of its type and orientation found in the former moat. It may have acted as a lightly-built water control/dam structure, presumably in connection with the mill (though it was found downstream of the mill and c. 1 m higher above sea level than the water as it exited the mill). Dendrochronological dating of one sample returned a date of c. A.D. 1605. This shows that it is contemporary with the first known phase of mill construction.

The Tail Race Structure

The main parts of the tail race comprised of a wooden floor and walls, the construction space into which it was built, and some sturdy timber structural elements that lead into the tail race from the mill itself. It also included some construction deposits, of stone, brick and rubble, placed to raise ground level for the end of the mill/start of the tail race. The structure was well built, and survived in good condition. The tail race was c. 5,3 m in width, and was seen to be at least 8,5 m in length. The wooden floor of the tail race only extended about 4,6 m however, but it may have originally extended further to the southeast.

Whether the tail race would have been timber-lined all the way to the harbour is unclear. 17th century mapping suggests a straight-sided and well-defined channel running from the western gate to enter the sea at Gammel Strand, running parallel to and just inside the city ramparts. This may suggest that the tail race was timber-lined all the way to the harbour.

Figure 77 Mill tail race, seen from southeast (note the revetment to the right)

A cut was made into the moat silts, within which a line of posts were driven, floor beams fitted around the posts; and a fill was laid between the floor beams. Horizontal planks were then nailed to the posts forming a sidewall; floor planks were nailed to the floor beams; and three phases of backfill were placed behind the (northeast) side planks. The tail race was built with a step down into it from the mill, presumably to channel the water away from the wheel as rapidly as possible to keep the mill working freely. On the upper side of the step were two huge horizontal beams of beech wood, that measured c. 6,5 m in length, and were each c. 0,4 m in width. These extended metres beyond the tail race to the northeast, and it is likely that they mark the division between the mill itself and the tail race. They were placed on top of the massive boulder and timber foundation platform discussed earlier and seen as the first stage of the mills construction.

A number of timbers from the tailrace, all of pine, were submitted for dendro dating. They ranged in date from A.D. 1591-1621 to A.D. 1610-1630. Taken as a group, they suggest a construction date in the early 1600s, with new elements added (repairs presumably) in about A.D. 1620 and again in A.D. 1627. There is no evidence for any further repair work after A.D. 1627, despite the fact that the mill appears to have been used for another 40 years or so. It may simply be that it was well maintained, and that the timber was in good condition (bearing in mind it was still in quite good condition in 2012). The timber was sourced in West Sweden or Southeast Norway, as well as Southwest Sweden, Gotland and Sodermanland, again in Sweden. This suggests that timber was being imported to Copenhagen from a wide catchment area in these years.

Deconstruction of the tail race

The decommissioning of the water channel/tail race was documented in the form of a series of substantial deposits in and over the tail race. The main layer consisted of rubble which was recorded as 'water rolled', which may suggest that the tail race was partially backfilled for a time while water was still flowing through it. This infilling must date to the late 17th century based on finds, stratigraphic position and written sources documenting the deconstruction of the fortifications and related structures from c. A.D. 1668.

Deconstruction as Construction

Defences and Mill Decommissioned

In the late 1660s, the process of changing the city's defences began once again, with the decommissioning of the Christian IV era moat and bastions, and all of the mill-related structures – in order to facilitate the construction of a new and more modern set of larger bastions.

Medieval gate deconstruction

A series of layers located in the environs of the inner gate (mainly between the walls), are thought to have related to the deconstruction of the medieval gate. They were mostly of sandy clay, with some rubble, mortar and charcoal. A shallow pit filled with rubble and stones, was also recorded adjacent to the former inner gate. It has been interpreted as part of the deconstruction of the gate.

A further series of deposits of sand, stones and bricks was seen mainly within the remains of the construction cut for the wall that lead from the west corner of the inner gate towards the bridge. These deposits of construction material were disturbed, and probably represented elements of the former wall that stood here, demolished and dumped back into the foundation cut. In the Swedish spy map of A.D. 1620 the inner gate was not depicted, though in the oldest map of the city from A.D. 1590 it was; whether this was simply an omission in A.D. 1620, or whether the gate was demolished within this 30 year period, is uncertain. Certainly it did not survive beyond A.D. 1670 or so when the mill etc. was demolished. We know this archaeologically, as the foundations of the inner gate were truncated in a substantial way by the placement of wooden waterpipes, which have been dendro dated to the winter of A.D. 1666/67.

Medieval moat decommissioned

The medieval moat, established no later than A.D. 1371/2, remained in use as a moat up until about A.D. 1600. In that time, the bridge was changed, posts were added along its inner edge, and various additional moat elements and bastion elements were added outside the medieval moat, over a span of more than 200 years. Finally a mill and mill race was constructed within it, in about A.D. 1605/06, with the moat being partially backfilled in order to narrow it, and raise its base. It was probably at about this time that the organic moat backfills seen in Trench Z 3064 were filled in to the moat.

These deposits were located to the northeast of the mill head race. Collectively, they measured c. 3 m in depth. They were dark moist peaty layers, and were very find-rich, with much pottery (Late Redware, German stoneware, Jydepot), glass, a whetstone, stove tiles, leather and general organic waste recovered. Animal bones were also plentiful, and included cow, pig, sheep/goat, domestic goose, hare and cat. Similar deposits were seen to the southwest of the mill race.

Some of the deposits were clearly manure waste from stables or similar, and smelled strongly of horse manure. Others seemed more like general domestic waste, though this kind of material could also have found its way on to the manure pile. This waste must have been collected from houses or streets in order to be used to fill in the moat. The finds suggest an approximate 17th century date. It is likely that these deposits were dumped here when the mill race was constructed in about A.D. 1606, and they must predate the general moat/mill backfill layers (see below) by about 60 years.

Road west from the medieval gate decommissioned

Two deposits were excavated in the west end of Area 4 that were composed of a mixture of re-deposited natural and occupation material. It is likely that these layers represented the deconstruction of the road west from the medieval gate. Finds included sherds of medieval pottery (Late Greyware and Early Redware) but also a sherd of green-glazed stove tile. It is likely, based on the other changes carried out in this area after A.D. 1600, that these layers were also deposited in this phase.

Outer gate, outer moat and bastion decommissioned

A series of substantial deposits, many of them organic in nature, were documented in trenches along the west side of the excavation area, i.e. the east edge of HC Andersens Blvd. These were interpreted as being backfills of the Christian IV era moat, and are likely to have been dumped in about the 1660s when that moat was filled in. In places the natural clay was encountered beneath this material, and was seen to slope down to the west, suggesting that the excavation trenches overlay the moats inner, eastern edge. Significant amounts of find material were recovered, including Late Redware, faience and glass fragments.

A series of dumps of rubble-rich clay were documented further east, also in the outer moat, in the environs of the outer gate. These deposits must date from the deconstruction of the upper elements of the outer gate and the filling up of the outer moat. These acts were carried out in order to prepare for the construction of a newer and bigger set of defences slightly further out from the city to the west. From what was seen on site and in older excavations, it seems that when the outer gate was deconstructed it was only the upper part that was dismantled, and the remainder was buried under the new bastion. When the youngest bastion was itself taken down in the late 1800s, these gate remains were exposed, and documented to a degree. They were then demolished further, as ground level was lowered to form the square now known as Rådhuspladsen. Finds were few, and generally post-medieval. These deposits must date to c.AD 1670, based on written sources which refer to the construction of the youngest moat at this time, and this is supported by the finds retrieved.

Figure 78 Possible rampart and moat deposits seen from west

Large dumped deposits were seen in a watching brief trench (Z 3444) towards the south of the site, early on in the excavation. They were mostly quite organic, and sloping downwards from east to west. The layers in question can be seen in Figure 78, and it can be seen that there were some very organic layers sitting over a very sterile sandy clay layer, with repeated washes of material coming off of the sterile clay onto the organic material. It is possible that what we see here is part of the rampart (the sterile clay) and some of the natural build-up of humic material on the base of the ramparts and in the moat (the dark material). The repeated lenses of grey washing over the dark material appear to be evidence for the grey material being washed over time by rain, out over the dark material, suggesting that it was the exposed surface of the rampart for some time. Overall it seems most likely that this rampart dates to about the Christian IV era (c. A.D. 1600).

Mill and Mill Race deconstructed

Located in the northeast part of Area 3 and the southeast part of Area 4, elements of the dereliction and in particular the deliberate deconstruction of the mill building by Vesterport were identified. They were spread over a sizeable area (c. 19 m x 7 m), and two separate excavation areas. Almost all of the deposits contained material such as mortar or brick rubble, as well as glass and tile fragments, and were consistent with the kind of material one would expect to remain following the deconstruction of a building. Once no longer in use, the building was demolished its interior was filled up in order to level the area. This meant that the primary deconstruction layers were preserved in-situ beneath the more organic dumps of urban waste used to level the overall area subsequently.

It is likely that these deposits accumulated over a short period of time during the abandonment and deconstruction phase of the mill. A few localised pieces of the mill wall survived, perhaps where the bonding was simply too strong, and it is because of these that we know how the wall looked. These deposits date to the latter half of the 17th century. This dating is based on the finds recovered in the deposits, which are consistent with such a date, and is further backed up by historical references.

A series of nine deposits were located in the northern part of Area 3 and southern part of Area 4, and overlay the mill floor. They measured c. 17 m in length x c. 4 m in width, with a depth of up to 0,4 m. Two of these are interpreted as abandonment deposits, and related to the time when the mill building was beginning to collapse during its dereliction. The remaining deposits are more likely to have resulted from deliberate deconstruction, and contained more mortar and brick material. These layers were very rich in finds, and contained much ceramics (mostly Late Redware), glass (both window, flask and bottle fragments), many decorated stove tiles (thought to be from one stove), nails, a chain fragment, a knife with a bone handle, a chisel, a saw blade, a hinge, copper alloy pins and some clay pipe fragments. No fewer than four silver coins were recovered, with dates between A.D. 1625 and 1650. The dating of the coins may suggest that they were lost during the latter years of the mills use.

Figure 79 An example of the many stove tiles found in the mill abandonment deposits

These deposits represent the final phase in the life of the mill. Some of the dereliction type deposits in particular may give us some indications of the kind of materials used in and as part of the mill itself.

A 'robber cut' (a cut made to access and remove structural material for reuse) and its backfills were observed along the north-eastern edge of the mill building, made when the eastern wall of the mill was removed to its base, presumably with the aim of reusing the masonry material. The overall cut ran in a northwest-southeast direction within Area 3 and Area 4, overlying the eastern edge of the mill building. It measured 22,4 m in length, with a maximum width of 2,2 m and a maximum depth of 0,48 m. As the robber cut was made through deposits that relate to the abandonment of the mill, it seems likely that the mill had been in a state of disuse and decay for a period of time prior to the formal deconstruction of the building. The robber cut also truncated the wooden floor of the mill, removing its eastern edge. This cut appears to date to the late 17th century, based both on the finds material from the deposits dumped into the robber trench and historical references.

Further linear cuts were located near the northeast corner of the mill building in Area 4. The most significant element of the deposits within was frequent inclusions of brick fragments, including some pieces that were still mortared together. It appears that these were foundation cuts, probably of a small building or annexe attached to the northeast corner of the mill, rather than the mill itself.

<u>The final in-filling of the moat and mill race</u>

An enormous series of dumps (labelled Group 200) was located within the moat in Areas 3 and 4. 109 deposits were considered part of this act of dumping. Within the excavation area they measured up to 42,5 m in length and 26,5 m in width (across the moat). Together they measured c. 5 m in depth. The deposits varied in form, colour and shape. They ranged from pockets of sterile clay and sand, to more frequent and larger deposits of dark organic-rich material, sometimes mixed with sand, silt, clay or rubble. These deposits were very rich in cultural material.

Figure 80 Moat backfills during excavation, February 2012

Given their varied nature, it seems likely that the layers were tipped from carts or barrows from the edge of the former moat/mill/mill race during a fairly rapid deliberate process of in-filling. Located as they were in a deep and damp cut feature, the conditions for organic preservation were ideal, and consequently a huge range of material survived (wood, leather, textile, plant matter etc.).

Figure 81 Leather book cover from the moat backfills

The range and quantity of finds recovered from the moat backfills was very great (see below). As well as ceramics, glass and metal artefacts, large amounts of organic and composite artefacts were recovered, many of which were quite high status.

Figures 82 and 83 Gold ducat and doctor's stamp from the moat backfills

One find worth particular mention was a Frederik III gold ducat from A.D. 1660, though this item was surely a casual loss rather than deliberately dumped. A huge amount of environmental evidence was retrieved, seeds, nuts, fish and animal bones, and snail shells. The finds have been looked at by a range of specialists, and have contributed greatly to our understanding of 17th century Copenhagen. An examination of the clay pipes for example, where dating based on typology was possible, has shown that these deposits were dumped in to the moat in a relatively short time, with no particular pattern obvious. The clay pipes dated to between A.D. 1630 and c. 1700, but generally cluster around A.D. 1670 to 1690. Furthermore, some of the deepest layers produced pipes that dated to as late as A.D. 1670, while some late deposits produced pipes with date ranges from A.D. 1660 to 1685. Fifteen coins and tokens were recovered from these deposits, and dated to between A.D. 1628 and 1680. Their dates and relative stratigraphic positions also support a later 17th century date.

Overall, the mixed up nature of the finds through the deposits suggests that most layers dumped in to the moat were probably laid down between c. A.D. 1675 and 1685. This ties in quite well with the historical references, which suggest that the mill went out of use sometime between A.D. 1668 and 1674, when the miller was compensated for the loss of his mill due to the alterations to the city bastions.

Many samples were taken from these deposits, both environmental samples and large samples for sieving. The results of processing these has added to the overall picture in terms of the range of artefacts, bone and plant material that were in the deposits, including small items that might not have been seen on site. The material dumped here was clearly urban waste, both domestic refuse and waste from streets, squares, workshops and stables.

Figure 84 Moat backfills exposed in Area 3, from northeast

These deposits represent the final major phase of activity within the original city moat, though by the time it was filled up in this way, it was of course no longer acting as a moa, but rather as a mill race connected to the mill. The filling up of this channel should be seen as a deliberate act of organised deconstruction.

Figure 85 Moat backfills seen from south

Table 2 Find types from the moat backfills (Group 200): (selection)

Ceramics	Majolica, Faience, Jydepot, Late Redware, Late Greyware, Stoneware. Also clay marbles, clay pipes and a ceramic lamp.
Glass	Window shards, bottle, drinking glass, vase. Rohmer glass, Pass glass.
Bone	Animal bones. Artefacts, needles, combs (c. 20 of bone, antler, horn), elephant ivory handle.
Iron	Spoon drill, cannon balls (3), keys, knives, knives with bone handles, axe blades, saw, candle holder, frying pans, file, hammer, nails, wire. spurs (x 3
Other Metal	Musket balls, Barrel tap, slag, scabbard, Cu. pins, cloth seals, bridal fragments, snuffle bit, riding), rapier handles, book clasp, window cames, lace chape, lead fragments, Cu. thimbles, Cu. head-dress frames, Cu. buttons, coins (including Frederik III 1 and 2 skilling, and gold ducat, and a Christian IV 2 skilling, tokens/jetons, belt buckles, toy halberd, fish hook, candle snuffers.
Leather	Shoes, book covers, scabbard, gloves, cut offs (waste pieces)
CBM	Stove tiles, floor tiles, roof tiles, wall tiles, bricks.
Cutlery	Knives, wooden spoons, iron fork fragments, Cu. spoons, silver spoon.
Wood	Barrel staves, barrel lids, brooms, plates, bowl, gaming piece, pulley, money box, buttons, gear wheels, lace making tools, awl.
Textiles	Wool, silk, twill, velvet, lace, net, felted wool. Hairnets, wig, cap, rope, socks, cardigan, jacket fragments, gloves.
Various	Mineral seal/stamp, stone styli, gun flint, cowrie shells, lejesten (mill axel-stone), mill stone fragment, bracelet (wire and glass).

Figure 86 Leather glove from the moat backfills

A series of extremely organic deposits were documented in trench Z 3465 in 2011, stratigraphically and physically under the late 17th century gatehouse/guardhouse. It was considered likely that these were moat backfills, and when the nearby Area 3 was later excavated it was seen that this interpretation was correct. These deposits were also extremely find-rich, with a vast array of metal, ceramic, glass and organic finds retrieved. Three coins were found in this group (some from sieving), and these dated from between A.D 1621, up to the 1660s. This ties in well with the moat being backfilled shortly before the final fortifications (and gatehouse) were established, in about the 1660s. These deposits are directly comparable with and presumably contemporary with, the upper layers see in Areas 3 and 4.

Other features in Phase 5

Isolated features

In the eastern corner of Area 2B, a feature interpreted as a possible linear surface (road, or path) was identified. This surface was set in a shallow cut, made into the natural clay beneath, and comprised of small rounded cobble-like stones, set in an informal way into the natural clay beneath. Very little of this feature survived. It is also possible that this feature represented a drain of some form. Finds were mainly ceramic, and post-medieval in date, with a 17th century date likely.

New infrastructure – waterpipes

From the 16th century, a citywide investment was made in a municipal water system, which saw water pumped into the city through wooden waterpipes. These waterpipes were essentially tree trunks that were mechanically hollowed out. They were connected end to end, bringing the water several kilometres to the city from various sources. The pipes were generally placed in trenches, which were then filled in, meaning that they were not visible on the surface. Within the city they generally followed the streets, and in many cases probably started on peripheral streets such as Vester Voldgade, before having side pipes connected to them to take water down the various side streets. A gravity feed was used in some cases, with the water

coming from a more elevated source outside the city, but a second system of pumped water was constructed in the 17th century, and soon became the more popular of the two (Topcagic, 2014).

Located in Areas 3 and 4, a set of four such waterpipes were documented running parallel to the former city moat. These were found in a vertical-sided trench cut, and were covered in a mixed backfill. The cut was made through the foundations of the former medieval gateway, which shows that this was surely demolished by this time as the level of truncation caused by the waterpipe trench was quite severe. There was a height change, dropping 0,2 m from the north-west to the south-east indicating that the water flowed in this direction. The pipes had an internal bore diameter of c. 11 cm, which suggests that these pipes were part of the main water network, rather than being part of the system that lead from the pump to the main water network (these pipes would have a narrower bore diameter of c. 8-9 cm (Topcagic, 2014). This was a major water pipe construction, and had a much later set of waterpipes running adjacent to it (see Figure 87). The location of these pipes suggests that waterpipes would have run inside the city defences, following a route corresponding to modern day Vestervoldgade.

Figure 87 Below left: Waterpipe s cutting through the medieval gate foundation, seen from northwest

Figure 88 and 89 Evidence for cleaning of wooden pipes

The finds and stratigraphy suggested an approximate mid-17th century date for these pipes. Two dendrochronology dates were retrieved, and both were from the winter of A.D. 1666/7. These pipes either pre-date or coincide with the 'closing down' of this area, the deconstruction of the mill and filling up of the former moat. Indeed it was clear during excavation that the backfill of the mill and moat overlay this pipe trench; hence it was definitely laid down before the area was backfilled with urban waste. It is even possible that the pipes were placed here as part of the same large scale phase of works that saw the mill decommissioned and the area prepared for the placement of the new bastion and ramparts.

Located just east of the outer gate in Area 2, and running in a southwest-northeast direction towards the gates southeast corner, was a single wooden water pipe. The cut had been made through the backfilled moat deposits to the east of the gate, and the fill was probably the same material dumped back in to the trench. It is thought that this part of the moat was filled in already by about the early 1600s, so this pipe cannot be older than this. A dendrochronology sample was taken, but a date could not be retrieved. An iron ring joint was seen on the eastern extent of the pipe although the next pipe was absent. This could in theory have been the end of the pipe, either simply spilling in to the moat, or possibly feeding a pump at this location. It is considered likely that the outer gate was in use at the same time as this pipe, and that it was being supplied by the pipe.

Another waterpipe system consisted of a construction trench, a heavily decayed wooden waterpipe and a backfill deposit, running in a northwest to southeast direction across the site, and seen in three trenches. Separate parts of this pipe were identified over a distance of 42 m. The pipe trench cut through the deposits placed around the late medieval bridge and also the actual side walls of the bridge itself, which had had holes punched through them for the pipe to pass through. As these holes seem to have been made quite roughly and with no repairs to the brickwork subsequently, it seems likely that the bridge was no longer in use when the pipe was placed here.

One dendrochronology sample was taken from this pipe, but unfortunately due to the decayed and partial nature of the wood, it was not possible to retrieve a date. Taking the stratigraphic evidence into account, it seems most likely that this pipe post-dates A.D. 1600, and probably predates A.D. 1670.

Phase 6 The final phase of fortifications – c. A.D. 1670– c.1860

Main structures: moat, wall, gatehouse/guardhouse foundation, wooden water pipes

Introduction to Phase 6

Phase 6 at Rådhuspladsen saw a series of alterations to the defences and infrastructure at the western edge of the city, changes which reflect the further modernisation of Copenhagen's western defences, and also the advancement of more large scale civilian infrastructural developments, particularly the water pipe system. The changes to the fortifications were very significant in scale, and saw the replacement of all previous defences in this area with new massive 17th century type bastions and moat. The possible reasons for this may relate to a desire to keep up with current trends in urban defence, as well as an increased need for defence, particularly given the ongoing political climate with regard to Sweden.

The new fortifications were very broad, very regular, and very much in line with fortifications in use elsewhere in Europe by this time. As well as traces of the earthworks, elements of the wall leading from the gate to the 17th century bridge were encountered, as well as the foundation of the former gatehouse/guardhouse. Evidence was seen for the ongoing establishment of wooden water pipe lines through the area, both expanding and upgrading the system already in place. Evidence for their maintenance and possibly repair was also seen.

Some traces were also seen of the deconstruction of many of the fortification elements in the latter part of Phase 6, including the moat and the gatehouse/guardhouse. The traditional form of urban defence – moat and ramparts or wall in close proximity to the city – had become obsolete by the 19th century, mainly due to developments in warfare. The defences near the western gate – which could have remained even if obsolete – were removed to open up of the western boundary of the city, allowing expansion in that direction, and also allowing for the future creation of a new square in this location.

Phase 6 Description

The sixth recognised phase of activity at Rådhuspladsen corresponded approximately to the later post-medieval period (between about A.D. 1670 – 1860), and saw a final and very large-scale re-development of the city's defences in the environs of the western gate. The defences were modernised and upgraded, in line with changes elsewhere in Europe, with an emphasis on the construction of a broad moat and ramparts, which required the fortifications in this area to be pushed out even further to the west. For this reason much of this moat lay outside of the excavation area at Rådhuspladsen, as it had been moved so far out of the city. The ramparts themselves would have been located within the excavation area, but had been almost entirely removed in the past. Elements of the associated gateway were identified however, along with parts of the associated gatehouse.

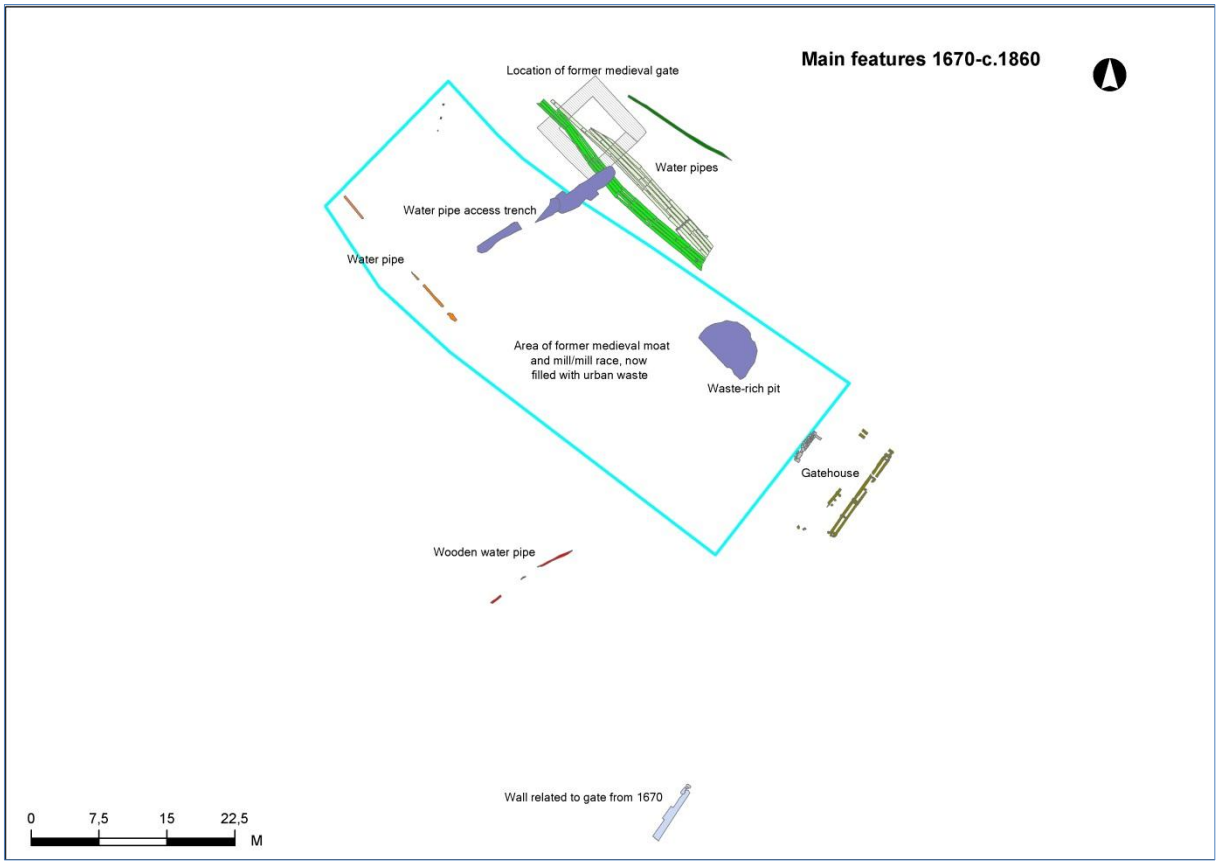


Figure 90 Phase 6 main features

The post-medieval remains seen at Rådhuspladsen were heavily impacted by later activities in the area such as modern service trenches and bunkers, but also by the deliberate levelling out of the ramparts and in-filling of the moat as part of their deliberate removal, along with the creation of a new square in the late 19th century. The types of features excavated that can be dated to the later post-medieval period include new moat elements, gate or bridge related elements and evidence for the associated guardhouse, as well as evidence for the deconstruction of all of the above. Several water pipes were also recorded from this period, and a range of pits, dumps and miscellaneous other features. This phase primarily consisted of large scale structures however, mostly indicative of defence.

Fortifications

During Phase 6 of the site (AD 1670 – 1860) the final version of the city moat and bastions was established, and by the end of this phase had already become obsolete and was being dismantled. These developments will be outlined in the following sections.

Moat and Embankments

Phase 6 at Rådhuspladsen began with the establishment of an entirely new set of fortifications around this part of the city; a vast construction project carried out to modernise and upgrade the cities defences. This project would also see the fortifications moved further out from the city, with very broad ramparts, and a very wide moat. While this moat was in most areas back-filled and the rampart levelled out in the latter

decades of the 19th century, some elements of both have been preserved in localised areas, in parks (Ørstedsparken, Botanisk Have, and Østre Anlæg) and in the grounds of Tivoli. Very little of the actual moat and rampart from this period was seen at Rådhuspladsen; this is because the rampart was later removed very thoroughly, and the moat was located largely beyond the limits of the archaeological excavation.

Located to the south of the main excavation area, two deposits and a possible cut were identified which have been interpreted as representing moat backfills. It is likely that these deposits were placed here in the later 19th century, when the fortifications were taken out of use. These layers were seen in a small trench and were seen to extend beyond the limits of the trench. Hence little more can be established about their nature. They were seen to have a depth of at least 0,6 m. They comprised of both sterile clay and dark organic clay.

Some 15 m north of the deposits discussed above, another small trench revealed probable dark moat backfill, located just 0,7 m below modern ground level. There was some uncertainty, due to its location, whether it should be seen as backfill of the 1670s moat (laid down in the 19th century), or if it could be backfill of the previous moat, filled up in about the 1660s. No evidence was found to answer this question, so it remains uncertain. Located along the extreme western edge of the overall excavation area, a number of dark find-rich deposits were identified that appeared to be moat backfills. These must have related to the backfilling of the latest moat in the later 19th century.

Overall very few traces of the 1670s bastion, rampart and moat were seen during the excavation. It should be borne in mind however, that it was not expected that much of this phase of fortifications would be encountered.

Western Gate related structure

A number of structural elements were seen which were interpreted as being part of, or at least related to, the city gate (Vesterport) built in about A.D. 1668 and torn down in the 19th century. Seen in a narrow trench at the beginning of the Rådhuspladsen excavations in 2011, the remains of a redbrick wall were found, placed quite centrally in the square, and with a southwest-northeast orientation. An examination of available mapping and some illustrations from the 19th century suggest that this wall, based on its form, was almost certainly part of the flanking wall which led from the gate out towards the bridge over the moat, connecting the two structures.

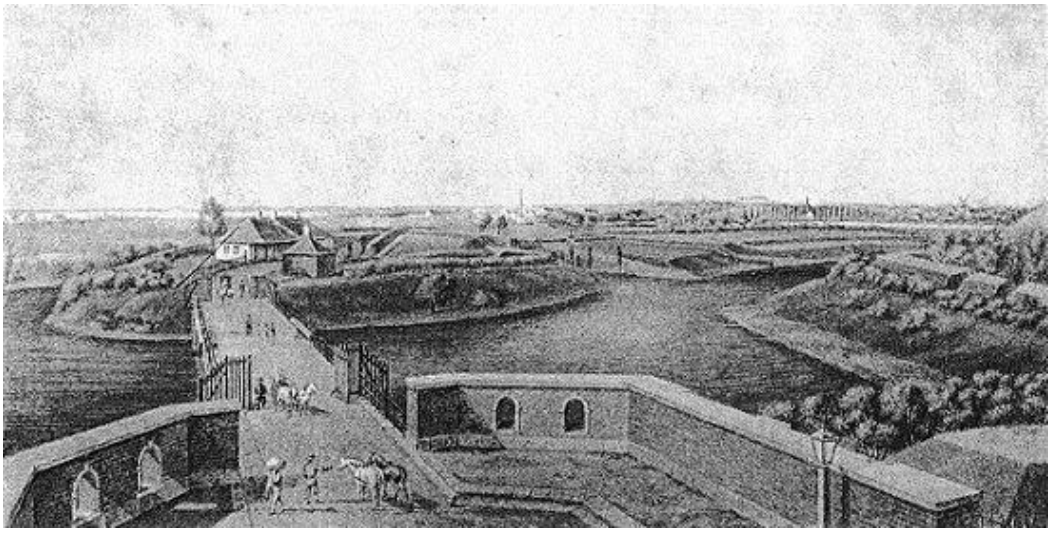


Figure 91 A depiction of the flanking wall by Vesterport, painted by F.L. Bradt (c. 1800) and reproduced by F. Hendriksens (Dansk Centre for Byhistorie)

The wall survived up to five courses in height, and in some areas foundation stones were observed. Two deposits were also recorded, which are likely to have been foundation layers for the wall.

Figure 92 The outer face of the wall (from north).

The wall remains were not very deep below the modern ground surface of the square, so it is likely that any future work on the square might expose further elements of this wall and the associated gate foundation. The part seen in 2011 however, was removed during the laying of services in the trench. A series of five deposits were documented immediately adjacent to the west side of the wall. These were generally quite mottled deposits with a lot of brick fragments, mortar and stones. They have been interpreted as relating to the deconstruction of the wall and perhaps gate, and as such are likely to date to the 19th century.

Gatehouse/Guardhouse

A number of elements of a building were documented c. 31 m northeast of the wall outlined above, in the direction of present day Strøget. This building has been interpreted as being the remains of the former gatehouse or guardhouse, located just to the north of the inner side of the western gate. This structure is seen on a number of paintings, and its size and position as seen on site seems to correlate well with these. It would then be considered likely to date to about A.D. 1668 or shortly after, when the western gate was constructed. Dendrochronology dates (see below) point to a likely construction date of c. A.D. 1677 however, suggesting that the gatehouse was built some years after the gate itself.

The larger and main part of the gatehouse was seen in a linear watching brief trench, while a further element, a probable annexe to the rear of the building, was seen in the adjacent southeast edge of Area 3. Both structures survived as foundations only. The two elements were constructed in quite different ways. The foundation of the main structure was constructed from a number of different elements. Firstly a linear foundation cut was made into the soft organic moat/millrace backfills below, then a series of foundation piles were driven down through the base of this cut and in to the soft layers below. These were placed in sets of three, each set taking up the width of the base of the foundation cut.

Figure 93 Foundations seen in section, from northeast

The piles (all of oak) were each 1,25 m long, placed between 2 m and 3 m apart along the base of the foundation cut. On top of the outer piles and supported by them, linear beams were placed horizontally within the foundation cut, running parallel along its edges with a row of sizeable stones placed in the gap in between. Finally clay was packed into the foundation cut around all the elements, to hold them together. The top of the foundation was at a height of 5,05 m above sea level.

Figure 94 Part of the timber and stone foundation

Cross-pieces were also seen; these were shorter wooden pieces that linked the two sides of the timber linear foundations, and it may be that it was on top of these that the timber frames of the walls above would have rested. As these did not survive however, we cannot be certain. The main building was quite substantial, measuring almost 13 m in length, and almost 5 m in width. Four dendrochronology samples were taken, and returned dates of as early as A.D. 1651, and as late as A.D. 1692 +/- 15. However, taken as a group, they appear to suggest a construction date for the building of somewhere between A.D. 1677 and 1685. The timbers used originated in Halland in Sweden.

Figure 95 The foundation of the possible fireplace. Seen from southeast

A further smaller section of foundation found within the building may have related to an internal wall, or perhaps to the placement of a fireplace and chimney at the centre of the building (see above). It was built in the same basic style as the main structure, with wooden piles and horizontal wooden beams. Some similar gatehouses survive in Copenhagen today (for example on the ravelin between Christianshavn and

Amager), and show how the upper elements of this building might have looked – though of course to what extent these buildings have been rebuilt and repaired over the last almost 350 years is uncertain.

An element of a probable rear-annexe to the gatehouse/guardhouse was seen in the south-eastern edge of Area 3. This comprised of a foundation cut into moat/millrace backfills, and a combination of stones and broken bricks laid within to form a foundation, upon which was placed a brick and mortar laid foundation.

This structure measured 3,8 m in length, and would have extended c. 3 m out from the main gatehouse/guardhouse. Given the fact that this structure is smaller than the main structure and built in a different way, it is likely that it was a later addition/extension to the building. Hence we cannot say precisely when it dates from. Its function is also unclear; it may have acted as a storage area, or it may simply reflect a need for more space within the building.

Figure 96 The annexe structure seen from northwest

Infrastructure

In Phase 6 of the site (A.D. 1670 – 1860) the infrastructure in this area was improved in a number of ways, most obviously of course in relation to defence, but also in non-defence related ways. Perhaps the most important of the improvements was the expansion of the water system, with many new water pipe lines established.

Water pipes

Wooden water pipe lines were being established in Copenhagen since at least the 1600s. The years after A.D. 1670 saw the renewal and expansion of this system in the Rådhuspladsen area, and thanks to dendrochronology dates, we can outline these developments and their chronology with some confidence.

A set of four pipes was described in the previous section, running more or less parallel to and along the edge of Vester Voldgade. That set of pipes was dated to c. A.D. 1667, and was probably established around the time the mill was decommissioned. Located directly beside these pipes, a second set of five wooden water pipes was discovered running in an almost identical alignment. While the older pipes were clearly

sealed by the backfilling of the mill/moat, with the cut for the pipe-trench only appearing when these dumps were removed, these later pipes were apparent much earlier in the excavation, and were clearly cut through the moat backfills.

These pipes had a vertical sided trench cut. This contained the five water pipes, one of which was placed under the others, and which did not continue beyond the boundary of Area 3 and 4. The reason for this pipe not continuing is not clear, but it may suggest that some of the pipes were replaced at some point, with the old pipes sometimes being left in situ in the trench. Approximately 24,5 m of the pipes length was exposed during the excavation at Rådhuspladsen. Laid over the pipes was a mixed backfill deposit, very similar to the moat backfills, but looser and more mixed.

Figure 97 The later water pipes (on the right) seen from southeast

A re-cut of the pipe trench was seen in Area 3. This re-cut was shored with timber which had been left in situ, and appears to point to some sort of repair work carried out in this area. These pipes were notably bigger than the older version, with broader diameters (0,35 m – 0,4 m). Another notable difference was that these pipes had had their bark removed, whereas the older pipes still had much of their bark attached. Both sets however, had an internal bore diameter of c. 11 cm, which suggests that these pipes are part of the main water network, rather than being part of the system that lead from the pump to the main water network (these pipes would have a narrower bore diameter of c. 8-9 cm (Topcagic, 2014).

These pipes were probably laid as a replacement or perhaps an addition to the older set recorded immediately to the west. A further possibility is that one line might represent ‘pumpevand’ (pumped water), while the other might be coming straight from the source. Both pipelines ran along Vester Voldgade, using the open street as it would be easier to dig up. Dendrochronological analysis indicates a felling date of winter 1822-1823, suggesting that these were one of the later sets of water pipes in the city. This timber was identified as having originated in Småland in Sweden.

Figure 98 Timber shoring in situ, possibly for accessing the pipes to carry out repairs. Seen from south

Located in the northern corner of the excavation area in a watching brief trench, a single wooden water pipe was seen early on during the excavation at Rådhuspladsen. It was placed in a vertical-sided, flat-bottomed trench cut, which was back-filled with mixed material. The pipe measured just 0,24 m in diameter, while the hole in the water pipe had a diameter of 12 cm. The trench and pipe ran in an E-W direction, perhaps towards the west end of Vestergade. No date was retrieved; however based on the form of pipe and as it still had bark attached, it can be tentatively suggested that it is relatively old, perhaps 17th century or a little later.

Seen in different trenches across the site at Rådhuspladsen, the various pipes likely dated to post-1670 suggest an increasing need or desire to have fresh running water in the city, and points to a city-wide level of organisation and planning to ensure this. We have seen from the dates retrieved at Rådhuspladsen that as early as A.D. 1590 wooden pipes were being laid beneath the streets of western Copenhagen, and that this process continued in a technologically similar way until at least A.D. 1822/23.

Water pipe access-trench

A linear trench thought to relate to accessing some of the wooden water pipes was documented in Area 4. The trench was located in the eastern half of Area 4, running in a roughly southwest-northeast direction. It consisted of a linear trench dug presumably dug for the purpose of maintenance of the pipes. The northeast terminus of the trench exposed the top of four wooden water pipes which ran at 90 degrees to this trench. These had not been damaged in any way, (though the bark was missing here) and there was a wooden peg driven in to a drilled hole on top of each, located centrally in the trench - suggesting possible maintenance work. However, the reason for the extension of the trench to the southwest is unclear. It may be that there was uncertainty as to exactly where to find the pipes, or that the trench was dug to access the pipes, which were then tapped, and that the purpose was in fact to use water from the pipes. The trench

appears to lead toward the water canal, and though the mill must have been out of use by this time, the millrace might have been kept open somewhat longer.

The cut was filled with similar material to the backfills of the mill and moat, and probably was mainly the material that was dug through while making the trench. The fill was very rich in finds, which generally dated to the late 17th century, including faience and china. It also produced hundreds of fragments of clay pipes, particularly stems, which generally appeared to be unused. The trench appears to date to the very late 17th or early 18th century based on the finds assemblage, and was clearly one of the latest archaeological features in Area 4.

Figure 99 The access-trench seen from northeast

Other Features

Pits

A number of pits have been dated to the period after A.D. 1670. One example located within the eastern edge of the former moat/mill in Area 3, consisted of a large circular cut. This pit was cut into the already back-filled moat/mill. It was subsequently filled up with a large amount of waste material, mainly organic waste, but with a large amount of cultural material. This material included many high status objects, more than in the moat back-fills, and it may be that this pit was filled with the household waste from a nearby wealthy household. It is probable that the pit held a high concentration of either (or both) latrine waste or animal manure. There was evidence suggesting periods of flooding or slumping occurring while the pit was in use.

Figure 100 Wig (FO 205962) found in the large pit

Figure 101 The large pit post-excavation. Seen from northwest

This pit dated to the late 17th century, post-dating the backfilling of the mill/millrace/moat, suggesting that it dated to after A.D. 1670. The dating is also based on the artefactual evidence from its fills. Indeed some of the clay pipe fragments recovered point to a date of at least A.D. 1690, or perhaps slightly later. The backfills in the moat may have been somewhat 'sanitised' by this time, whereas the material dumped into this pit was fresh 'unclean' waste, which required burying. Another possibility is that the cut itself was the significant element, that perhaps a structural element of the mill, previously left in-situ, was uncovered and removed – though this scenario seems unlikely.

Figure 102 Spur (FO 206642) from the large pit, post-conservation

Artefactual material recovered included textile, leather (including shoes and a hat), clay pipes, wood chips, straw, animal hair, kitchen utensils, combs, horseshoes, a cannonball, tokens, a buckle, a metal stylus, scissors, nails, pins, nuts, sea shells, animal bones, bucket staves, a glove, a wig, an iron key, a spur and drinking glass fragments. Samples were taken from the main fill, one large sample for sieving, and two environmental samples. Dietary information recovered from these showed the presence of walnuts and hazelnuts, while a huge amount of animal bone was recovered, including haddock and ling, goose, hen, duck and swan, cattle, pig, sheep, goat and red deer (antler only), as well as cat and horse. Many cattle and sheep horn fragments (as well as the antler fragments) are thought to be evidence for horn-working, but overall the bone assemblage reflects a domestic assemblage.

Phase 7 The modern city – A.D. 1860- present day

Main structures: air raid shelters

Introduction to Phase 7

Phase 7 saw ongoing activity around the square, mostly related to landscaping and the placement of various modern services. Traces of some of this activity were documented to a degree during the excavation, because of the impact they had on archaeological features, and in order to explain the condition of the impacted archaeology.

Also documented in Phase 7 were a number of air raid shelters. These offered a glimpse of an occupied city at war. Given the increasing interest in conflict and battle-field archaeology, it was deemed appropriate to treat these structures as archaeologically and historically interesting, and hence they were documented – albeit briefly. The construction of these structures had a quite severe impact on the earlier archaeological features.

It is worth bearing in mind that the air raid shelters constructed during World War II were in a sense the modern equivalent of the city fortifications, defence for the urban population in an era when enemy attack could no longer be kept out with the use of physical barriers on the ground. The shelters were in a sense the last resort, not so much urban defence, as places of temporary refuge to be used while the city itself might be destroyed overhead.

The underground toilet building, also constructed in the 1940s, was still in use up until early 2011. This building also had a major impact on the archaeological features, particularly the former mill. This building was not documented archaeologically, but can be seen on many of the site plans, as the blank area at the centre of the main excavation area, and in some of the photographs.

Phase 7 Description

The final recognised phase of activity at Rådhuspladsen relates to the modern period, from c. A.D. 1860 up to the present day. In this period the square known as Rådhuspladsen was established, and later saw both the placement and removal of a tram system, and in more recent times the construction of a bus terminal. Some of these events were recognisable in the archaeological record, such as the construction of a number of air raid shelters during the 1940s, and an underground public toilet building that would remain in use right up until the beginning of this excavation in 2011. The defences had, prior to this phase, been removed in this area, though more modern fortifications were instead established far outside the urban area.

Despite their modern nature, the features found at Rådhuspladsen from this period, particularly the air raid shelters, contribute to our understanding of Copenhagen, and indeed its defence, during this period. The modern remains seen at Rådhuspladsen heavily impacted earlier features in the area such as the post-medieval mill structure and the outer gate, but left behind interesting traces of more modern activities in the urban area.

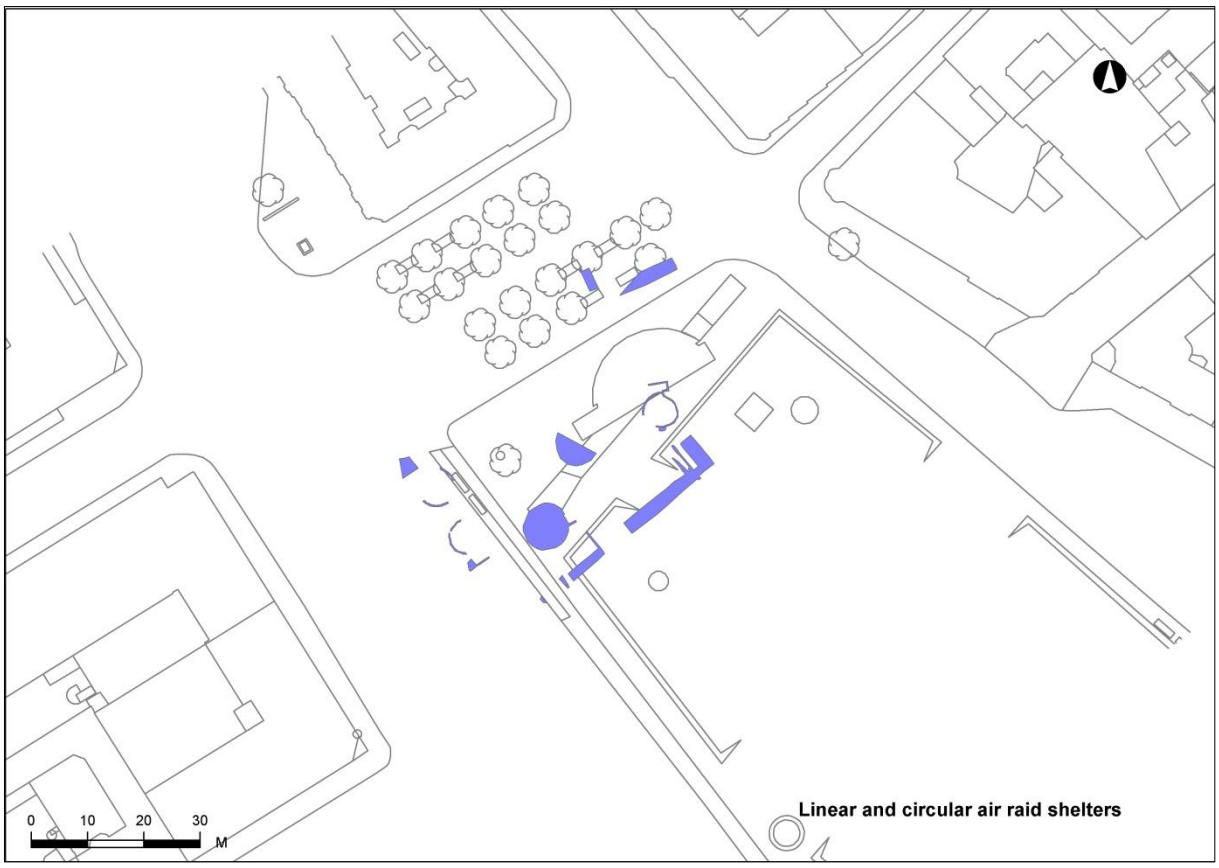


Figure 103 Plan of the main features in Phase 7

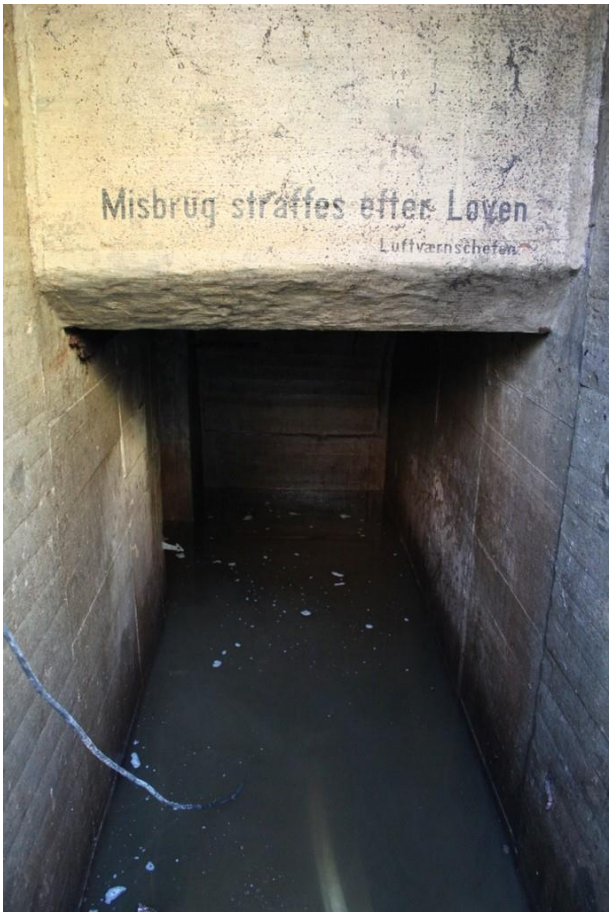
Modern Urban Defence

The remains of air-raid shelters were seen during the excavation. In general two types of shelter were encountered, L-shaped or linear shelters (in some cases still intact), and round or domed shelters (all of which had been largely demolished previously).

Sources indicate a date as late as A.D. 1944 for the construction of these shelters, by which time (we can say in hindsight) the war was approaching its end. The construction of the shelters was prompted by news of the heavy bombing that many German cities were experiencing, and a fear that Copenhagen might suffer a similar fate. It is understood that these shelters, constructed in public areas such as city squares, were built for people on the streets to use in the event of an air-raid. Elsewhere, basements in residential buildings were also set up to function as bomb shelters.

L-shaped bomb shelters

During the excavation carried out at Rådhuspladsen, three linear or L-shaped air-raid shelters were uncovered. The first encountered and most intact example was first seen in trench Z 6326 and later the remainder was exposed in Area 4 of the main excavation. The main entrance to the shelter was at its north-western end, located in Z 6326, and following the removal of concrete slabs sealing the entrance stairs (and the pumping out of water), it was possible to examine the interior of the structure.



The shelter consisted of a linear reinforced concrete structure, set within a large and quite deep construction cut. It was clear that the entire structure would have been below ground level, apart from the top of a centrally placed small square turret, which presumably was both a lookout and potential escape route should the main entrance become blocked.

The stairway and entrance area measured 1,1 m wide by 2,05 m high (at the bottom of the stairs). Above the entrance '*Misbrug straffes efter Løven. Luftværnchefen*' (misuse punishable by law. Air Force commander) was painted in black lettering. Fragments of a wooden inner door survived, lying broken in the doorway. The door measured 1,69 m high and 0,925 m wide, with 'C.L' painted in red letters. This is an abbreviation of *Statens Civile Luftværn* (The State Civil Air Defence).The stairway joined to the main tunnel section seen in Area 4 at a right angle.

Figure 104 Entrance to the shelter, inner door visible on left side

The main section consisted of a vaulted arch of c.16 m in length (16,7 m in length externally). The internal width was c. 2,5 m, c. 3 m externally. It seems that the linear part of these shelters was effectively a reinforced concrete cylinder, but with a flat concrete floor poured on the inside to make it more user friendly. A cylinder was probably both easy to make, but also quite strong.

A groove ran along both sides of the flat floor, presumably for any water that might get in to the shelter to flow along. It is likely that there would have been a drain for excess water to flow out somewhere, but this was not seen. This type of shelter would have had benches running along its length on both sides, but either they had been removed or they had rotted away. Rusted iron attachments could still be seen along the walls.

Figure 105 The interior of the shelter

Some sandy sediment had collected in the shelter over the years, presumably washed in by flood water. Finds comprised of the door remains (described above) and some glass beer bottles, manufactured in the 1940s. The latter objects would suggest that the shelter was probably sealed off shortly after the war, and left untouched thereafter. The structure was very solid, with no obvious deterioration. The majority of the structure was removed during the excavations at Rådhuspladsen, though some elements of the south-western end of the structure were left in situ. Breaking up the structure, as with all of the bunkers, required the use of a mechanical excavator fitted with a hydraulic hammer, and took considerable effort, showing how well built the shelters were.

The second linear or L-shaped air-raid shelter seen at Rådhuspladsen was seen in Area 2 (A and B), and in Area 5. The shelter was L-shaped, with a 90 degree bend in the main structure. The stairwell was built parallel to the shorter north-eastern part of the shelter, to its west. At the western end of the structure, the construction cut had been made through the remains of the outer gate façade, which must have taken considerable effort. It is surprising that it was not simply decided to place the shelter in a slightly different position to avoid this obstacle. The cut for the shelter truncated a considerable amount of archaeological features, including several medieval pits in Area 2B.

The shelter was constructed in a similar way to the example described above, using reinforced concrete, though where the two sections were connected, a short ‘corridor’ area built with concrete blocks was used. It could be seen that the concrete of the main structure had been shuttered during construction, and so was presumably built (poured) in location. The main section was only seen inside briefly, as it had been damaged and blocked off by the steel shoring around Area 2A. The shorter eastern section however, could be accessed from the roof hatch/turret in Area 2B (this had been capped with concrete – presumably when the shelter went out of use), and was found to be in good condition.

Figure 106 The eastern part of the second shelter, within Area 2A. Seen from north

It was similar in form to the other shelter, but two unusual features are worth mentioning. Along the north-eastern wall, a timber plank was attached to the wall, and at regular intervals along it, grey electrical wires were attached, which had been cut off at the ends. Their purpose is uncertain, but it is possible that this end of the bunker was set up to be an emergency communication point, with phones or telegraph installed.

The other unusual feature was the presence of a raised concrete plinth in the north-western corner, and a ceramic pipe which came through the roof/wall above it, where it ended. The inside of this pipe appeared to have a slightly sooty texture, and it seems likely that some form of stove had been fitted in this corner, sitting on the plinth and with its exit flue attached to the ceramic pipe. The combination of these unusual features certainly points at this end of the shelter having had some special function, and being set up for at least slightly more long term use.

Finds from this shelter included scraps of old newspaper, a ceramic plate fragment, a rusted can, and a Frederik IX coin. The year on the coin was unclear, but must have been between 1947 and 1972. The discovery of a tiny white plastic skull in the bunker showed that some intrusive material was present. This may have come from the chimney pipe, which may have been open to the surface in later years.

Figure 107 The northern end of the shelter described above. Note the wooden panel and wires to the right, and the ceramic pipe in the corner.

One further linear air-raid shelter was documented on site, in trench Z 77745. This had been truncated by many modern services (including a large district heating trench), and so survived only partially. Its basic construction appears to have been similar to the shelters described above, but its overall size and shape are unknown.

Circular/domed bomb shelters

Across the excavation area at Rådhuspladsen several circular/domed air-raid shelters were recorded. In every case these survived only partially. It seemed in general that the domed top, which would have protruded above ground, had been deliberately broken up, to below ground level, in order to remove the visible traces of the shelters. The bases of the shelters, to a height of c. 1 m generally survived, often with remnants of the top of the shelter lying broken up within. The staircases survived to varying degrees.

Seven circular shelters were seen in total, and these occurred in two clusters of three, with one more isolated shelter in between. The first cluster was located along the west side of the excavation area, close to HC Andersen's Blvd. These three shelters were placed in one construction cut, and were placed in a line parallel to the edge of the square/street.

The most southern example measured c. 7,5 m across. It had some traces of a stairs surviving to its southeast side. It was badly damaged in the past, and its eastern half had been removed completely by a fjernvarme (district heating) trench. Located c. 3 m to the northwest was the second shelter. This structure survived in two parts, as the fjernvarme trench had also gone through it. It measured c. 7 m across as documented. Located immediately to the northwest was the (possible) third shelter. It seems possible that this could simply represent an element of the previous shelter, or the very partial remains of another circular shelter.

The second cluster of shelters occurred further east, in Areas 2 and 5. The foundations of the former bus terminal had interfered with the structures to quite an extent. The best preserved shelter (see photo below) was located to the east, close to the underground toilet building. It was possible to document this shelter to a greater extent than the others.

Figure 108 Air raid shelter. Seen from southwest

The diameter at the base was documented at c. 7 m, while the staircase measured c. 1,6 m wide. The thickness of the concrete dome was approximately 25 cm, and it was clear that it had been shuttered and poured in situ. The shelter would have had an internal height at the centre of c. 3,5 m.

Figure 109 Some of the circular bunkers at Rådhuspladsen during construction in 1944

This example was not physically connected to any of the others. It was largely destroyed, probably in 1947 when other bomb shelters on Rådhuspladsen were demolished. Benches would have been fitted around the edge of the shelter, but no trace of these survived.

In the base of the stairwell a drain was located in the floor. From inside the shelter there was also a drain, connected to a sand-trap in the entrance. In or around the drain/entrance, a small orange bakelite or plastic flask was found. On the bottom of this container was written "Hautentgiftungssalbe" "eje" "115" "1943" and "44". This was part of the military equipment given to German soldiers during World War II (e.g. http://www.mp44.nl/equipment/skin_decontamination.htm). It contained skin decontamination cream for any toxic "war substance" one might come in contact with during combat, e.g. blister gas. The "eje" probably refers to the factory where the bottle was produced. 1943 is the year the bottle was produced. The 44 is melted into the plastic and this refers to the date where the ointment was filled in the bottle. The lid was (still) attached to the bottle with a nylon string, and the bottle would originally have been stored in a small container of plastic coated cardboard, along with some cotton swabs. This was the only clearly military artefact relating to World War II recovered on site.

Figure 110 'Hautentgiftungssalbe' from the shelter

Another air-raid shelter was documented in trench Z 77745. This was c. 7,5 m in diameter, and constructed in the same way as the other domed shelters. Only its western half was seen, the rest was probably removed when the Movia bus terminal was constructed. No further details were noted.

Located just northwest of the shelter above was the last of the eastern shelter-cluster. Only the western edge of this structure survived, having been destroyed when the bus terminal was constructed. While only a small part of the shelter was seen, it was clear that it was constructed in the same way as the other circular/domed air-raid shelters.

Located within trench Z 77745 was one further domed air-raid shelter. This was c. 7 m in diameter across its base, and was constructed in the same fashion as the others. No further details were noted.

These domed air-raid shelters were all built at about the same time, in precisely the same fashion, with the use of standard shuttering moulds. Therefore, it is likely that they were almost identical. The measurements taken at Rådhuspladsen suggest a diameter of c. 7 m was standard; variations in survival condition can explain the slight variations apparent above.

Other Activity

A series of deposits were recorded overlying the remains of the outer western gate, which are thought to date to sometime after the gates secondary deconstruction in the 19th century. While some of these deposits might belong in Phase 6, modern material was seen and it seems likely that these layers have been disturbed by modern activities in the late 19th or 20th centuries. A number of modern service trenches had been placed in the area, for electric cables or pipes of various forms, cutting some of the upper parts of the deconstructed gate. The placement of these services probably explains the disturbed nature of many of these deposits.

Discussion

Public spaces and activities

Public spaces were identifiable in the form of roads/streets, and in the form of the city gates and bridges. An identified cemetery area could also be defined as a form of public space. It may be that some of the wells identified should be seen as for public use. Certainly the wooden waterpipe system seen in a number of areas was part of a large scale urban project. One of the surfaces defined, under present day Vester Voldgade, might relate to a square rather than a street. In most areas where street surfaces were encountered, substantial evidence existed for their ongoing use, and intermittent replacement or renewal with new surface material. This can surely be seen as centrally organised work. It could also be seen that Vestergade, or a street in the same place, appears to have existed from the earliest stages of Copenhagen, as well as a continuation of that street, out of the city to the west.

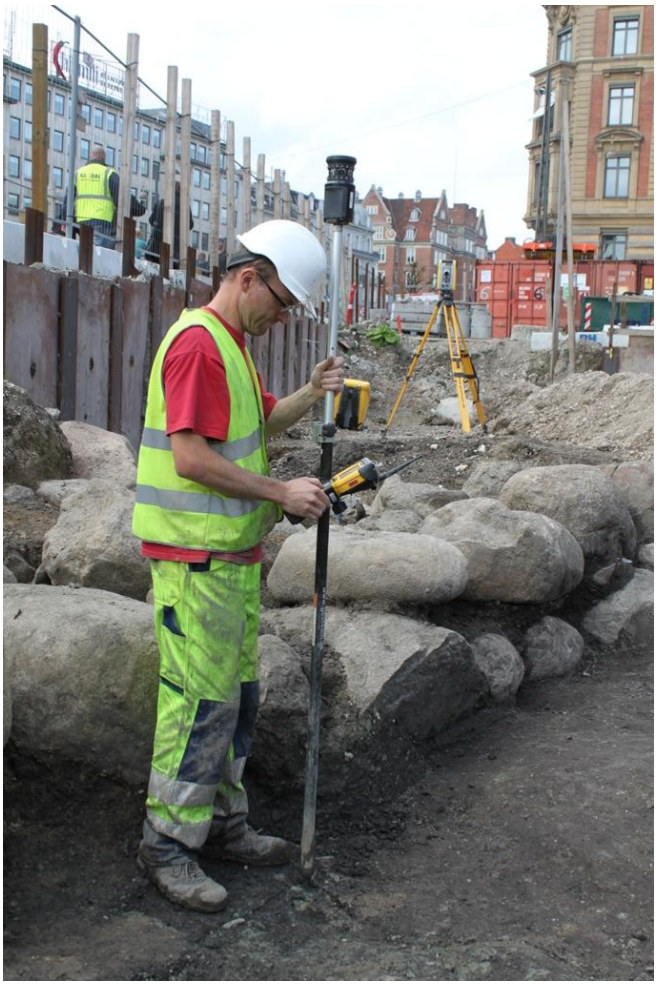
Figure 111 The outer gate foundations exposed in Area 2A

A wealth of evidence was uncovered relating to the town boundary, in the form of various fortification elements. These fortifications, and the many alterations to them, have given a vast amount of physical evidence for the chronology and morphology of the fortifications through time. Interesting evidence was unearthed regarding the land use inside and outside of the town. Perhaps most surprising is that no evidence was seen for a boundary in this area prior to the 14th century, and furthermore, a range of evidence (such as pits, wells, buildings and the burial area) outside of the later medieval fortification, suggests that this area was part of the urban area of the town from a time predating the first known defences.

Infrastructure and organisation can be seen in the construction, repair and reconstruction of the roads, the planning and construction of the various fortifications including the bridges, and of course the building of the mill. Furthermore, the placement and replacement of the wooden waterpipes are evidence for large-scale infrastructural works, with the aim of supplying fresh water to at least some of the citizens. It should also be remembered that even the filling up of the moat with urban waste reflects centralised organisation, not just in the terms of the decision to re-landscape the area, but also in terms of the organised collection and transportation of the waste. In a much more modern sense, the air-raid shelters also point to large-scale projects with central organisation.

Economic and demographic development

Evidence for trade and craft was recovered in considerable quantities. This varied from (for example) fish processing waste to butchered and/or processed animal bone, much evidence for milling, wood working, needle craft, pottery making, comb making and tanning. Even begging, in an official sense, was evident. From the later period, possible evidence was seen for brewing, for textile manufacture, pottery making, bone working and iron-working. Fish processing was clearly still going on in the area, as well as butchery. Perhaps most obvious of all activities was milling, in the form of the remains of the watermill building and associated millrace.



From the 17th century moat/mill race deposits, there came a wealth of evidence for a growing economy, and for a growth in consumerism. This came in the form of the amassed urban refuse, dumped into the defunct moat/millrace in the later decades of the 17th century. Due to excellent conditions for preservation, great quantities of organic material survived as well as the more typical inorganic finds material. This gave a very complete picture of the kinds of material being discarded in this period, including fine glassware, ceramics, clay pipes, textiles, shoes, cutlery, food waste, weapon and tool parts, timber waste, building material (bricks and tiles) and horse equipment. Other more accidentally dumped material such as coins, tokens, a doctor's stamp and intact knives, showed how important objects could end up being lost within refuse. The artefacts also reflected the ongoing trade in the city.

Figure 112 Documenting the archaeology in Area 2A

The nature of trade at the time is apparent, with many foreign wares included amongst the waste (particularly German and Dutch). It has also been seen – in the pottery assemblage for example – that during the post-medieval period while there was large-scale importation, there was also local manufacture of imitation foreign goods. The brewing of beer was clearly thriving, as was the importation of tobacco and wine. It can also be seen however, that though consumerism was on the rise, on the other hand there was also much repair and reuse going on, of items such as clothing and shoes. The invaluable source material from the former moat certainly opens up opportunities for research into topics related to consumerism and trade, and their consequences for society.

Socio-cultural implications and consequences of urban life

The material evidence left behind implies many kinds of social interactions, at various social levels. It also tells us much about the kinds of lifestyles that existed in the city, particularly in the 17th century, for which the greatest volume of evidence survives.

With few structures surviving to any great extent, the aim of examining spatial layout of actual individual structures may prove elusive. However, there is evidence that provides information on the organisation of activities and consumption, i.e. in the early and high medieval remains of pits used for refuse disposal including a diversity of household and production refuse. For example, food evidence did survive, and much has been established about the diet of Copenhageners through the centuries, particularly in relation to meat and fish resources, and also cereal and plant consumption. The majority of this food evidence came from secondary locations such as waste pits and the moat however, and is difficult to directly associate with particular households, with the exception of one high medieval house structure seen in Vester Voldgade. Household items were also recovered in considerable quantities, but the same caveat applies as to that with the food evidence. Nonetheless, particularly where the 17th century is concerned, there is much potential to address trends across society, if not individual households.

Items such as repaired clothing and repaired and recycled shoes point to the stratification of society, with the wealthy purchasing new and fashionable items, and later the same items working their way down the social ladder, through resale, charity or scavenging, and end up in the hands of the poorer people. The recovery of a gold ducat for example, also points to the wealthy (perhaps merchant) class, while a beggars badge recovered from the fills over the millrace is reflective of relative poverty, and also to the social and administrative organisation of the town, where an activity such as begging was in effect subject to licence. Clearly there were well established different levels in the 17th century social topography of Copenhagen.

From the establishment of the town boundary in the 14th century, it does not appear that there were any structures of a domestic or industrial nature in the immediate vicinity of the outside of the western gate. There were also few finds recovered from that area from the late medieval or post-medieval period, apart from in the backfilled moats. Hence, there is little opportunity to examine ‘differences’ in the material culture or structures inside versus outside the fortifications, other than to observe the relative lack of them outside the town area.

Conclusions

The excavation at Rådhuspladsen carried out between 2011 and 2012 in advance of the construction of a Metro Cityring station identified very significant archaeological remains surviving under the present day square. This material was documented thoroughly, and has provided a wealth of information regarding the origins and development of the town and later city of Copenhagen through the centuries.

The early and high medieval remains which were documented, including road surfaces, pits, wells, levelling layers, fragments of buildings, and a hitherto unknown burial ground, represent the first large-scale archaeological settlement material excavated from this period in Copenhagen, and are therefore a very important source of information on the early development of the town and of life in the town. The material has given reason to rethink earlier interpretations of the extent and fabric of early medieval Copenhagen. This material will be worked with in greater depth, as part of a project that will focus on exploring what activities, people and networks were important in the early urbanisation process of Copenhagen, and if and how urban ways of life and urban identities can be seen in the material culture.

The high medieval remains were also very significant in nature, both relating to everyday life (street layers, pits, wells and structures) but also to urban fortification. New dates for some of the fortification elements give reason to re-examine the process of constructing the high medieval fortification around the city, and the time-line involved. The new dates point to a prolonged process, which raises questions as to why this was, on whose initiative and in whose interest the fortification was built and what the main purpose of it was. The new evidence relating to the fortification can inform future research, perhaps in association with the evidence uncovered at Kongens Nytorv, and at other excavations around the city.

In terms of sheer volume, the post-medieval remains dominated the excavation at Rådhuspladsen, with a wealth of structures, pits and of course fortification elements documented across the excavation area. The new evidence adds considerably to our knowledge of the development of the city's boundary area and fortification, including the civil use of the area around the western city gate right up to the mid-19th century. Furthermore, vast amounts and a great variety of artefactual material were recovered, particularly from the backfilled moat, mill and mill race (material dumped there in the later 17th century). This assemblage holds great potential to enlighten us regarding life in the city in the 1600s. Aspects of the assemblage, the shoe and textile collection for example, are already part of ongoing research projects.

The sheer scale of the finds assemblage ensures that there are further opportunities for material studies relating to a variety of different object and material types. Pottery, glass, household objects and personal related objects are categories with potential to give new information on consumer culture and the way people promoted themselves in public or in their homes. The emphasis put on scientific and specialist analyses of different materials has also yielded a source material which holds potential for further studies and research. For example, the metal working residue from the medieval period has potential to add to our knowledge of the medieval development of this craft in Denmark, of where the ore was coming from, and the role of iron production and the smith in the medieval trade networks and in society.

There are many possibilities for further research projects which could address aspects of this assemblage. For the Renaissance moat finds, the potential is not only in the individual finds categories, but also an

opportunity - and a challenge - lies in placing the entire assemblage into a contextualized view of consumer culture and the display of urban identity in 17th century Copenhagen.

Clearly the excavation at Rådhuspladsen has already added significantly to our understanding of Copenhagen's past, and the research projects both ongoing and upcoming illustrate the value of the information gained, and its potential going forward to form the basis for further studies. The material is extensive and varied enough to stand on its own, but perhaps its greatest value will be as part of the collective archaeological and historical source material relating to Copenhagen, and also in comparison with other cities in Denmark and Europe.