

# The Imperial *horrea* of the *Porticus Aemilia*

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## Abstract

This article presents the preliminary results of excavations carried out between 2011 and 2013 among the standing remains of the building commonly identified as the *Porticus Aemilia*, centrally located in the ancient river harbour of Rome. The common identification of this building as a warehouse has recently been questioned by another school of thought, which contends that it was the Urbs' *Navalia* or shipshed. The excavations allow us to conclude that such one-sided interpretations fail to do justice to the archaeological evidence, which suggests instead a highly differentiated history of occupation in the area. Although the original use of the building in the late Republican era remains obscure as yet, we have documented multiple traces of abandonment, collapse, rebuilding and restructuring for the various post-Republican phases. The excavations are particularly revealing with regard to the late first and early 2<sup>nd</sup> century AD, when parts of the building were restructured to accommodate *horrea*. The new data constitute the first scientifically excavated evidence of the existence of *horrea* in the Urbs.

## INTRODUCTION

In recent years a great deal of archaeological research has been devoted to discovering more about workings of large warehouses and other storage facilities in Ancient Rome and its harbours.<sup>1</sup> The remains of the *Porticus Aemilia*, in the modern-day Roman neighbourhood of Testaccio, have proven particularly relevant in this quest. Since the reconstruction by G. Gatti in 1934, this building has commonly been identified as one of the largest storage facilities in the Ancient Roman world. Between

2011 and 2013 the *Soprintendenza Speciale per i Beni Archeologici di Roma*, the Royal Netherlands Institute in Rome and the Archaeological Centre of VU University Amsterdam carried out a series of excavations between the standing remains of this monumental structure (fig. 1). The aim of these digs was to investigate the spatial configuration of the building and the history of its occupation. The findings provide important new insights, particularly for the late first and early 2<sup>nd</sup> century AD, when parts of the building were restructured to accommodate *horrea*.



Fig. 1. The excavations in progress (photo C. Tetteroo).

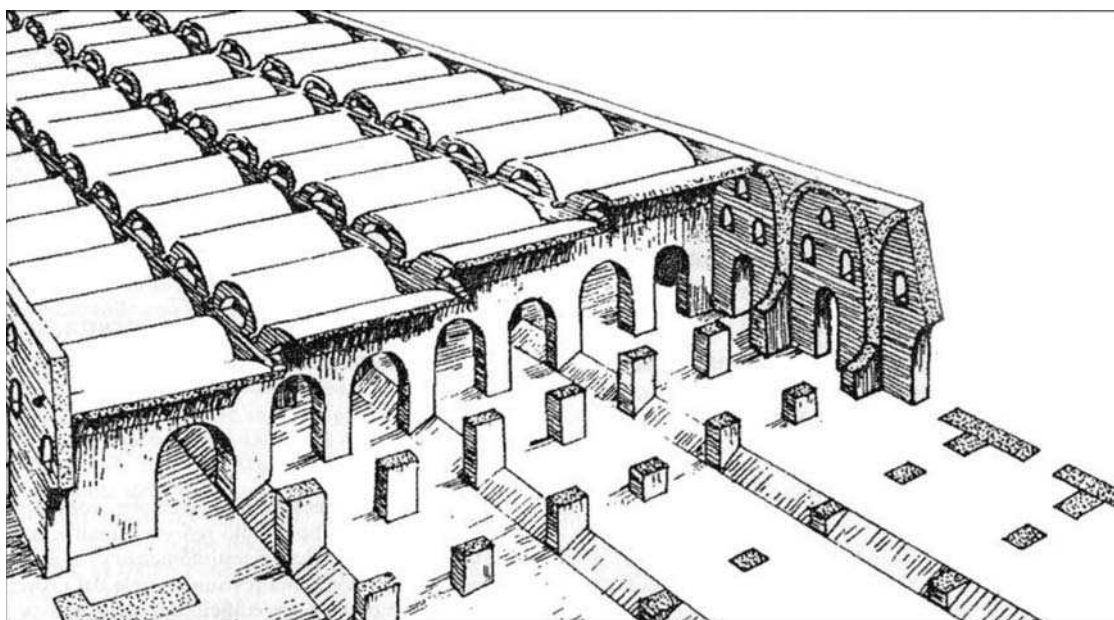


Fig. 2. Axonometric view of the Porticus Aemilia (Rodríguez Almeida 1984, 31, fig. 4).

The building commonly identified as the *Porticus Aemilia* is named after the *aediles* Marcus Aemilius Lepidus and Lucius Aemilius Paulus, who, according to Livy (35.10.11-12), started building a *Porticus* outside *Porta Trigemina*<sup>2</sup> in 193 BC, with the aim of capitalizing on the new harbour (*Emporium*) in what is now the Testaccio district in Rome. On the basis of Giuglielmo Gatti's commonly accepted reconstruction of the building (based primarily on linking on-site observations to relevant fragments of the Severan marble plan, the *Forma Urbis*), we can say that the building measured approximately 487 by 60 metres and had 50 aisles descending

towards the Tiber (figs 2 and 3; Gatti 1934).<sup>3</sup> The aisles were separated by arches, founded on a continuous wall across the width of the building. The enormous structure is thought to have been covered by a barrel vault. It was built largely with irregular tufa blocks in the *opus incertum* technique, attesting indeed to its Republican origins.

Gatti's identification of this building as Livy's *Porticus Aemilia*, which supposedly served as a warehouse, was recently questioned by another school of thought which has identified it as the *Urbs' Navalia* or shipsheds, on the basis of, amongst others, a different reading of the letters inscribed

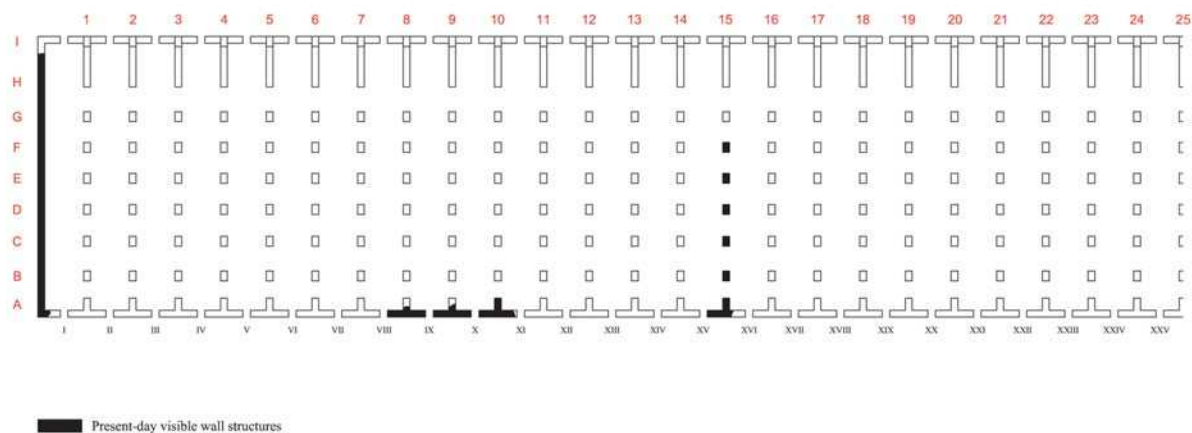


Fig. 3. Layout of the Porticus Aemilia with the numbering of the aisles and pillars

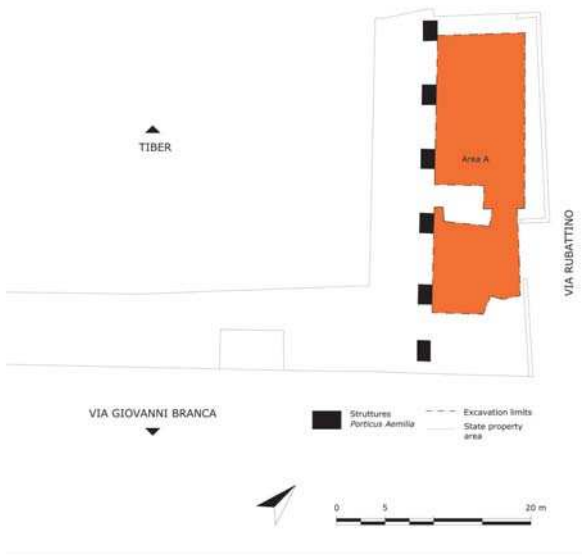


Fig. 4. Lay-out of the excavation area in aisle XVI, discussed in the present article (graphics by S. Della Giustina).

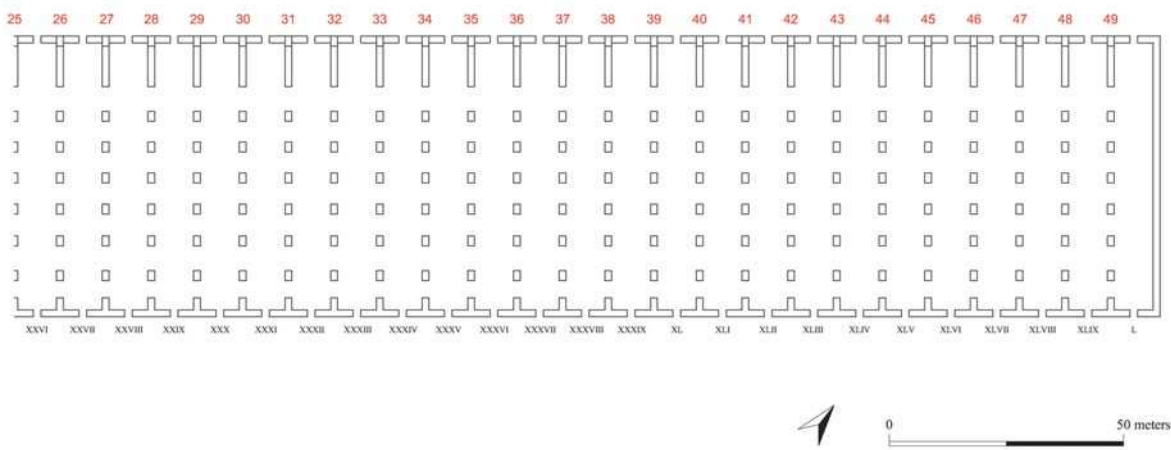
on the *Forma Urbis* fragments.<sup>4</sup> We could not prove either of these hypotheses with our excavations, at least not with regard to the building's original use. No Republican strata were identified during the digs. As we will demonstrate in this report, our explorations provide information on various post-Republican phases of abandonment, collapse, rebuilding and restructuring, all of which may have contributed to the obliteration of the Republican layers.<sup>5</sup> The Imperial Period is especially relevant in this argument, since earlier layers may have been systematically removed in a major effort to restructure the building. In this

article we focus particularly on this later history of occupation. In the documentation and discussion of the excavation data, however, the numbering of the walls, aisles and pillars follows the plan of the original building as reconstructed by Gatti and shown in figure 3. The article will focus mainly on the excavations carried out in aisle XVI of this monumental building (fig. 4).<sup>6</sup>

#### THE RESTRUCTURING OF AISLE XVI

One of the most important conclusions that can be drawn from our excavations is that the area of aisle XVI in the Porticus Aemilia was turned into a construction site at some point in the late first or early 2<sup>nd</sup> century AD. In fact, large-scale restructuring work took place in this period, which testifies to a thorough re-organization of the aisle and most probably to other parts of the Republican building as well.<sup>7</sup> This operation turned the rear side of the aisle, occupying three corridors, into one single room (B), which could be accessed by steps from another, lower-lying room (A) on its north-western side (fig. 5). The plan of these two rooms and the floor system *a sospensura* in room B are reminiscent of the plan of *horrea*, as known from Portus and Ostia.<sup>8</sup>

It was ascertained that the Republican structure must have been in a state of neglect when the Imperial building was constructed. Parts (especially angles) of the pillars were damaged and the Republican walls in *opus incertum* which connected the pillars were in a relatively poor state of conservation, which necessitated the integration of Imperial walls into the original Republican wall structures at various points (fig. 6).



(after Gatti 1934, pl. II. Graphics by V. De Leonardis).



Fig. 5. Photo and layout of the Imperial building and of room A and B, as excavated in 2012 (photo R.A.E. Kok-Merlino, graphics layout of the map by S. Della Giustina).

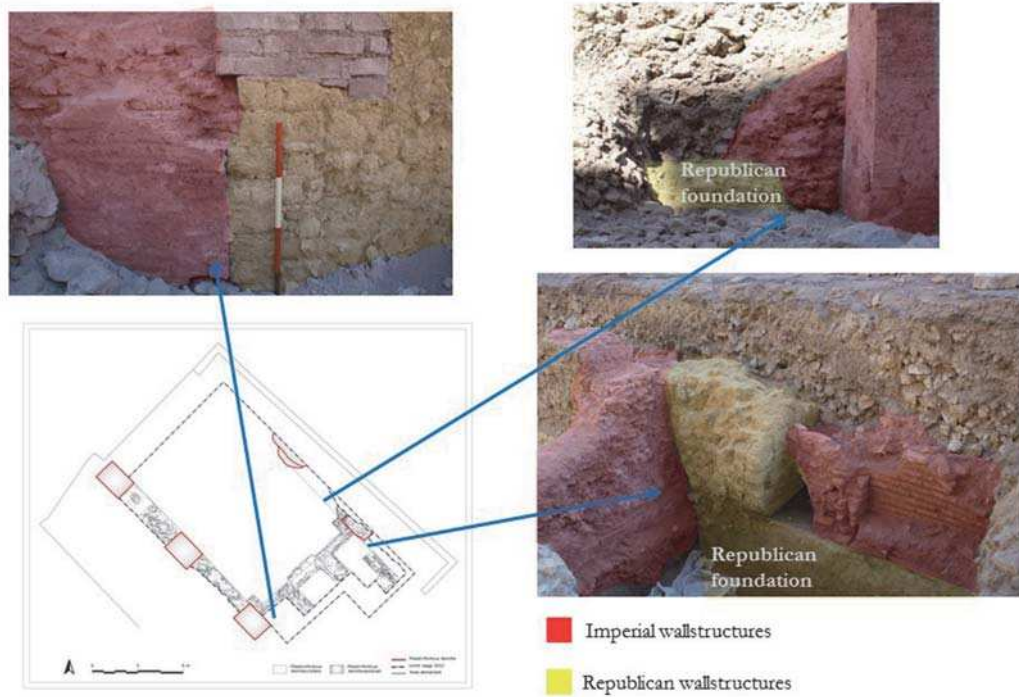


Fig. 6. Several Imperial wall structures which interlock with the Republican pilasters and presumed foundations (photos R.A.E. Kok-Merlino, graphics by S. Della Giustina).



Fig. 7. A deposit of pottery sherds near pillar D16 (left) and the layers of pozzolana which were used to elevate the horizontal surface in between pillars B15 and B16, seen from the southeast (photos R.A.E. Kok-Merlino).

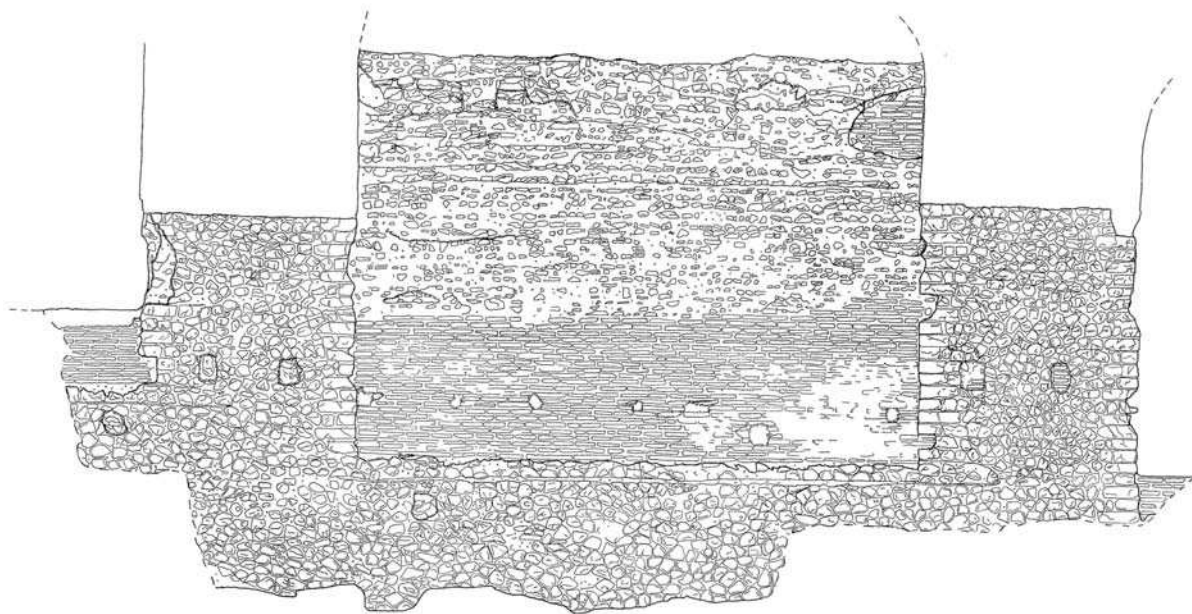


Fig. 8. Drawing of the pillars B15 and C15 and the continuous wall in opus incertum which could be interpreted as foundation. On top of the latter one finds the Imperial wall in opus testaceum which impedes the passage between aisles XV and XVI through corridor B, seen from the northeast (drawing by A. Tartaro).

Prior to the Imperial restructuring in aisle XVI, the floors were raised by at least 1.7 metres.<sup>9</sup> This took place in two ways. In the central part of the aisle, between pillars D15 and D16, deposits of pottery sherds, mainly from amphorae, were found, while towards the rear wall of the Porticus, between the pillars B15 and B16, the deposits consisted of layers of red pozzolana (fig. 7).<sup>10</sup> Both types of deposit can be dated to between the end of the 1<sup>st</sup> and the beginning of the 2<sup>nd</sup> century AD. Although different in composition and consistency, both materials

have good draining properties, which suggests that they may be connected with the construction of the *horrea*.

After the layers of the thick, highly drainable deposits of shards and pozzolana had been laid, construction continued with the building of walls in opus testaceum in between the arcades. These walls closed off aisle XVI from the neighbouring aisles, thus creating the two rooms A and B, mentioned above (figs 8 and 13). Whereas the passageway between aisles XV and XVI was entirely closed,

the one between aisles XVI and XVII was closed only between pillars D15 and E15; the other arcades in this passageway were left open.

Other walls in *opus testaceum* were then added in aisle XVI between pillars D15 and D16, thus subdividing the aisle into two separate rooms. Two small rectangular-shaped brickwork pillars were positioned against pillars D15 and E15. These probably sustained an arch which accentuated the entrance to room B and reinforced the roof at this point.<sup>11</sup>



Fig. 9. The staircase with access to room B, seen from the northwest (photo R.A.E. Kok-Merlino).

The entrance to room B was flanked by two walls in *opus testaceum* and was accessible by two steps, approximately 2.30 metres wide (fig. 9).<sup>12</sup> The steps served to overcome the difference in height caused by the gradual descent of the entire *Porticus Aemilia* building towards the river Tiber (see the introduction above). On the upper step, parts of a hinge (*cardo*) enclosed by triangular bricks were identified, which seems to indicate the presence of a door that closed off room B from room A.

The well-preserved walls in *opus testaceum* all have similar architectural characteristics, with surfaces consisting mostly of tiles and a few bricks and a nucleus in *opus caementicium*. The mortar is compact and friable, light grey in colour and with a high concentration of black *pozzolana* and undiluted lime. The nucleus in *opus caementicium* contains a large quantity of tile fragments as well as some small yellow tufa blocks and some *spicatum* and pottery sherds. The quality of the wall constructions is not refined, even for a functional building. This observation was confirmed by the analysis of the Imperial foundation walls which were found in the corridor between room A and room B and which seem to indicate a somewhat sloppy building site.<sup>13</sup> The excavation of the trenches of these foundation walls delivered numerous



Fig. 10. Room A seen from the north (photo R.A.E. Kok-Merlino).

diagnostic pottery sherds which have been dated to between the middle and the end of the 1<sup>st</sup> century AD. Also, several iron nails were found, which could have belonged to formworks.

In order to achieve uniformity in appearance, the new brick walls as well as the old Republican pillars in *opus incertum* of rooms A and B had been covered with a whitish layer of plaster around three centimetres thick, thus establishing a polished and waterproof surface (fig. 10). Iron nails (*claves muscarii*) were also found *in situ*. The plaster was well-preserved in room A, but destructive post-depositional processes meant that hardly any of the plaster had been preserved in room B. However, *claves muscarii* were also found here and the discolouration of the walls indicates that plaster had indeed been used.

On the northern side of the pillars between aisles XV and XVI rectangular holes were identified in the masonry, two on each pillar. A smaller hole somewhat lower than the others, was found in the *opus testaceum* wall between pillars D14 and E14. These openings were located at the same height

(14.4 metres) and must have been created before or when the plaster was applied to the structures, as the inside of the holes is partly covered by plaster. In room A the plaster is thinner near the holes and ends at the same height in a rounded profile. The holes probably served to support wooden beams, possibly creating a mezzanine. The height of the holes seems slightly low to suggest a second floor in the Imperial building (2.10 metres in room A, 1.50 metres in room B).

Not long after the major restructuring work, some minor adaptations were made to the new building, especially to the connection between aisles XVI and XVII. In room A two steps had been built against the eastern Republican wall in *opus incertum*, so that the wall could be crossed to gain access to aisle XVII (fig. 11). These two steps, probably 1.20 metres in length, covered the *cocciopesto* floor which abutted onto the Republican wall in *opus incertum*, indicating that the steps had indeed been built in a second phase. It is highly probable that the wall in *opus testaceum*, which obstructed this passage in the initial phase of the Imperial building, was partially dismantled in the second phase.<sup>14</sup> On the other hand, in room B the passage between aisles XVI and XVII seems to have been closed in the second phase of the Imperial building. Remains of Imperial walls in *opus testaceum* were discovered on top of the Republican *opus incertum* wall between pillars B and C and between C and D (fig. 12).<sup>15</sup>

#### THE IMPERIAL FLOORS

The floors of the Imperial building were relatively well-preserved. Room A had a *cocciopesto* floor (fig. 10), with a curb along its south-western edge that enabled it to lean against the stonework.<sup>16</sup> The *cocciopesto* had a rather coarse matrix with relatively large fragments of pottery and *pozzolana*; only the parts near the brick walls had smaller



Fig. 11. Photo of the small staircase seen from the southwest (photo R.A.E. Kok-Merlino).



Fig. 12. The T-shaped wall structures between aisles XVI and XVII. To the left the remains of the walls between pillars B16 and C16, to the right the wall structures between C16 and D16 ; seen from the southwest (photos R.A.E. Kok-Merlino).

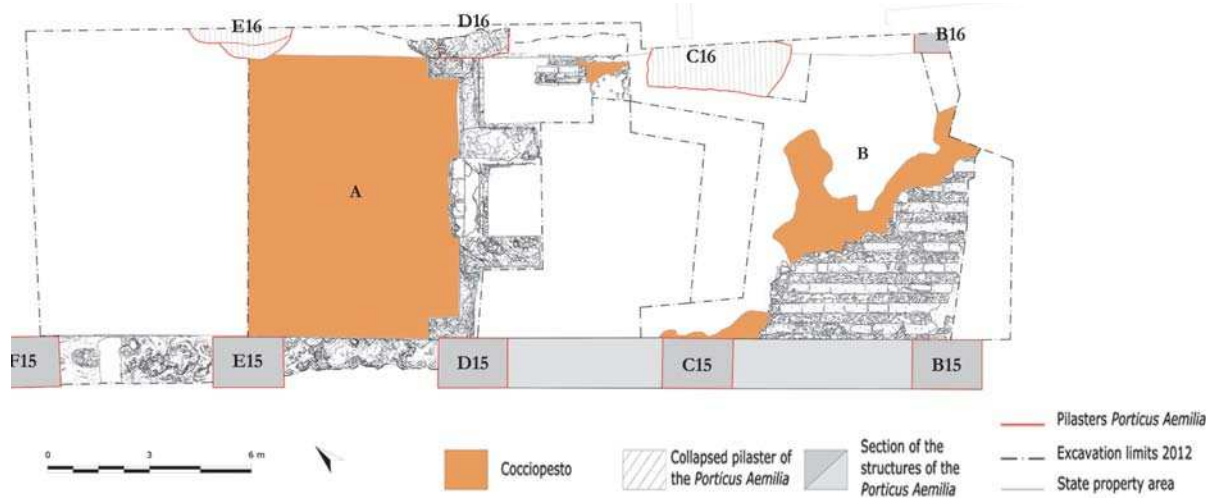


Fig. 13. Plan of the excavations in the XVIth aisle of the Porticus Aemilia (drawings by B. Taddei, M. Mimmo, S. Marrotta. Graphics layout by S. Della Giustina).



Fig. 14. Wall delimiting the entrance to room B at north-east with traces of the attachment of the floor level and underneath the offset covered with tile fragments, seen from the southwest (photo R.A.E. Kok-Merlino).



Fig. 15. View of the suspensurae of Room B, seen from the southeast (photo R.A.E. Kok-Merlino).

inclusions. The *cocciopesto* surface was roughly finished and cracked in several places due to the compression caused by the collapse of the vault on top of it (see below). The floor in the central part of the room also caved in under the weight of the roof, creating a drop of around 30 centimetres.

It was possible to analyse the preparation beneath the floor in the north-eastern part of room A; it consisted of flat-lying tufa blocks measuring between 15 and 20 centimetres. Near the walls in *opus testaceum* the *cocciopesto* floor rested instead on a row of protruding bricks. The *cocciopesto* and the entry steps to room B must have been built at the same time, since the floor abuts onto the stair-

case (fig. 9). At the level of the upper step between rooms A and B, at the point where the wall plaster finishes, clear traces were found of the attachment of the floor (12.9 metres), resting on some protruding bricks (fig. 14).

Room B also had a *cocciopesto* floor; however, it lay on sets of *suspensurae*, placed at a regular distance of approximately 30 centimetres from each other (figs 15 and 16). These small *suspensurae* walls, 65 centimetres high and around 30 centimetres wide, were oriented northwest-southeast and consisted of irregularly shaped tiles which were mostly triangular on the outer surfaces, whereas the *nucleus* consisted of mortar, tile fragments and tufa. The outermost *suspensurae* were smaller in width (10 centimetres) and placed against the walls



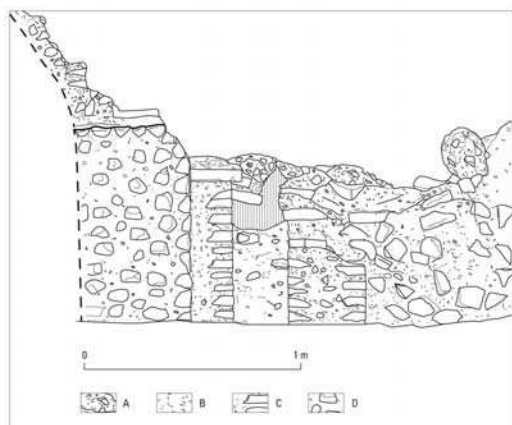


Fig. 16. Section drawing of the *suspensurae* in the northern part of room B (drawing by M. Mimmo, graphics layout B. Brouwenstijn). A: cocchiopesto; B: mortar; C: brick curtain wall; D: opus incertum curtain wall.



Fig. 17. View of the side of a *suspensurae* wall with the two construction phases (photo R.A.E. Kok-Merlino).

in *opus incertum* that demarcated room B (figs 15 and 16). In the northern part of this room, the small *suspensurae* walls rested on bipedal bricks which were lying on a thin cementitious layer spread on top of a preparation of tufa blocks.<sup>17</sup> One layer of bipedal bricks was positioned on top of the *suspensurae* walls which supported a *cocciopesto* floor (fig. 16). In the central part of the room, the *suspensurae* walls were built directly on the same preparation of tufa blocks. A cementitious layer between the small structures bore the imprints of brick fragments which were still present in some cases. On top of the *suspensurae* walls the *cocciopesto* was sustained by two layers of bipedal bricks divided by a layer of mortar.

Although the floor and the underlying system of *suspensurae* had been severely damaged at some

points and had even been partially removed, it is clear from the excavations that this system once covered the whole of room B, including the entrance. The analysis of the *suspensurae* walls has led to the identification of two phases in this floor system. In some places the upper part of the *suspensurae* walls was different from the lower part; it was made of different materials and had been constructed with a different technique (fig. 17).<sup>18</sup> Most probably this difference relates to a second phase in which the Imperial floor and building were restructured, but which cannot be dated with any certainty.

#### INTERPRETATION OF THE IMPERIAL STRUCTURE IN AISLE XVI

As stated above, the plan of the Imperial structure that came to light through new excavations in the *Porticus Aemilia* resembles that of a *cella* of *horrea*, identified in Portus and Ostia. Evidently, in this case, the dimensions of the *horrea* had to be adapted to fit in with the available width inside the aisle of the *Porticus*. The walls in *opus testaceum* which flanked the entrance to room B (below figs 5 and 13) were functional and no doubt helped to prevent cereals from slipping into the entrance and perhaps under the door.<sup>19</sup> Most probably, the cereals were preserved in piles: a large one in the central part of the *cella* or several along the walls.<sup>20</sup> The presence of *suspensurae* in room B lends more credibility to the interpretation as a *cella* of *horrea*, as such a floor would have facilitated the preservation of dry wheat. The *suspensurae* would have stopped the humidity from rising to the *cocciopesto* floor and helped to maintain a constant temperature, - an absolute necessity, because if the temperature rose above 18/20° the cereals would start to ferment.<sup>21</sup> This interpretation is confirmed by our archaeobotanical analyses, which have revealed the presence of carbonized emmer wheat (*Triticum dicoccum*) and barley (*Hordeum vulgare*).<sup>22</sup> If room B can indeed be interpreted as an authentic storage *cella*, room A may have served as a connection between the inside and the outside of the building. The numerous coins found on the *cocciopesto* floor could also indicate that room A was a place where exchange took place. In fact, storage buildings could have different functions such as a small market, as is acknowledged at M'eninx on the island of Djerba. Moreover, it is known from juridical sources that wholesale took place even in buildings that were entirely dedicated to storage.<sup>23</sup>

In the first phase of room B, the passage between aisles XVI and XVII seems to have been open,

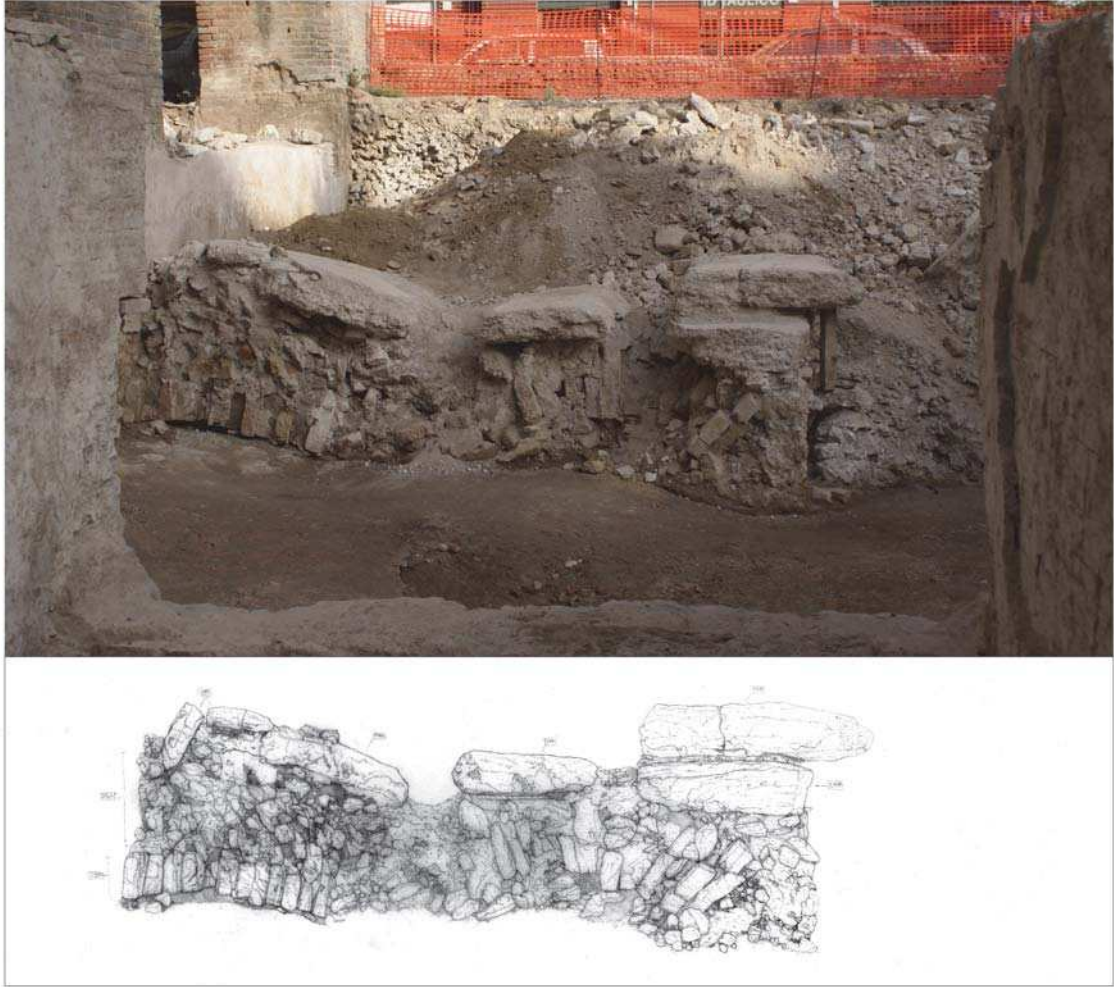


Fig. 18. The collapsed vault, seen from the southeast  
(photo R.A.E. Kok-Merlino, drawing by B. Taddei, graphic layouts B. Brouwenstijn).

which fits in with the hypothesis that the Imperial *horreum* in the *Porticus Aemilia* was larger than the only *cella* we found during the excavations. It is certainly conceivable that a similar structure was built in aisle XVII, communicating with our *cella*, and that even a much larger part of the back of the *Porticus* was transformed into *horrea* in the first half of the 2<sup>nd</sup> century AD.<sup>24</sup>

#### THE END OF THE IMPERIAL HORREA

Rooms A and B were in use at least up to the 5<sup>th</sup> century AD. The archaeological data indicate that they collapsed between the 6<sup>th</sup> and 7<sup>th</sup> century AD.

In room B pillar C16 collapsed together with part of the arch over corridor B.<sup>25</sup> The roof and the walls then came down as well. Our analyses

indicate that spoliation took place both before and after the collapse. In fact, on the preserved part of the *cocciopesto* floor in room B, bricks and tiles were found which seem to originate from the *suspensurae* walls. Moreover, it was clear that the floor on the north-eastern part of the room had collapsed because of spoliation: here the *suspensurae* walls had been removed, causing the *cocciopesto* to cave in. The south-western part shows, on the other hand, that the collapsed roof and the floor were cut in order to retrieve building materials. It is evident that room B suffered more damage after its abandonment than room A. The poor preservation of the plaster in room B may well be due to the large pits that were dug right through the layers of debris; these pits also cut the floor and damaged the exterior of the walls. The filling

from these pits consisted of material dated from between the 5<sup>th</sup> and the beginning of the 6<sup>th</sup> century AD, which seems to indicate that this part of the building may have collapsed somewhat earlier than room A.

In room A the collapse probably began when pillar E16 fell down on the wall in *opus incertum* on which the pillars of the Republican *Porticus* had been built. This was followed by the collapse of the vault and the side walls of the building. In the central part of room A, between pillars E15 and E16, the collapsed remains of the vault came to light and provided important insights into the construction of the roof (fig. 18). The rectangular tufa blocks of the collapsed vault (45 centimetres by 12 centimetres) were positioned sideways on the floor and covered by the inner concrete part of the roof. These tufa blocks and the nucleus of the vault were covered by bipedal bricks (approximately 4.2 centimetres thick) and large fragments of concrete which were plastered and smoothed on top. The concrete slabs, which had a maximum length of 1.85 metres and a maximum thickness of 26 centimetres, served to reinforce the covering of the building and make it impermeable. The restoration, which most probably took place in Imperial times, consisted of the positioning of the bipedal bricks and the plastered concrete on top of the tufa construction. The covering of the Imperial building was probably reinforced with a brick arch above the entrance to room B, as a collapsed brick construction in front seems to suggest.

Underneath the collapsed tufa blocks, a layer consisting of numerous pottery sherds of significant dimensions was excavated. The sherds, which came mainly from amphorae, have been dated between the beginning of the 4<sup>th</sup> and the 6<sup>th</sup> century BC, and indicate the time when the room was abandoned. This deposit covered a highly organic layer with a maximum thickness of 3 centimetres, which can be interpreted as the last surface which had been walked on in the Imperial building. It revealed flat-lying pottery sherds dating from the first half of the 3<sup>rd</sup> century AD and numerous coins which are currently being studied, as they could shed light on the last phases of use of the *horreum* and the room in front of it.

#### LATER REUSE

Though the Imperial structure in aisle XVI had fallen into abeyance, its rooms were not abandoned forever. In the north-eastern sector of room A a small rectangular compartment was found, cut into the collapsed remains (fig. 19). The com-

partment with northwest-southeast orientation was enclosed by dry-stone walls preserved up to a height of three to four rows, which were built against the cut debris. Most of the blocks were made of concrete and tufa but fragments of *cocciopesto* had also been used as building material, all with irregular shapes and dimensions. The largest blocks were placed in the lower part of the walls, while the smaller ones were positioned in the higher rows. The floor of this structure consisted of well-trodden soil, immediately on top of the Imperial *cocciopesto*. A round hole of around 15 centimetres in diameter in the eastern corner was probably used to hold a support pole for the roof. To create more space for the realization of the compartment a large chunk of concrete that had fallen from the Imperial roof was moved.

Even though this part of room A had been heavily compromised by modern construction works, it was still possible to excavate some layers, testifying to the abandonment of this late structure, which can be dated after the 6<sup>th</sup> century AD. Unfortunately, it could not be dated with any more precision but its stratigraphic position indicates a date soon after the collapse of the room. The interpretation of the compartment may be that of a shelter or a shed for animals which probably remained in use for a long time.

In room A, in the wall in *opus testaceum* between the pillars E15 and F15, an almost circular hole cutting the plaster and the wall was identified. The pit had an opening of about 15 cm in diameter which lead to an interior space of about 30 cm wide. The hole was (still partially) closed by some tiles and could have functioned as a small repository perhaps for valuable items. The dating of this repository turns out to be problematic



Fig. 19. The small compartment built into the collapsed layers of room A, seen from the northeast (photo R.A.E. Kok-Merlino).

given the complete lack of ceramics or numismatic materials. It is however possible to hypothesize that its realisation is contemporary to the reuse of the spaces described above. Stratigraphically it is clear that the repository was made after the abandonment and the collapse of room A.

#### CONCLUSION

The above-discussed excavations in aisle XVI of the *Porticus Aemilia* clearly show that stratigraphical digs have much to contribute to a more complete understanding of the complexity of the use of space through time. In fact, with these excavations we wished to emphasize that this area has a highly differentiated history of occupation which should not be reduced to the discussion or identification of the original building only and mainly on the basis of written sources. Moreover, the digs suggest that in one and the same period, the area occupied by the structure of the *Porticus Aemilia* might have accommodated a wide range of functions.

What is most evident from our excavations is that in the late first and early 2<sup>nd</sup> century AD at least parts of the building were restructured to accommodate *horrea*. Early in this phase, large-scale building activities took place in aisle XVI. First, the floor level was raised considerably by adding thick layers of sherds and *pozzolana* with good draining properties. These deposits served as the foundation for a new building, which reused the solid structure of the Republican *Porticus* as a framework. The plan of the new building, the floor on *suspensurae* and the archaeobotanical data suggest that the *Porticus* was used as *horrea* in the Imperial era. Most probably, the result of the excavations in aisle XVI can be projected on a larger part of the *Porticus Aemilia*. It seems plausible that a significant part of the monumental building was turned into *horrea publica* with numerous *cellae* along the rear wall of the *Porticus*, and perhaps also at the front, including three corridors in the former Republican building.

The renovation of the complex can be seen as part of a larger restructuring programme undertaken in the Emporium during the Trajanic-Hadrianic era. In this phase there is a renewed interest in the urban harbours in general<sup>26</sup> and several storage places became Imperial property.<sup>27</sup> Wheat was the principal product in weight and volume that was imported in the harbours of the Tiber,<sup>28</sup> which explains the presence of numerous storage facilities in the area of the Emporium. These were still growing in number even around the middle

of the 2<sup>nd</sup> century AD, when older buildings were making way for storage facilities, as demonstrated by the Mercato Nuovo excavations.<sup>29</sup> It is not entirely clear how long the Imperial *horrea* in the *Porticus Aemilia* were used, nor when exactly the reconstruction of the *suspensurae* and the building of the walls between aisles XVI and XVII took place. In room A, the layers dating from the last use before the collapse of the vault could be ascribed to a period between the 4<sup>th</sup> and 6<sup>th</sup> century AD, most probably the beginning of the fifth, while the collapsed layers were dated in the first half of the 7<sup>th</sup> century AD. The building seems to have definitively declined when people started using several locations as burial grounds.<sup>30</sup>

#### NOTES

- <sup>1</sup> E.g. Boetto et al. 2010; Bukowiecki et al. 2011; in press; Burgers et al. in press; Keay 2008; Sebastiani/Serlonzi 2011; Virlovet 2011.
- <sup>2</sup> Livy (41.27.7-8) also recalls renovations by censors Quintus Fulvius Flaccus and Aulus Postumius Albinus in 174 BC.
- <sup>3</sup> By analyzing the excavation data gathered during the district's construction, Gatti was also able to retrace the whole plan of the building, thereby producing an essential framework for all researchers who wish to examine this area. Gatti's identification was probably inspired by Lanciani.
- <sup>4</sup> Cozza/Tucci 2006, 175-181; Tucci 2008, 18-24; 2012, 575-591. The new interpretations are based mainly on a different reading of the letters [...]lia found on fragment 23 of the Forma Urbis, namely [nav]lia instead of [porticus aemi]lia. Contra: Arata/Felici 2011, 127-53. Yet another interpretation can be found in Tuck 2000, 175-82, who argues to identify the letters with [corne]lia. See Coarelli 2007, 41-46.
- <sup>5</sup> Another hypothesis that can't be excluded at the moment is that the original floors of the *Porticus Aemilia* have been preserved in not yet excavated deeper level, underneath the Imperial levels.
- <sup>6</sup> The excavations at the *Porticus Aemilia* are part of the project 'Challenging Testaccio. Urban History of a Roman Rione', of the *Soprintendenza Speciale per i Beni Archeologici di Roma*, the Royal Netherlands Institute in Rome and the Archaeological Centre of the VU University Amsterdam. They are sponsored by the same institutions and directed by Renato Sebastiani and Gert-Jan Burgers. Field directors: Raphaëlle-Anne Kok-Merlino, Sara della Ricca, Valerio De Leonardis, Franco Tella and Matteo Merlino. Other staff members: Sarah Della Giustina (graphics), Evelyn Bukowiecki (architectural analyses), Alessia Contino, Lucilla D'Alessandro (pottery analyses). Drawings and maps for this article were produced by Bert Brouwenstijn unless otherwise stated. Student participants: C. Tetteroo (assistant field director), C. Cojaniz, M. Caspers, A. Tartaro, S. Marrotta, M. Mimmo, B. Taddei, V. Tolstoj, S. Lengkeek, N. Stoffels, K. Qarche, L. Noorda, D. van Diepen, S. Sleijpen, R. Bruinsma, F. Bouten, L. Drouen, B. Krijger, M. De Hey, C. Fasciani, J. Maas, N. Laghezza, M. Catsman, D. Van Dokkum, D. Bergmans, J. Ypma, M. De Jong, M. Gelhausen, S. Row-

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- 7 Excavations in the Xth aisle have revealed the same stratigraphic sequence as encountered in the XVIth aisle (Bukowiecki et al., in press, Burgers et al., in press).
  - 8 For example the *Magazzini di Traiano* at Portus (Boetto et al. 2010; Bukowiecki et al. 2011) and the *Grandi Horrea* at Ostia (Monteix 2011; Rickman 1971, 43-53).
  - 9 The level of the new Imperial floors was found at 12.9 m, while the deposits which raised the level were found at 11.24 m. The lowest point of the excavation in the central part of the Imperial building was 10.54 m.
  - 10 Pozzolana is 'a type of volcanic ash used for mortar or for cement that sets under water' (Oxford Dictionary).
  - 11 This hypothesis is reinforced by the presence of a collapsed brick structure in front of the entrance to room B.
  - 12 The latter consisted in two steps, each one foot high and covered by bipedal bricks of which only the imprints were conserved (three of 59 cm and one of 53 cm long).
  - 13 Three foundations of the *opus testaceum* walls have been examined in the corridor between the two rooms: two of these walls delimited the entrance to room B and one served as the substructure of the staircase previously described. All three foundations consisted of masonry using bricks, tiles and small tufa blocks, alternated with thick layers of mortar. Two foundation walls were bounded and were probably constructed with a formwork. The foundation trenches explored in the same corridor were rather narrow, except for the south-western one where construction needed more space.
  - 14 It is of course possible that the wall in *opus testaceum* never completely blocked the passage, but if so, it is hard to understand why the staircase was constructed later.
  - 15 It has been possible to determine that between pillars C16 and D16 two walls were built: one following the same direction as the Republican wall, and a smaller one perpendicular to it, leaning with the surface to the southeastern side of pillar D16, and thus forming a T-shape. Between the pillars B16 and C16 a similar situation has been discovered, with the T-shape versus pillar B16. Between pillars C16 and D16, in the space left by the T-shaped walls, a line of fragmented bipedal bricks has been found, one of them with a stamp dated to the beginning of the 2<sup>nd</sup> century AD. It is unclear what its function was.
  - 16 The bad conservation of the floor along the north-eastern limit of the room does not allow to assess if the curb was present on both sides.
  - 17 The bipedal bricks were absent underneath the smaller *suspensurae* wall next to the wall in *opus incertum*.
  - 18 This renovation of the *suspensurae* was operated with yellow, thick bricks instead of the former thinner red ones. Moreover, the mortar on the upper part has been roughly smoothed resulting in a trimmed joint sealing, while on the original part of the walls, hollow joints sealing have been used.
  - 19 Monteix 2011, fig. 1.
  - 20 See Monteix 2011 for the first hypothesis and Papi/Martorella 2007, 89-92, figs 4, 5, 7 for the second reconstruction.
  - 21 Mattingly/Aldrete 2000, 147; Papi/Martorella 2007, 90. Keay (2008, 13) notes that the presence of *suspensurae* identifies a room as a wheat storage space. *Suspensurae* floors are common for *horrea* in Ostia: *Grandi Horrea*

- (Reg. II. Is. IX.7), *Horrea Antoniniani* (Reg. II. Is. II.7) and *Horrea* Reg. I Is. VIII.2. The latter are characterised by small 30-cm-wide transepts placed at a distance of 30 cm from one another (Rickman 1971, 28). See also Trajan's warehouses in Portus (Boetto et al. 2010; Bukowiecki/Panzieri/Zugmeyer, 2011), cellars re-built under Commodus and those converted in the Severan age in Ostia's *Grandi Horrea* (Monteix 2011; Rickman 1971, 43-53).
- 22 The archaeo-botanic analyses were conducted by D. Lentjes.
  - 23 Virlouvet 2011, 11-12, with relevant bibliography.
  - 24 Research of the archives executed by S. Della Ricca and V. De Leonardis has brought to light earlier discoveries of *suspensurae* in several parts of the *Porticus Aemilia*.
  - 25 This collapse has permitted us to retrieve the exact measurements of the tufa blocks of the arches, also useful for the 3D reconstruction which will be presented in the final publication of the excavations of the *Porticus Aemilia*. The arches that are still standing are heavily eroded.
  - 26 Sebastiani/Serlorenzi 2011, 71. At the *Emporium* extensive construction works took place, such as the realisation of a large dock (cf. Gatti 1936, 55-82; Rodriguez Almeida 1984, 71).
  - 27 As is known from epigraphy (Castagnoli 1980, 39, note 43).
  - 28 Le Gall 2005, 294-296.
  - 29 Sebastiani/Serlorenzi 2008; 2011, 86-95.
  - 30 The building seems to have definitively declined when people started using several locations as burial grounds. Burials have been found in the area of the *Emporium* (Meneghini/Moccheggiani 1985a, 15-64, Meneghini/Moccheggiani 1985b, 86-95), at the *Nuovo Mercato Testaccio* (Carboni 2008), at Via Marmorata (Quaranta/Capodiferro 2011, 60-65) and near the rear wall of the *Porticus Aemilia* (Burgers et al. in press).

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