# Mededelingen van het Nederlands Instituut te Rome

DEEL XLVI NOVA
SERIES 11

Uitgegeven vanwege het Ministerie
van Welzijn, Volksgezondheid en Cultuur
Rijswijk 1985, door de
Staatsuitgeverij, 's-Gravenhage

# Notes on the design of the house of Pansa (VI,6,1) in Pompeii

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The house of Pansa, a patrician residence dating from the Pompeian tufa period, is characterized by a striking axial-symmetric plan[1] (fig. 1-3). Because of this the house is mentioned in archaeological literature as the building that comes the closest to resembling the prototype of 'the Roman house'.[2] Only few remnants in poor condition of wall paintings from this house have survived.

The ground plan of the house of Pansa (fig. 3), which was intermittently excavated in the period 1813-1827,[3] occupies a complete *insula.* The main entrance on the Via delle Terme leads through the *vestibulum* (a) and the *fauces* (I) - flanked on either side by *tabernae* - to the Tuscan atrium (2). The atrium gives access to six *cubicula* (36, 3a-e) and the *triclinium fenestratum* (7), whereas the *alae* (4a-b) and the *tablinum* (5) open on to this room. The spacious peristyle (9) with its sixteen tufa Ionic columns[4] can be reached via the *andron* (6). Built onto the peristyle are the *exedrae* (lla-b), three cubicula (12ac), a large *triclinium* (13) with an adjacent servants' room (14), and the *oecus* (15) which aligns with the buildings' central axis. To the west of the oecus lies the kitchen (19), the carriage-house (20) and a corridor (17), which leads to the *porticus* (21) and a large vegetable garden on the north of the house.

Besides the rooms mentioned above, which were intended for the use of the owner and his family, there were also apartments and shops in the house of Pansa which were let out on lease.[5] From the Vicolo di Modesto two storey apartments (24 and 26) and a bakery (28-33) can be entered, while three medium sized living units (A, B and C) can be approached from the Via dell a Fullonica.

In archaeological literature it is unanimously accepted that the construction of the atrium dates back to the first building period of the house,[6] which A. Maiuri dated between 140 and 120 B.C.[7] However, the question is whether the peristyle also belongs to the original layout of the house. H. Nissen cannot give a definite answer to this question,[8] but without further explanation J. Overbeck and A. Mau opt for contemporary construction of the atrium and the peristyle.[9] In a later study, A. Mau on the contrary points out the possibility that the peristyle is 'vielleicht etwas jünger'.[10] It was left to A. Maiuri to demonstrate that the atrium and the peristyle both form part of the original layout of the house.[ll]

The contemporary construction of the two principal rooms, combined with a dating in the middle of the tufa period, places the house of Pansa among the first buildings in Samnite Pompeii in which, under Hellenistic influence, the peristyle was integrated in the architectural draft.[12]

The symmetrical plan mentioned above and the contemporary construction of the atrium and the peristyle make the house of Pansa an excellent subject for metrological analysis. The aim of this type of analysis is to gain insight into the design of a building with the help of measurements expressed in the original unit of measure. Attention is mainly focused on the concept of measure and proportion.

In order to arrive at a well-founded analysis, it will first be decided which walls belong to the relevant first building period. Then the size of the employed foot measure will be deduced from the metrical values, which will enable us to express the measurements of the layout of the house in feet. Next, on the basis of this evidence, we shall analyse the design of the house, concentrating on proportions and on how the measurements of the various rooms relate to each other. Finally we shall determine to what extent the design of the house of Pansa follows the rules laid down by Vitruvius for the planning of Roman houses.

## MASONRY

The relatively regular plan of the house of Pansa conceals somewhat that the building as it stands today is the final result of various structural alterations. In these adaptations which date from the time of the Roman colony, the main lines of the design and the layout of the principal rooms were not radically changed.[13] Only at the edge of the building is the original structure of the house partly lost.

In general, the oldest masonry in the house of Pansa is in accordance with the present conception of masonry from the tufa period.[14] For instance, the original pilasters in the eastern half of the facade and the vestibulum (a) were built in the *opus quadratum* of tufa, characteristic of this period. The same Nocera tufa was used for the columns and their foundation slabs in the peristyle.

The remaining original masonry consists of *opus incertum,* combined with large limestone blocks for doorposts and for the reinforcement of corners. In general these blocks of Sarno limestone were alternatively placed in horizontal and vertical position, creating an interlocking connection with the adjoining incertum masonry. Occasionally posts and corners were also formed by merely piling vertically placed limestone blocks on top of each other.

In the atrium, besides quoinings there are also pilasters built of limestone blocks. In these pilasters, the wall sections between the entrances to the cubicula, the ashlars were also placed in horizontal and vertical position, usually 'dry' on top of each other, but sometimes they were bedded into the block below. The dimensions of the blocks were however not calculated for the length of the pilasters, as a result of which, during construction, gaps were left in the middle of each wall section. *Caementa* of grey lava were used to fill in the fissures in the bottom layer of the wall, while caementa of dark red *eruma (i.e.* a very porous, but resistant igneous rock) were used in the top layers.[15]

The difference in the atrium between the base of the wall, filled in with grey lava, and the top part, filled in with dark red cruma, is characteristic of the oldest masonry in opus incertum in the house. The caementa used here were hewn from grey lava, dark red cruma and limestone. The way in which the walls are composed of these caementa, however, varies and on the basis of this, three different types can be distinguished in the oldest incertum masonry. The first two refer to the inside walls of the house, the third type is found in the original parts of the facades of the buildings' west and east sides.

### *a. Opus incertum mixtum I*

The walls in opus incertum of the alae (4a-b) and the tablinum (5), which are interwoven with the limestone masonry of the atrium, display at the base a concentration of grey

lava combined with dark red cruma and limestone, while for the top part of the wall caementa of dark red cruma were mainly used: *opus incertum mixtum* I. In general, the caementa of dark red cruma are smaller than those of lava and limestone. The walls of the triclinium fenestratum (7) and the east wall of the fauces (1), joined on to the opus quadratum in tufa of the vestibulum (a), were also built in this manner. The same applies to the south wall and part of the north wall of the exedra 11a, the north and east wall of the exedra 11b and the walls of the fauces B1 of living unit B.

In the peristyle only fragments of the original masonry have survived. The limestone quoinings belong to the original layout of the house. The walls built in opus incertum between these posts and corners can in most cases only be partly ascribed to the first building period. Only fragments of the base, consisting mainly of grey lava, are original. In general, the top part of the wall was radically restored; caementa of grey lava and dark red cruma were used for these restorations. The predominant use of these materials, caementa of limestone appear less frequently, possibly indicates that we are dealing with a restoration of walls faced with opus incertum mixtum I. The slipshod nature of these restorations, combined with the use of loamy mortar and the employment of tile fragments and lumps of *opus signinum*, justifies a dating after 62 AD.

*b. Opus incertum mixtum II*

Usually only one side of the wall was faced with the rather neatly finished opus incertum mixtum I. For instance the back of the east wall of the tablinum (5) was faced with masonry with also a preponderance of grey lava at the base, but for the top part of the wall, at variance with type I, mainly large, irregular caementa of limestone were used, combined with grey lava and dark red cruma: *opus incertum mixtum* II. The larger part of the walls of the cubicula annexed to the atrium (36, 3a-e) and room 8 were built with this kind of masonry. In living unit B the walls of the central room B2, the walls of the cubicula B3 and B4[16] and also the west wall of room B5 and the east and south wall of room B6[17] were erected in opus incertum mixtum II.

Almost all the masonry in opus incertum in the zone to the north of the peristyle is of Roman date.[18] This is indicated by the regular composition of the walls mainly consisting of limestone caementa and by the use of soft, yellow tufa and fragments of opus signinum. Posts and corners here were constructed in *opus vittatum simplex*[19] (living unit C) and *opus vittatum mixtum*[20] (oecus and other rooms in this zone). Only the east wall of the oecus has an irregular composition. Generally grey lava caementa were used in the base of this wall, while caementa of limestone were mainly employed in the top part. As regards the composition the east wall of the oecus is similar to the walls in opus incertum mixtum II, but the relatively clear distinction between the base and the top part of the wall prevents it from being classified without reserve in this category of masonry.

The oldest inside walls in opus incertum were built in incertum mixtum I and II. It is conspicuous that incertum mixtum type I is found in the principal rooms, whereas the walls in the rooms of minor importance were faced with incertum mixtum type II. [21] Only the oldest masonry of the oecus, related to type II, forms an exception.

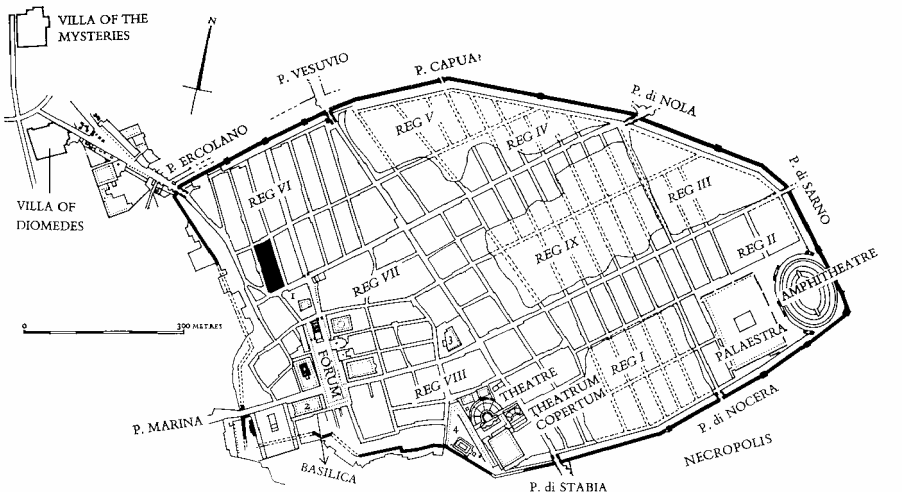


Fig. 1. The location of the house of Pansa (black) within Pompii (after Brilliant).

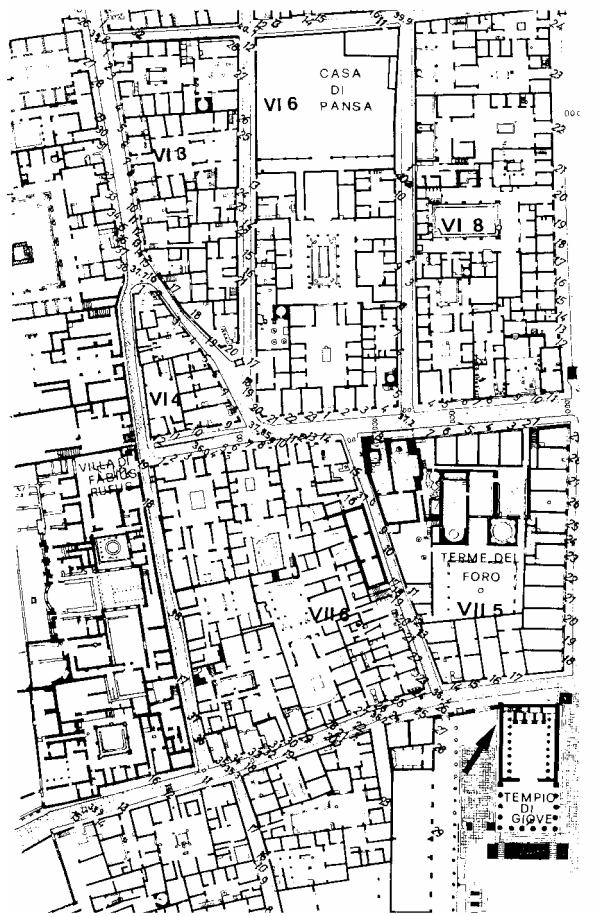


Fig. 2. The house of Pansa with its neighbouring (after Eschebach).

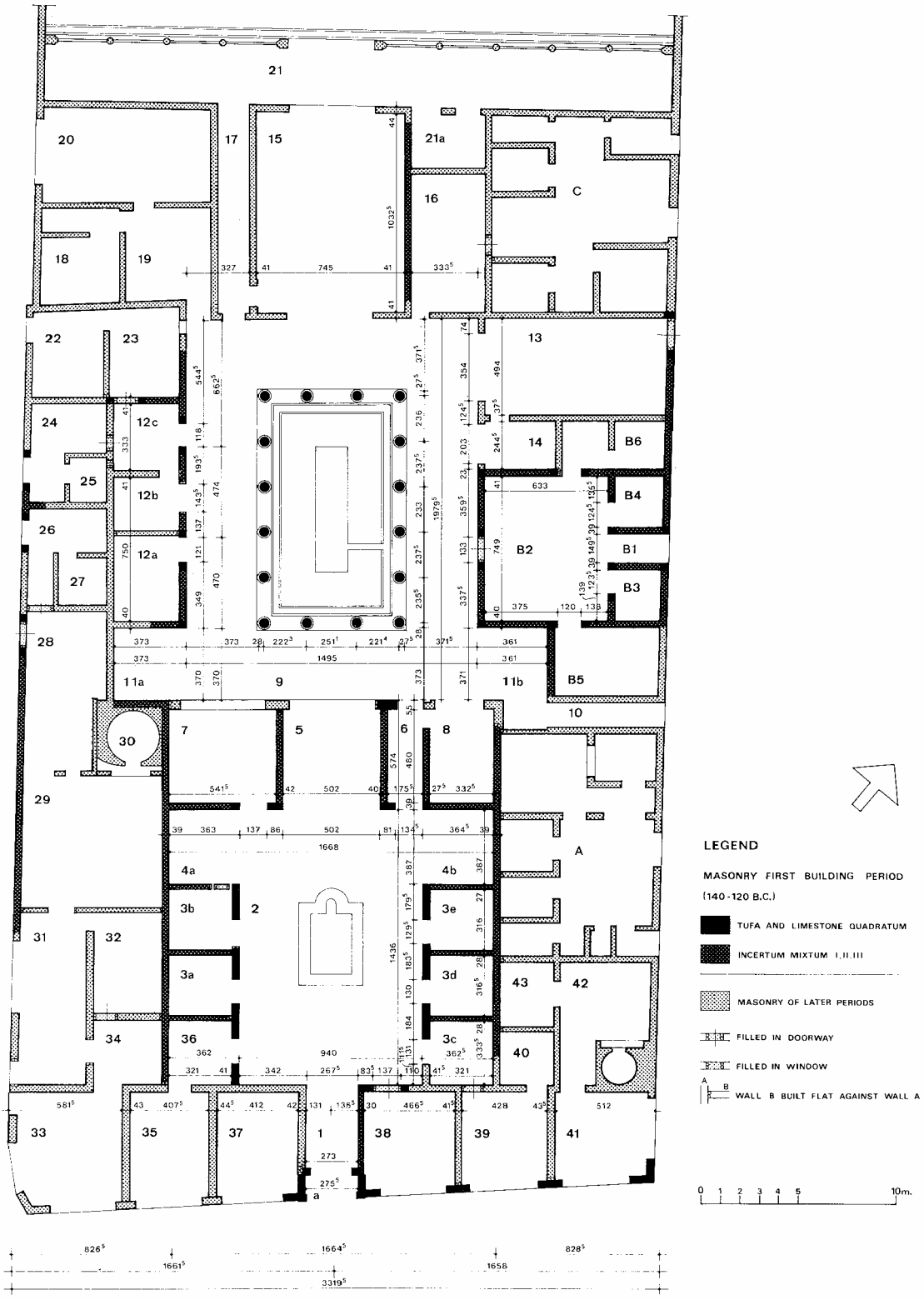


Fig. 3. The house of Pansa, plan with the measurements given in metres.

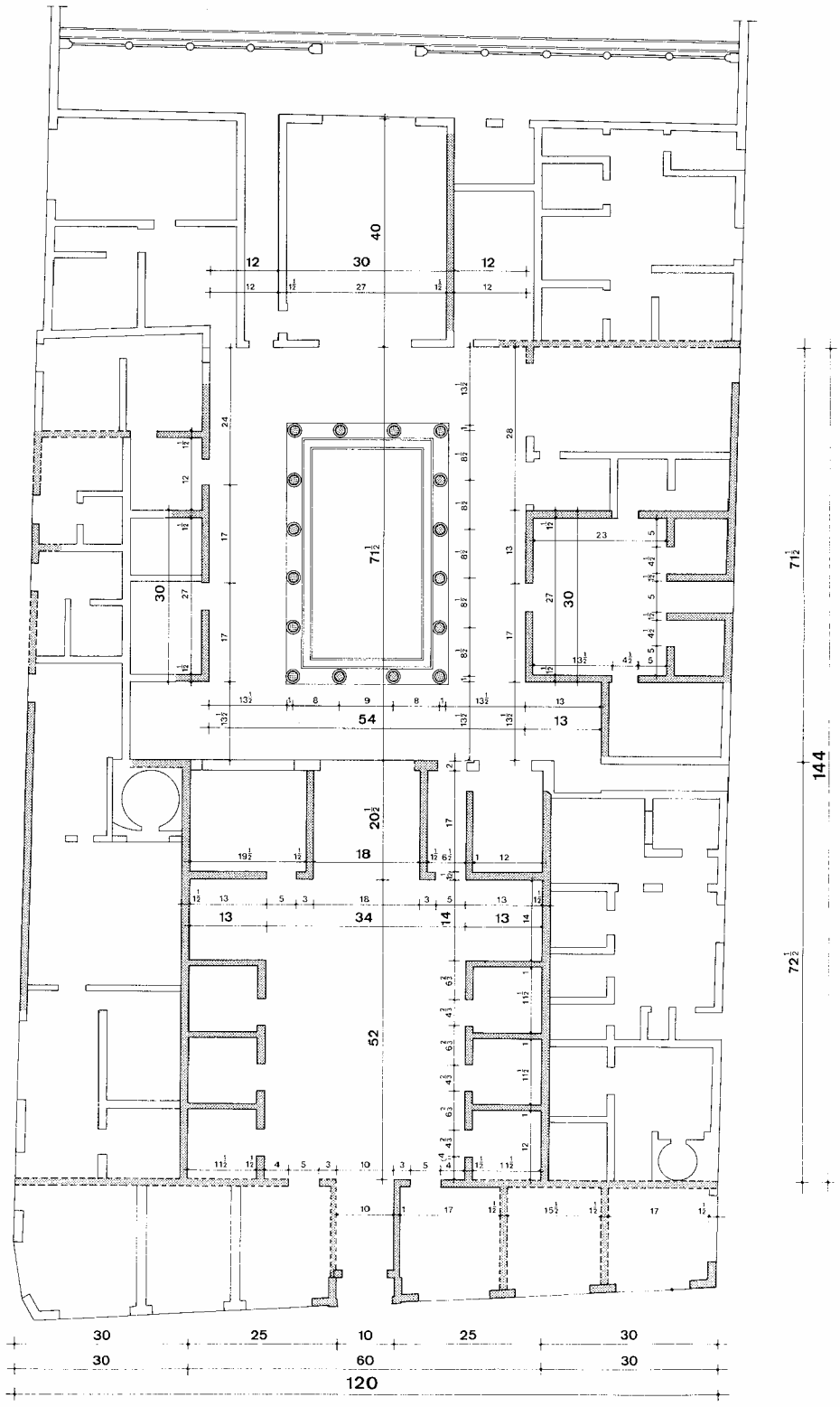


Fig. 4. The house of Pansa, plan with the measurements given in Oscan feet.

c. Opus *incertum mixtum III*

In contrast to the facade, which was built in tufa quadratum, the original parts of the two side walls of the house (fig. 3) were erected in opus incertum, quoined with large limestone blocks. Despite the difference in masonry technique, there is a clear resemblance between the facade and the original parts of the east and west outer walls: in both cases the base of the wall protrudes slightly (ca 5 cm).

The caementa in the lower part of the side walls, often reaching a level above the protruding base, were hewn from grey lava. In the top part on the contrary, almost exclusively limestone caementa were used; grey lava only occurs sporadically and the use of dark red cruma, is negligible.

On the east side of the house the outer wall of living unit B was faced with opus *incertum mixtum* III and on the west side this form of masonry can be found between the entrances to apartments 24 and 26. Between the entrances to room 28 and 31 only the lowest part in grey lava has survived.

In general the original masonry in opus incertum stands out from the other masonry in this technique because of its irregular composition: the three described types of opus incertum mixtum display at the base of the wall a varying concentration of caementa of grey lava, while in the top part dark red cruma caementa (type I) or limestone caementa (type III) or caementa composed of a combination of the two (type II) prevail.[22]

The oldest masonry in opus incertum of the house of Pansa is in line with A. Mau's remarks concerning the opus incertum of the tufa period: 'In Privathäusern ist besonders häufig in den unteren Theilen ausschließlich Lava, weiter oben andere Steinarten, unter denen entweder der Kalkstein oder die Cruma vorwiegt, angewandt'.[23]

Although structural alterations and renovations ascribable to the Roman age lie outside the scope of this contribution, a few adaptations must be looked at in order to arrive at a well-founded analysis. The doorway between the atrium and the taberna (38) on the one hand, and the one between the peristyle and living unit B on the other, which are flanked by limestone ashlars and are therefore classed as belonging to the first building phase, were filled in during a restoration. The same applies for the entrance to room 28 on the Vicolo di Modesto and for the doorway between cubiculum 12c and room 23. The doorway between ala 4a and cubiculum 3b (now filled in) and the doorway between the peristyle and cubiculum 12b are however not original as limestone posts are missing here.

In the south wall of the peristyle an original pilaster, built in large limestone blocks combined with dark red cruma filling, has survived. This pilaster was however shortened on the west side and has therefore been left out of consideration.[24] The *impluvium*, built out of fragments of marble slabs (modern) and which therefore cannot belong to the first building period, has not been dealt with either.

In the north the peristyle is bounded by wall sections which do not belong to the original layout of the house. Yet the position of these wall sections seems to correspond with the course of the original north wall. In the first place this is indicated by the original quoining of the north wall, built of limestone ashlars, in the northeast corner of the triclinium 13.[25] Furthermore the depth of the colonnade on the north side of the peristyle, which corresponds with the depth of the colonnade on the other sides, also supports this hypotheses. A final argument is provided by the wall thickness of 41.0 cm. (= 11/2 Oscan foot) of the pilasters in opus vittatum mixtum on the south side of the oecus (15) whereas in other cases where this technique was employed the wall thickness amounts to ca 44.0 cm. (= 11/2 Roman foot). It therefore seems justifiable to include the north wall of the peristyle in the metrological analysis.

The last adaptation concerns the oecus (15). As we have mentioned above, the east wall of this room, which lies in a direct line with the eastern row of columns of the peristyle, dates back to an earlier building period than that of the remaining masonry north of the peristyle. Although the west and rear wall of the oecus are ascribable to the Roman age, the oecus seems to form part of the first layout of the house. This is indicated by the symmetrical construction of this room within the plan of the house and by the relationship between the dimensions of the oecus and those of the peristyle; the latter will be dealt with later. Therefore, anticipating further study, we cautiously consider the west and rear wall of the oecus as having been built on the foundations of their predecessors belonging to the original layout of the house and will include the oecus in the metrological analysis.

## METROLOGICAL ANALYSIS

In Pompeian house planning until the early Augustan age (ca 20 BC) a pre-Roman unit of measure was used: the Oscan foot.[26] The size of this unit was deduced by H. Nissen and fixed at 27.5 cm[27]. It has, however, been recently demonstrated that the exact length of the unit of measure for each building has to be calculated separately from the sum total of measurements in metres.[28] As a rule, this is the only way in which measurements in feet can be obtained which are in accordance with the values intended by the architect.

The correct length of the unit of measure is in principle calculated as follows: the relationship between a limited number of measurements in metres gives an indication of the employed unit of measure. This hypothetical unit of measure is then compared with the other measurements in metres and their subdivisions. If the hypothetical unit of measure also produces a coherent picture of measurements in feet for these values then we may assume that this hypothetical unit of measure closely approximates the employed foot measure. In order to ensure that the unit of measure thus obtained is based upon all measurements in metres and not only upon these of which the hypothetical unit of measure was deduced, the length of the unit of measure is defined by calculating an ideal, average value from the sum total of measurements in metres: the weighted average foot measure.[29]

If this method is employed in the analysis the house of Pansa, then in the first place a provisional unit of measure of approximately 27.5 cm must be deduced from the measurements in metres, for which a starting point must be found in the plan. A close study of the plan (fig. 2-3) reveals that the characteristic central axis of the house does not run truly parallel with the west and east alignment nor does the axis lie at right angles to the facade. Within the alignments, on the contrary, the walls do run parallel with the central axis, or were erected at an angle of 90° with this central line. It appears that the plan was not laid out from the side walls, but from the axis of symmetry.

Assuming that the location of the central axis inside the outer walls was not arbitrary, there must be a point of reference in the plan which determines the exact position of the axis. The only point which can be taken into consideration is the intersection of the central axis with the line formed by the south wall of the atrium and the walls lying in a direct line with it. For only here does the central axis lie exactly in the middle of the house. If the line described above with the intersection with the central axis in the middle was divided into round measurements in feet, this will enable us to deduce the length of the provisional (hypothetical) foot measure.

The width of the house (fig. 3) measured up to the south wall of the atrium is 3319.5 cm. The intersection with the central axis lies 1661.5 cm from the west alignment and 1658.0 cm from the east side of the house. The width of the atrium increased by the depth of the adjacent cubicula (36 and 3c) equals 1664.5 cm; in the west the distance between the side of the house and the rear wall of the cubiculum (36) is 826.5 cm, on the east side this distance was measured as 828.5 cm. As appears from these measurements, the width of the atrium increased by the depth of the cubicula equals half the width of the house and on both sides the distance between the rear wall of the cubicula and the side of the house is a quarter of the total width.

With a foot measure of 27.66 cm, the total width of the house can be fixed at 120'. This figure was then divided into 60' for the width of the atrium increased by the depth of the cubicula and twice 30' for the distance remaining on either side to the outer walls of the house. Given a total width of 120' the central axis lies 60' from both side facades. The conversion of the other measurements and their subdivisions, in each case measured on masonry belonging to the original layout of the house, also presents a coherent picture of measurements in feet. The length of the provisional unit of measure (27.66 cm) appears to be roughly correct, but by calculating the ideal, average foot measure it can be fixed with greater precision at 27.67 cm.

The following survey presents the conversion into feet of the most important measurements.

On a level with the south wall of the atrium, the width of the house was divided as follows:

| | measured (in cm) | feet (27.67 cm) | theoretically (in cm) |
|---|---|---|---|
| distance west alignment to rear cubiculum 36 | 826.5 | 30 | 830.1 |
| width atrium + depth cub. 36 and 3c | 1664.5 | 60 | 1660.2 |
| distance rear wall cub. 3c to east alignment | 828.5 | 30 | 830.1 |
| overall width of the house | 3319.5 | 120 | 3320.4 |

The measurement of 60' for the width of the atrium together with the depth of the adjoining cubicula was divided into:

| | measured (in cm) | feet (27.67 cm) | theoretically (in cm) |
|---|---|---|---|
| depth cub. 36, 3a-b | 321.0– 323.0 | 11½ | 318.2 |
| wall thickness | 41.0– 42.0 | 1½ | 41.5 |
| width atrium | 938.0– 943.0 | 34 | 940.8 |
| wall thickness | 41.5– 42.0 | 1½ | 41.5 |
| depth cub. 3c-e | 321.0– 323.5 | 11½ | 318.2 |
| overall width | 1664.5– 1668.5 | 60 | 1660.2 |

On a level with the alae, the figure of 60' was divided into:

| | measured (in cm) | feet (27.67 cm) | theoretically (in cm) |
|---|---|---|---|
| depth ala 4a | 363.0 | 13 | 359.7 |
| width atrium | 943.0 | 34 | 940.8 |
| depth ala 4b | 362.0 | 13 | 359.7 |
| overall width | 1668.0 | 60 | 1660.2 |

On a level with the north wall of the atrium the figure of 60' was divided into:

| | measured (in cm) | feet (27.67 cm) | theoretically (in cm) |
|---|---|---|---|
| north wall ala 4a | 363.0 | 13 | 359.7 |
| doorway | 137.0 | 5 | 138.4 |
| width ashlars | 86.0 | 3 | 83.0 |
| width tablinum (5) | 502.0 | 18 | 498.1 |
| width ashlars | 81.0 | 3 | 83.0 |
| doorway | 134.5 | 5 | 138.4 |
| north wall ala 4b | 364.5 | 13 | 359.7 |
| overall width | 1668.0 | 60 | 1660.2 |

On a level with the tric1inium fenestratum (7), the figure of 60' was divided into:

| | measured (in cm) | feet (27.67 cm) | theoretically (in cm) |
|---|---|---|---|
| width triclinium fenestratum | 541.5 | 19½ | 539.6 |
| wall thickness | 42.0 | 1½ | 41.5 |
| width tablinum | 502.0 | 18 | 498.1 |
| wall thickness | 40.0 | 1½ | 41.5 |
| width andron | 175.5 | 6½ | 179.9 |
| wall thickness | 27.5 | 1 | 27.7 |
| width room 8 | 332.5 | 12 | 332.0 |
| overall width | 1661.0 | 60 | 1660.2 |

At the south wall, the width of the atrium amounts to 940.0 cm. This figure was divided into 342.0 cm for the distance between the west wall of the atrium and that of the fauces (1), 267.5 cm for the width of the fauces and 330.5 cm (= 83.5 + 137.0 + 110.0) for the distance between the east wall of the fauces and that of the atrium. The asymmetrical structure revealed by these figures is owing to inaccuracies in the reconstruction in *opus reticulatum* of the west wall of the fauces and of the adjoining wall in the atrium. The original width of the fauces, amounting to 273.0 cm, can still be measured at a point where the renewed west wall joins on to the original masonry in opus quadratum of the vestibulum. The width of the fauces, however, gradually decreases in the direction of the atrium from 273.0 cm to the already mentioned 267.5 cm, from which it follows that the west wall of the fauces does not run parallel with the east wall of this room. In order to obtain the correct values in feet, the measurements in which the division of the south wall of the atrium is now expressed need correcting: for the width of the fauces 273.0 cm is taken; the distance between the east wall of the fauces and that of the atrium (330.5 cm) remains unaltered, so that 940.0 - 273.0 - 330.5 = 336.5 cm remains for the distance between the west wall of the atrium and that of the fauces. The width of the fauces is converted into 10'; the wall section on both sides of the fauces corresponds with 12' .

| | measured (in cm) | feet (27.67 cm) | theoretically (in cm) |
|---|---|---|---|
| wall section west | 336.5 | 12 | 332.0 |
| width fauces | 273.0 | 10 | 276.7 |
| wall section east | 330.5 | 12 | 332.0 |
| width atrium | 940.0 | 34 | 940.8 |

The length of the atrium, measured between the original masonry on the east side, is 1436.0 cm, which corresponds with 52'.[30] On a level with the pilasters and the doorways in the side walls, the length of the atrium was divided as follows (from south to north):

| | measured (in cm) | | feet (27.67 cm) | theoretically (in cm) |
|---|---|---|---|---|
| | west | east | | |
| pilaster | 111.5 | 111.5 | 4 | 110.7 |
| doorway | 130.5 | 131.0 | 4⅔ | 129.1 |
| pilaster | 180.0 | 184.0 | 6⅔ | 184.5 |
| doorway | 133.5 | 130.0 | 4⅔ | 129.1 |
| pilaster | — | 183.5 | 6⅔ | 184.5 |
| doorway | — | 129.5 | 4⅔ | 129.1 |
| pilaster | 179.0 | 179.5 | 6⅔ | 184.5 |
| width alae | 387.0 | 387.0 | 14 | 387.4 |
| length atrium | 1432.0 | 1436.0 | 52 | 1438.8 |

On a level with the cubicula the length of the atrium was divided into:

| | measured (in cm) | feet (27.67 cm) | theoretically (in cm) |
|---|---|---|---|
| width cub. 3c | 333.5 | 12 | 332.0 |
| wall thickness | 28.0 | 1 | 27.7 |
| width cub. 3d | 316.5 | 11½ | 318.2 |
| wall thickness | 28.0 | 1 | 27.7 |
| width cub. 3e | 316.0 | 11½ | 318.2 |
| wall thickness | 27.0 | 1 | 27.7 |
| width ala 4b | 387.0 | 14 | 387.4 |
| length atrium | 1436.0 | 52 | 1438.8 |

The dimensions of the peristyle are 1495.0 - 1497.5 x 1976.5 - 1979.5 cm, which corresponds with 54' x 711/2'.[31] On a level with the colonnade, the width of the peristyle was divided into (from west to east):

| | measured (in cm) | | feet (27.67 cm) | theoretically (in cm) |
|---|---|---|---|---|
| | south | north | | |
| depth colonnade | 373.0 | 371.0 | 13½ | 373.5 |
| ½ column diameter | 28.0 | 28.0 | 1 | 27.7 |
| interaxial | 222.3 | 221.3 | 8 | 221.4 |
| interaxial | 251.1 | 251.4 | 9 | 249.0 |
| interaxial | 221.4 | 224.8 | 8 | 221.4 |
| ½ column diameter | 27.5 | 27.5 | 1 | 27.7 |
| depth colonnade | 371.5 | 373.5 | 13½ | 373.5 |
| width peristylium | 1495.0 | 1497.5 | 54 | 1494.2 |

On a level with the colonnade, the length of the peristyle was divided into (from south to north):

| | measured (in cm) | | feet (27.67 cm) | theoretically (in cm) |
|---|---|---|---|---|
| | west | east | | |
| depth colonnade | 373.0 | 373.0 | 13½ | 373.5 |
| ½ column diameter | 28.0 | 28.0 | 1 | 27.7 |
| interaxial | 234.8 | 235.5 | 8½ | 235.2 |
| interaxial | 235.9 | 237.5 | 8½ | 235.2 |
| interaxial | 234.7 | 233.0 | 8½ | 235.2 |
| interaxial | 236.1 | 237.5 | 8½ | 235.2 |
| interaxial | 238.5 | 236.0 | 8½ | 235.2 |
| ½ column diameter | 27.5 | 27.5 | 1 | 27.7 |
| depth colonnade | 368.0 | 371.5 | 13½ | 373.5 |
| length peristyle | 1976.5 | 1979.5 | 71½ | 1978.4 |

The west wall of the peristyle is composed of the following parts (from south to north):

| | measured (in cm) | feet (27.67 cm) | theoretically (in cm) |
|---|---|---|---|
| width exedra 11a | 370.0 | 13½ | 373.5 |
| wall section | 470.0 | 17 | 470.4 |
| wall section | 474.0 | 17 | 470.4 |
| wall section | 662.5 | 24 | 664.1 |

The east wall of the peristyle consists of the following parts (from south to north):

| | measured (in cm) | feet (27.67 cm) | theoretically (in cm) |
|---|---|---|---|
| width exedra 11b | 371.0 | 13½ | 373.5 |
| wall section (337.5 + 133.0) | 470.5 | 17 | 470.4 |
| wall section | 359.5 | 13 | 359.7 |
| wall sections (23.0 + 203.0 + 124.5 + 354.0 + 74.0) | 778.5 | 28 | 774.8 |

The column diameter measures 55.5 cm and is converted into 2'; according to Breton,[32] the height of the columns measures 470 cm, which corresponds with 17'.

| | measured (in cm) | feet (27.67 cm) | theoretically (in cm) |
|---|---|---|---|
| column diameter | 55.5 | 2 | 55.3 |
| column height (Breton) | 470 | 17 | 470.4 |

The overall length of the atrium, tablinum (5) and peristyle is 3982.5 - 3989.5 cm, which corresponds with 144'. This figure is composed of the following parts:

| | measured (in cm) | | feet (27.67 cm) | theoretically (in cm) |
|---|---|---|---|---|
| | west | east | | |
| length atrium | 1432.0 | 1436.0 | 52 | 1438.8 |
| depth tablinum | 574.0 | 574.0 | 20½ | 567.2 |
| length peristyle | 1976.5 | 1976.5 | 71½ | 1978.4 |
| overall length | 3982.5 | 3989.5 | 144 | 3984.5 |

The external dimensions of the oecus (15) are 822.0 - 827.0 x ca. 1115 cm, which presumably equals to 30' x 40' (theoretically 830.1 x 1106.8 cm). The inner width of the oecus is 740.0 - 745.0 cm, which can be converted into 27' (theoretically 747.1 cm).

## DESIGN

In the design of the house of Pansa, the width of the building was determined by the width of the insula: 120' (fig. 4).[33] As already mentioned, this figure of 120', measured on a level with the south wall of the atrium, was divided into 30', 60' and 30'. For the overall length of the atrium, the tablinum (5) and the peristyle, the architect chose 144' which is in a ratio of 5 : 6 to the width of the house. For determining the dimensions of the atrium and peristyle zone, the length of this principal form (120' x 144') was divided into two almost equal parts: 711/2' for the length of the peristyle and 721/2' for the length of the atrium together with the depth of the tablinum.

The division of the total length of 144' into two unequal halves, a division which is not based on any proportion, is at variance with the rational division of the width, measuring 120' (120' = 30' + 60' + 30') and with the dimensions of the principal form of the house which can be reduced to a proportion. The reason why the architect departed from the more likely division into exactly 2 x 72' is indicated by the disposition of the columns in the peristyle. The width of the peristyle amounts to 54' and is in a ratio of 3 : 4 to the theoretical length of 72'. This same ratio is also mentioned by Vitruvius (VI.3.7) for the shape of peristyles, lying transversely. The width of 54' was divided into four: on each side 13 1/2' for the depth of the colonnade and (2 x 13 1/2 =) 27' for the external width of the row of columns. This figure of 27' was then subdivided into three intervals of 9' . For the middle interaxial 9' was chosen; the 9' remaining on either side consist of a contracted interaxial (8') and half the diameter of a column (1').

On the same line the theoretical length of the peristyle (72') would have been divided into 2 x 13 1/2' for the depth of the colonnade and 5 x 9' = 45' for the external length of the row of columns, also with angle contraction at the outer interaxial (fig. 5a). The architect obviously wanted to avoid this as he decided on five equal intervals of 8 1/2' each, which stand midway between the width interaxials of 8', 9' and 8'. If we then add up the various parts including the adjusted interaxials, 2 x 13 1/2' (depth colonnade) + 5 x 8 1/2' (interaxial) + 2 x 1' (half a column diameter), the length of the peristyle equals 71 1/2' (fig. 5b). The architect obviously preferred avoiding angle contraction in the length of the peristyle rather than consistently arranging the plan of the house on the basis of proportions.

Given the interaxial of 8 1/2', the column height was fixed in the ratio 1 : 2 at 17'. The width of the exedrae (11 a-b) corresponds with the depth of the colonnade: 13 1/2'. As a result, the north wall of both exedrae lies on the line touching the outside of the front row of columns. The architect also used the disposition of the columns as a starting point for determining the position of the doorways to rooms 12a, 12c and B2: a line can be drawn in continuation of one of the two doorjambs which touches one of the columns in the peristyle.

If, instead of taking 72' for the length of the peristyle, the architect subtracted 1/2' from this figure, this implied that the total length of the atrium and the tablinum had to be increased by 1/2' from 72' to 72 1/2'. The layout of the atrium including the adjacent rooms indicates that the architect initially indeed decided on an overall length of 72' for the atrium and tablinum: if the width of the atrium (34') is increased by the depth of the

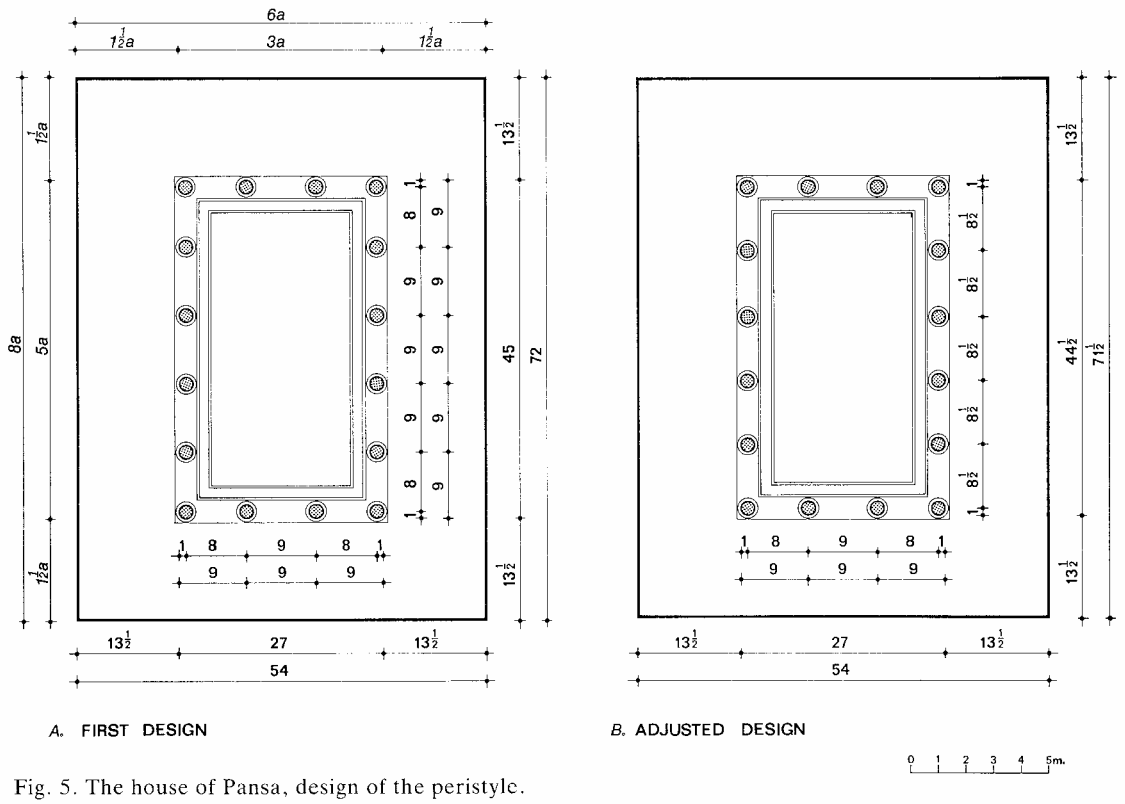


Fig. 5. The house of Pansa, design of the peristyle.

alae (13') this equals a total distance of (34' + 2 x 13' =) 60'. The ratio between this figure and the theoretical overall length of the atrium and the tablinum (72') is (60 : 72 =) 5: 6. We note that the ratio providing the base for the principal form of the house (5 : 6) recurs in the rectangle described by the south wall of the atrium and the rear wall of ala 4a, the south wall of the peristyle and the rear wall of ala 4b.

If we take the theoretical overall length of the atrium and the tablinum (5) as a starting point, the triclinium fenestratum (7), the tablinum (5), the andron (6) and room 8 were combined in a strip measuring 20' x 60' with the ratio 1 : 3. The alteration in the initial design of the peristyle caused this strip to be enlarged to 20 1/2' x 60'. The width of the tablinum is 18', which is 1/3 of the width of the peristyle.[34]

A previous study of five atria at Pompeii already revealed that as a rule the depth of the alae varies between 12' and 13'.[35] In the design of the house of Pansa the architect decided on 13'. This choice was possibly based on the following metrological relationship: the distance between the side wall of the tablinum and the rear wall of the ala amounts to 21' and was divided into 13' for the depth of the ala and 8' for the remaining wall section in the atrium. The figures 8', 13' and 21' form part of the numeral progression which approaches the proportion of the *sectio aurea* in round foot measurements.[36] The theory that this numerical progression forms the basis for the division of the wall between the rear wall of the ala and the side wall of the tablinum is supported by the way in which the wall section, measuring 8', was subsequently subdivided: the doorway in this wall section is 5' wide and the ashlars between the doorway and the side wall of the tablinum measure 3'. These measurements also form part of the above mentioned progression.

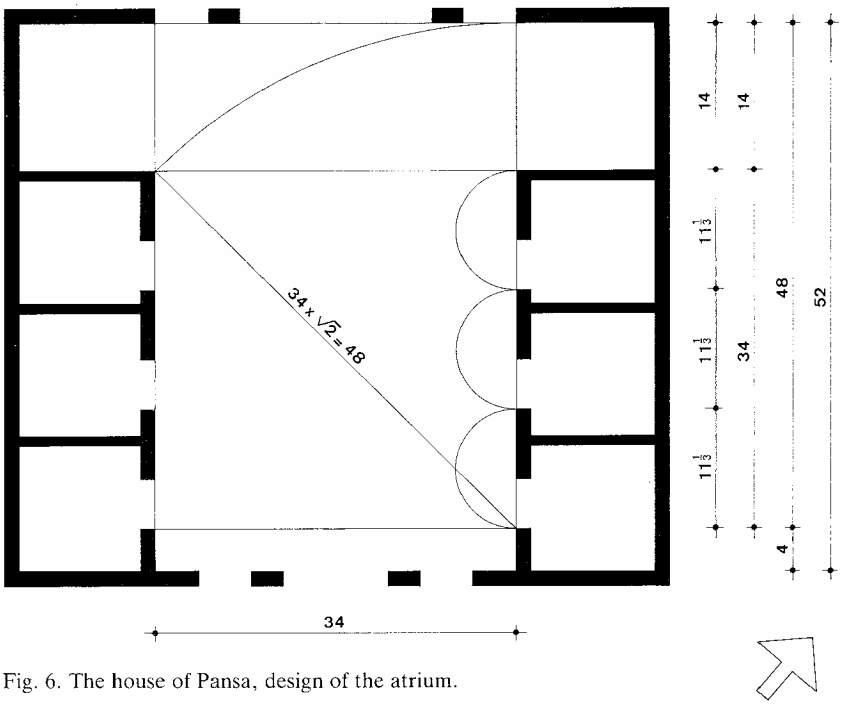


Fig. 6. The house of Pansa, design of the atrium.

A characteristic of the method of design employed in the house of Pansa is the procedure from outlines towards details. As a result of this method and of the fact that in principle the depth of the alae and of the tablinum constitute constants in the plan, dimensions for the atrium were left which cannot be reduced to a proportion: 34' x 52'.[37] Nevertheless, the construction of the atrium was planned with care. Starting from the north wall of the atrium the architect measured a rectangle of 34' x 48' (fig. 6), from which the width of the alae and the division of the side walls are determined. In round foot measurements this rectangle of 34' x 48' accurately approaches the geometric ratio 1 : √2, which is mentioned by Vitruvius as one of the three alternatives for the shape of the atrium.[38] As described by Vitruvius, a rectangle in the ratio 1 : √2 can be obtained by taking the side of a square for the width and its diagonal for the length. The difference in length between the diagonal and the side of the square, respectively 48' and 34' corresponds with the width of the alae: 14'. For the division of the side walls, the east and the west side of the square were divided into three: 3 x 11 1/3'. As the rectangle of 34' x 48' does not occupy the complete area of the atrium, a margin of (52' - 48' =) 4' x 34' is left on the south side of the atrium; the length of the southern pilasters equals the width of this margin which is 4'.

Besides the described atrium and peristyle zone, there is a third element. On the north side of the peristyle rooms 15-20, 21a and living unit C together form a strip of 40' x 120' which was added to the principal form (120' x 144'). The most important room in this zone, the oecus (15), has an inner width of 27', which is in a ratio of 1 : 2 to the width of the peristyle. The outer dimensions of the oecus are 30' x 40' producing the ratio of 3 : 4. Obviously, the dimensions of the oecus were related to those of the peristyle in first design in two different ways. This is indicated on the one hand by the ratio 1 : 2 between the width of the oecus and the width of the peristyle and on the other hand by the fact that the dimensions of the peristyle and the outer dimensions of the oecus were both determined by the ratio 3 : 4.

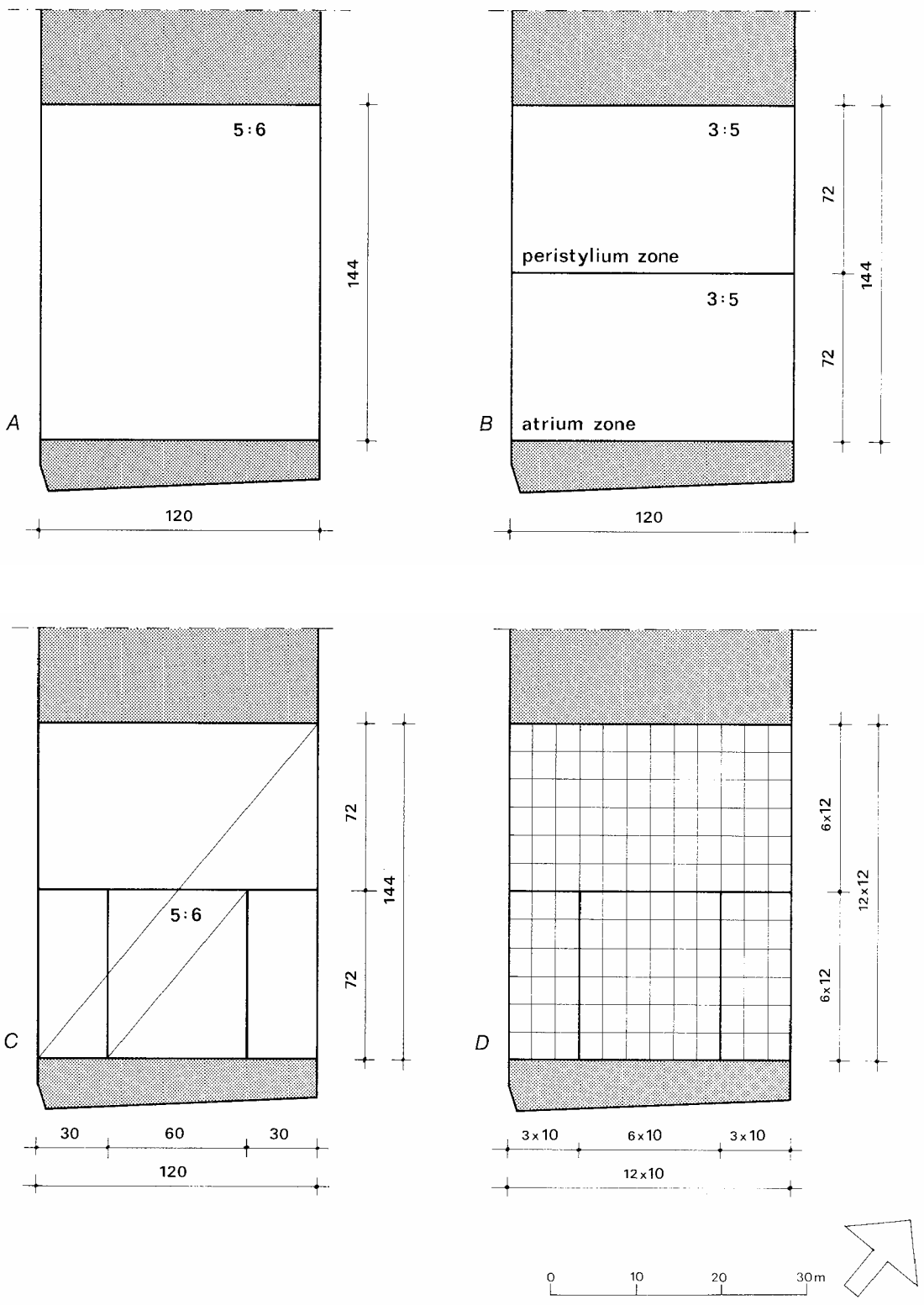


Fig. 7. The house of Pansa, the principle of mutually interrrelated proportions.

In summary, the plan was arranged as follows:
1. The principal form of the house was laid out in the ratio 5 : 6 at 120' x 144' (fig. 7a).
2. The principal form was divided into an atrium and a peristyle zone: both 72' x 120' with a ratio 3: 5 (fig. 7b).
3. The atrium zone was divided into four strips of 30' x 72', the middle two of which were taken for the atrium and the rooms surrounding it: 60' x 72'. This rectangle is of the same shape as the principal form of 120' x 144' (fig. 7c).
4. In the atrium a rectangle of 34' x 48' with the ratio 1 : √2 was measured for determining the division of the side walls and the width of the alae (fig. 6).
5. The dimensions of the peristyle were determined by the ratio 3 : 4. Given the length of 72' , the width of the peristyle was fixed at 54'. In the original layout the columns were placed within a rectangle of 27' x 45' with the ratio 3: 5.[39] As the architect chose not to apply angle contraction in the length of the peristyle, in the final plan the interaxials were altered to 8 1/2' , which resulted in a deviation from the standard guidelines (fig. 5).
6. A strip measuring 40' x 120' was added to the principal form with an implied ratio 1 : 3. Measured on the outside the oecus is of the same shape as the peristyle.

In designing the house of Pansa, the architect first determined the main division, in which the shape of the principal parts of the building and their mutual relations are laid down (fig. 7a-c). Owing to the close relationship between the various parts and the overall plan, it is not clear whether the architect chose his base from the principal form of the house and then divided this into parts, or whether the plan was developed from the rectangle described in the ground plan by the atrium and the adjacent rooms. If this rectangle was taken as the starting point, then the shape of the atrium and peristyle zone, of which the width was determined by the width of the insula, was obtained by doubling the width of this rectangle. The doubling of the length and the width for the mentioned rectangle produces the principal form which, as a result, is of the same shape (5 : 6) as that of the atrium and its surrounding rooms. From the similarity between the dimensions of the atrium and peristyle zone it can be concluded that both zones were of equal importance to the commissioner.

After the guidelines for the plan had been selected, the architect projected the atrium and the peristyle in the two principal zones and then worked out the plan in detail.

The design of the house of Pansa is based on mainly 'rational' proportions (e.g. 1 : 2, 3 : 4, 5: 6), expressed in round foot measurements.[40] Nevertheless, the approximation in round foot measurements of on the one hand a geometrical proportion (1 : √2) and on the other the *sectio aurea* also played a part.

## VITRUVIUS

The proportions and the relations between the various measurements in the design of the house of Pansa call for a comparison with the rules laid down by Vitruvius for the planning of private houses. This will give us an indication of the relationship between a Pompeian design and Vitruvius' regulations of a later date. We realize that in principle a similar comparison should be based on a large number of detailed analyses of Pompeian dwellings. However, as these were not available we shall have to rely solely on the design of the house of Pansa.[41]

Vitruvius raises the matter of house planning in the sixth book of his *De Architectura* in which he discusses the principles of design and explains how the plan is to be worked out in detail with the help of ratios. For the following exposition it is important to read two essential passages concerning the principles of design.[42]

VI.2.1

The architects greatest care must be that his buildings should have their design determined by the proportions of a fixed unit *(rata pars).*[43] Once the principle of interrelated proportions *(ratio symmetriarum)* has been defined and the measurements have been filled in by calculation, then it is a sign of intelligence to adapt the proportions by means of subtraction or addition to the nature of the site or the use, or the appearance of the building and to insure that, if the system of proportions has been altered by means of subtraction or addition, this appears to have been done correctly and that the outer appearance is nowhere disharmonious.[44]

VI.2.5

Therefore the principle of interrelated proportions, from which the architect can deviate without any difficulties must first be defined. Then the length and the width of the base of the future building must be plotted and once these dimensions are fixed, the architect must be guided by the beauty of proportions in the working out of the design, so that the *eurythmia* is clear to the observer. I must now tell how this may be brought about, and first I will speak of the proper construction of the cavaedium.[45]

We can conclude from these passages that in the first place the principle of interrelated proportions must be determined on the basis of the shape of a fixed unit. This principle of interrelated proportions can be described as a schematic design in which ratios express the mutual relations between the principal parts and between these parts and the overall plan.[46] When the *ratio symmetriarum* has been defined the architect, taking into account the dimensions of the building site, then converts the ratios into real values (foot measurements). Once the size of the total plan and of its principal parts is known, the design must be worked out in detail on the basis of proportions.

It is left to the architect to choose the principle of interrelated proportions; Vitruvius, on the contrary, dictates how the design is to be worked out in detail. According to Vitruvius, the latter also covers the construction of the atrium and peristyle.

In the analysis of the house of Pansa we noted that the design of the guidelines forms the basis for the detailed plan. This schematic design, in which the shape of the principal parts of the house and their mutual relations are laid down, can be seen as Vitruvius' *ratio symmetriarum*, providing that the layout is based on the shape of a fixed unit. However, Vitruvius does not mention what in house planning should be understood by this *rata pars.* We believe that a module of which the relation between the length and the width is fixed in a proportion is the best answer to Vitruvius description.[47]

In the house of Pansa a module appears to consist of the unit 10' x 12' in the ratio 5 : 6, which is deduced from the dimensions of the atrium and its adjoining rooms (fig. 7d): if the length and the width of the rectangle described by the atrium and the surrounding rooms are both divided by 6, then a module is obtained in which the area of the atrium and peristyle zone and also the ground plan of the principal form of the house can be expressed. In the atrium zone on both sides of the atrium and adjacent rooms (36 units of 10' x 12') a strip is left, measuring 30' x 72' , which corresponds with (3 x 6 =) 18 units of 10' x 12'. The area of the peristyle zone (120' x 72') consists of (12 x 6 =) 72 modules and the principal form of the house (120' x 144') is composed of (12 x 12 =) 144 units of 10' x 12'.

In comparing the proportions dictated by Vitruvius for filling in the plan with the ratios actually used in the design of the house of Pansa, we shall restrict ourselves to the main points. The architect chose the approximation in round foot measurements of the

ratio 1 : √2 for the division of the side walls of the atrium, a geometrical proportion mentioned by Vitruvius (VI, 3, 3) about a hundred years later as one of the three alternatives for the shape of the atrium. In line with Vitruvius' regulations (VI, 3, 7), the dimensions of the peristyle can be reduced to the proportion 3 : 4. The width of the alae, which Vitruvius (VI, 3, 4) calculates from the length of the atrium, is related to the length of the atrium, but not in the manner described by Vitruvius. Neither the width of the tablinum, which in the house of Pansa results from the width of the peristyle nor the width of the fauces were calculated according to Vitruvius' rules.

From what has been said it follows that the method of planning employed by the architect in the design of the house of Pansa by no means differs from the method dictated by Vitruvius. The further filling in of measurements of the plan, based on proportions, is, on the contrary, only partly in agreement with Vitruvius' regulations. It is however important that in the spirit of Vitruvius rules, the width of the rooms which open (almost) completely on to the atrium or the peristyle, is related to the dimensions of one of the two principal rooms. From the relationship between the design of the house of Pansa and Vitruvius' rules of design it appears that both originated in the same architectural tradition.[48]

NOTES

1 This research on Pompei an houses derives from metrological analysis which was first developed by dr. *1* .A. de Waele, department of Classics, Catholic University of Nijmegen. After previous participation in field work in 1979 at Satricum (Meded Rome 43,1981,7-68) carried out by the Dutch Institute at Rome under the direction of its vice-director, dr. C.M. Stibbe, five atria of Pompeian houses were measured in June, 1981 (Peterse 1984). The house of Pansa was measured and studied by the author in June 1983. He wishes to mention with gratitude his indebtedness to Miss Imke Plattel for her assistance by the measurement of the house. Furthermore thanks are due to dott. ssa Giuseppina Cerulli Irelli, dott.S. De Caro and dott. A. D'Ambrosio of the Soprintendenza Archeologica di Pompei for giving permission for this research. The author is also indebted to drs. F. van Dooren and Miss S. Mellor, the former for the translation into Dutch of Vitruvius VI.2.1 and VL2.5, the latter for translating the manuscript. Also thanks are due to Mrs. P. Metzger for copy reading the final draft. A considerable debt is owed to dr. *J. A.* de Waele, who contributed several critical suggestions, and to drs. L.J.F. Swinkels.
The drawings 3-7 were made by the author.
2 Breton 1855, 190; Nissen 1877,658; Overbeck/Mau 1884,325; Choisy 1929,592.
3 Fiorelli 1875, 102.
4 For a description see Napoli *1950,* 243-244.
5 C.I.L.IV, 138.
6 Here we mean the earliest visible remains of the house.
7 Maiuri 1944-1945, 143. Carrington 1933,131 assigns the house of Pans a on general stylistic grounds to the middle of the tufa period. Lugli 1957,421 assigns the atrium to the 'eta sannitica-arcaica' (300-180 BC) and the facade and the peristyle to the 'eta sannitica-evoluta' (180-80 BC).
8 Nissen 1877, 659.
9 Overbeck/Mau 1884, 329: '(...) vielmehr ist das ganze Haus des Pansa nach griindlicher Wegräumung aller älteren Bauten auf Grund eines einheitlichen Planes erbaut worden'.
10 Mau/lppel 1928, 216.
11 Maiuri 1944-1945, 142-143: 'Riservata dunque l'acqua dell'impluvio dell'atrio alle taberne prospicienti sulla strada, restava per i bisogni del quartiere d'abitazione la piena disponibilita delle due cisterne del peristilio, capaci di raccogliere, a carico pieno, non meno di 75 m3 d'acqua; prova di per se sufficiente per ritenere che atrio e peristilio, integrandosi I'un I'altro per l'approvvigionamento idrico, dovessero essere coevi'.
Nevertheless, Jashemski 1979, 19 assumes that the peristyle was added.
12 As previously: Maiuri 1944-1945, 143.
13 For these alterations see: Overbeck/Mau 1884, 325-326; Mau/lppel 1928, 216; Maiuri 1942, 99-100.
14 Nissen 1877,16,39-40, 57-63; Mau 1879, 3-6; Mau 1908, 39-40; Carrington 1933, 130-132; Van Aken 1943,14-18; Lugli 1957, passim; Habets 1975, passim.
15 Here we are not dealing with a restoration, as opposed to: Nissen 1877, 659.
16 It is difficult to form a clear impression, owing to stucco remains.
17 Mau 1882, 73 also assumes that the east wall of room B6 is older than the north wall of this room: 'Und zwar wird die NO-Ecke des Zimmers (B6) von der Decoration nicht anerkannt; es ist vielmehr klar, daB sich dieselbe auf der O-Wand

einst weiter nach N fortsetzte und älter ist als die Nordwand des Zimmers, welche (am Peristyl des Haupthauses) in einen Pfeiler aus ziegelformigem Kalkstein endigt'.
18 See also Nissen 1877, 659; Mau/Ippel 1928, 216.
19 Small sized blocks of tufa and limestone.
20 Alternatively one layer of small tufa blocks and two layers of bricks.
21 In accordance with Kockel/Weber 1983, 59: 'Außerdem scheint die Bautechnik von der Lage und Bedeutung der Mauer innerhalb des Baugefiiges abhangig zu sein. Außenwande, Innenwände und Wände der Obergeschosse werden gleichzeitig in verschiedener Weise errichtet'.
22 According to Kockel/Weber 1983, 59-60, the oldest masonry in *opus incertum* of the Villa delle Colonne a Mosaico also shows a difference between the base of the wall (basalt) and the top part (Sarno limestone).
23 Mau 1879, 3-4.
24 The shortened side was finished with small sized blocks of Nocera tufa, limestone and soft, yellow tufa and with medium sized blocks of limestone (ca 30 x 20 x 20 cm).
25 Only the bottom half of this quoining is original.
26 Nissen 1877, 74.
27 Nissen 1877, 74-76.
28 Hecht 1979, 110; De Waele 1980, 394; Peterse 1984, 9-12.
29 Peterse 1984, 12.
30 Dimensions of the atrium of the house of Pansa:
F. Boulanger (ca 1840): 936 x 1428 cm
E. Breton (1855): 940 x 1440 cm
H. Nissen (1877): 940 x 1434 cm
C. Peterse (1984): 938-943 x 1432-1436 cm
31 Measurements of the peristyle are lacking in archaeological literature or differ so strongly from the values measured by us, that there would be little sense in a comparison.
32 Breton 1855, 198.
33 The external width of the house increases from 3319.5 cm, on a level with the south wall of the atrium, via 3328.0 cm, on a level with the south wall of the peristyle, to 3342.5 cm on a level with the north wall of the peristyle. It is however obvious that the architect took a constant value of 120’ (theoretically 3320.4 cm) as a starting point for the design.
34 There is also a relation between the width of the tablinum and the dimensions of the atrium: if half of the atrium length is plotted from the east wall of the atrium in the direction of the west wall, then the width of this room, amounting to 34', is divided into 26' and 8'. If this procedure is repeated, but this time from the west wall in the direction of the east wall, the division 8' -18' -8' as found in the plan (Fig. 4) is obtained.
35 Peterse 1984, 17.
36 Progression of Fibonacci: 1-1-2-3-5-8-13-21-34-55-89-144 .
37 The width of the atrium (34') also forms part of the progression of Fibonacci. See note 36.
38 Vitruvius V1.3.3.
39 We are probably dealing with a pattern: within a rectangle in the proportion 3: 4 (54' x 72') a second figure in the ratio 3: 5 (27' x 45') is obtained by subtracting a quarter of the width (13 1/2' from the length (72') and the width (54') on all sides (Fig. 5a). The width of the inner rectangle thereby equals half the width of the outer rectangle; the length of the inner rectangle equals half the length of the outer rectangles' diagonal.
40 Cf. Geertman 1984 1,35, who takes the view that in the design of Pompeian houses the arithmetical approximation of geometrical proportions played a predominant part.
41 For the metrological analysis of five Pompei an atria see Peterse 1984, and Geertman 1984 I. Furthermore Nissen 1877, passim and Mau 1879 passim.
42 Vitruvius V1.2.1
'Nulla architecto maior cura esse debet, nisi uti proportionibus ratae partis habeant aedificia rationum exactiones. Cum ergo constituta symmetriarum ratio fucrit et conmensus ratiocinationibus cxplicati, turn etiam acuminus est proprium providere ad naturam loci aut usum aut speciem <detractionibus aut> adiectionibus temperaturas <et> efficere, cum de symmetria sit detractum aut adiectum, uti id videatur rccte esse formatum in aspectuque nihil desideratur'. (edition C. Fensterbusch)
Vitruvius V1.2.5
'Igitur statuenda est primum ratio symmetriarum, [a qua sumatur sine dubitatione commutatio] dcinde explicetur operis futuri locorum imum spatium 10ngitudinis <et latitudinis>, cuius cum semel constituta fuerit magnitudo, sequatur earn proportionis ad decorem apparatio, uti non sit considerantibus aspectos eurythmiae dubius. De qua quibus rationibus efficiatur, est mihi pronuntiandum, primumque de cavis aedium, uti fieri debeant, dicam'. (edition C. Fensterbusch)
43 After the edition Granger.
44 Cf. edition Fensterbusch, Morgan and Granger. Also with Geertman 1984 II, 53.
45 Idem.
46 We agree with Geertman 1984 II, 53.
47 In any case the *rata pars* cannot be interpreted as a unit of length as Vitruvius mentions *proportionibus ratae partis.*
48 Cf. Tamm 1973, 55.

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