The Roof of the Hephaisteion

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PLATES 37-40

Abstract

The present study is the result of a recent detailed examination of fragments, both previously and newly assigned, from the roof of the Hephaisteion and of a new, thorough survey of the geison courses and of the ceilings which remain in place on the temple. From the fragments and from the various cuttings and markings on the marbles which are in situ the jigsaw puzzle of the roof is now put together. The length, width, and correct placing of the sima blocks have been determined. Certain fragments of the sima course which had been mistakenly assigned to the twin temple of Ares in the Athenian Agora are now exactly located on the temple to which they belong. From these fragments and from the dowel cuttings on the geison course the corner sima blocks with their integrally carved acroterion bases are accurately reconstructed. Also enough information remains to give a general reconstruction of the apex acroterion bases. Finally, there is an analysis of the wood frame construction and an examination of the extant fragments of roof tiles. The architect of the building involved himself in an almost impossible situation with his roof framing since he did not properly correlate it vertically with his marble ceilings. To complicate matters even more the modular unit of these systems varied. This study suggests possible solutions, and what is seemingly the only probable one, to the problem. Of the roof tile fragments, a few were found in 1974 on top of the building, quite likely having been removed from the Byzantine barrel vault which covers the cella. These certainly belonged to the original construction and provide the answers to some problems. The roofing tiles were probably a mixture of Pentelic and Parian marble, as are the members of the geison and sima courses. Based on certain characteristics and dimensions, various other fragments found within the area of the excavations are also considered as possible candidates for the roof.

Various scholars in the past have been interested in and have contributed to our knowledge of the roof construction of the Hephaisteion.[1] Now, however, we have a new recording and study of the remains of the roof which permit a more exact restoration of this part of the temple than was formerly possible.[2]

Most of the information for this restoration comes from the flank and raking geison courses of which all the blocks, except for the five over the east pediment at the northern end, are preserved in situ (ill. 1). Other evidence comes from the marble coffered ceilings and beams, from cuttings for the ridge beam and purlins in the backer walls of the tympanums, and from the extant fragments of sima blocks, lion-head spouts and roof tiles.

INFORMATION FROM THE FLANK GEISON COURSE

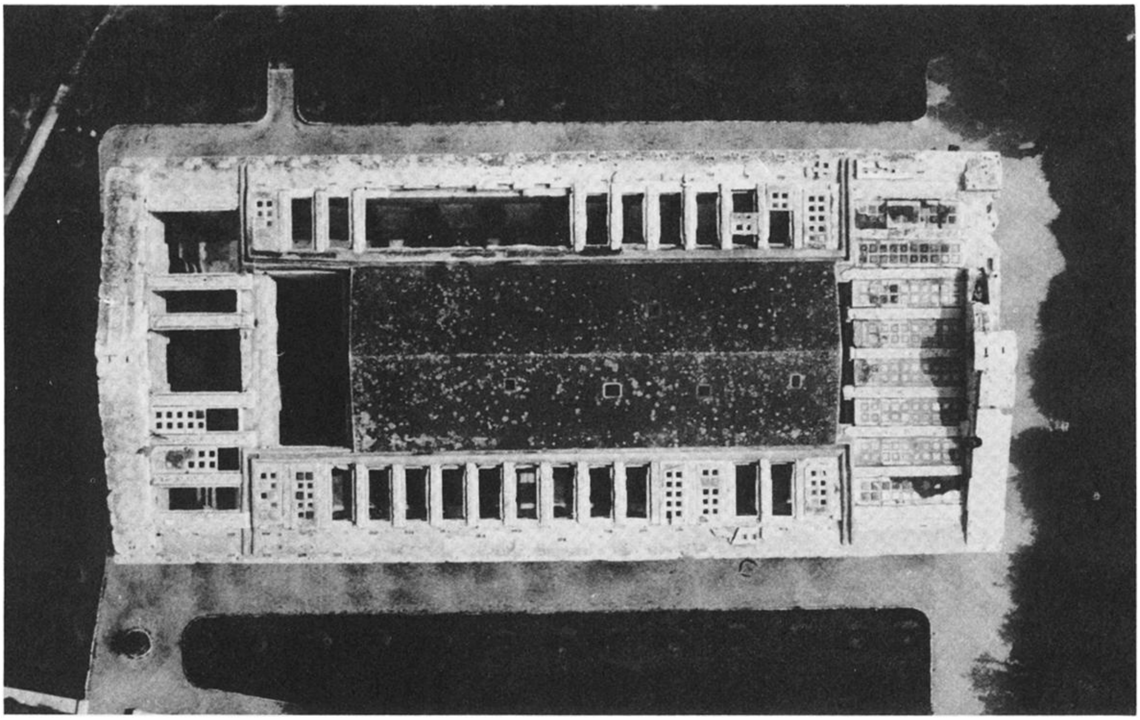
The flank geison course now has a length of 32.580 m. along the north side of the temple and 32.542 m. along the south. After subtracting those joints which have opened slightly over the centuries the original measurements would have been 32.518 m. at the north and 32.490 m. at the south (ill. 2).[3] These dimensions average 32.504 m. which is the basic figure which will be used in this study. There has also been a lateral spread. Although the building originally measured 14.428 m. from

[1] Stuart and Revett, *The Antiquities of Athens* (London 1794) III, i. F.C. Penrose, *Principles of Athenian Architecture* (London 1851) xi, pl. XXXV. S. Ivanoff, *Architektonische Studien* (Berlin 1892) pls. I-IV. W.B. Dinsmoor, "The Temple of Ares at Athens," *Hesperia* 9 (1940) 1-52 and *Observations on the Hephaisteion, Hesperia* Suppl. 5 (1941) [hereafter Dinsmoor, *Observations*]. W.H. Plommer, "Three Attic Temples," *BSA* 45 (1950) 66-112. H. Koch, *Studien zum Theseustempel in Athen* (Berlin 1955). M.H. McAllister, "The Temple of Ares at Athens," *Hesperia* 28 (1959) 1-64. A. Trevor Hodge, *The Woodwork of Greek Roofs* (Cambridge 1960). Further reference to these works will normally be made by the author's name only.

[2] I wish to thank Prof. Colin N. Edmonson who got me interested in this project and who helped a good deal in the study of the roof. Further consideration of the building, in regard to the marble ceiling and to the masons' marks on the coffer frames and lids of the ceiling by Colin N. Edmonson and William F. Wyatt, Jr., will appear at a later date.

I wish as well to express my gratitude for their helpfulness to Dr. G. Dontas, Ephor of the Acropolis, and to Professors Homer A. Thompson and T. Leslie Shear, Jr., the past and present Directors of the Agora Excavations. Homer Thompson kindly read this article in manuscript form and has made several valuable comments. Also he and John McK. Camp II did some final checking for me of roof cuttings. Mrs. Helen Besi tirelessly helped me on the roof in the surveying and taking of field dimensions. Eugene Vanderpool, Jr., took most of the photographs for the plates.

[3] Ill. 2 represents a completely new survey of the geisa and ceilings of the Hephaisteion and is completely independent of the similar, but incomplete and sometimes erroneous, plan in Koch, taf. 42.



ILL. 1. Aerial view of Hephaisteion roof. Photograph Julian Whittlesey

north to south at the level of the geisa, the width now varies from 14.455 to as much as 14.640 m.[4]

The flank geisa have a vertical curvature which follows that of the stylobate. The maximum curvature of the latter is along the western half of the north flank where the vertical difference is 0.044 m., while the maximum curvature of the geison course, again along the western half of the north flank, is 0.036 m.[5] The geisa fall into three distinct groups as to their lengths: the normal ones measure 1.287 to 1.296 m. long, averaging 1.2918 m.; the corner ones (on which are carved the beginning of the raking geisa) closely average 1.662 m.; the two central geisa on each flank, which have an extra via and half mutule, average 1.672 m.[6] Although the two central geisa on the north flank have their common joint within 0.003 m. of the center of the building, the corresponding joint on the south flank is 0.0105 m. off-center to the west, due primarily to the overly long central geison on the east side of the joint (ill. 8).[7]

Numerous cuttings, apart from the normal connecting double T-clamps, appear upon the geisa. Among them is a series of dowel holes, in pairs,

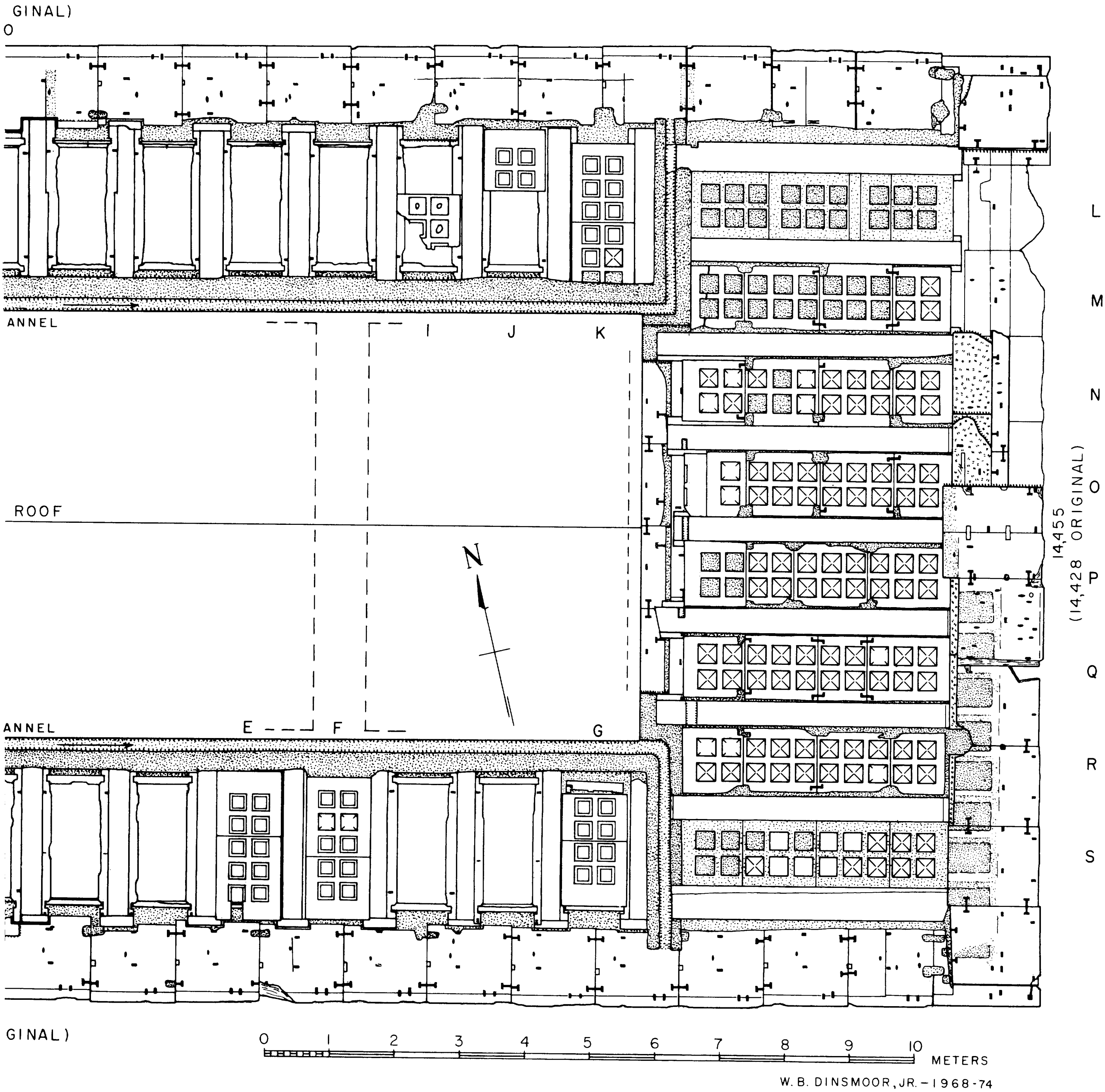
[4] The original width of the building at roof level can most accurately be measured along the east horizontal geison course, under the tympanum. The blocks of this course from south to north in meters are: 1.658, 1.296, 1.296, 1.293, 1.673, 1.672, 1.292, 1.296, 1.298, 1.654. These total 14.428 m. On the pediment, with the roof slope of 1: 4.023 (i.e. 1.793 : 7.214), each slope should measure 7.433 m. The north slope at the west, after deducting open joints, had a length of 7.434 m. Similarly, the south slope on the east was 7.430 m. long. The south slope on the west now measures 7.435 m. but was a bit less with open joints deducted. The north slope on the east is immeasurable.

As a check on the width of the building: from geison nosing to triglyphon antithema is 1.477 m. (x 2); from antithema to cella wall is 1.8705 m. (x 2); the wall thickness is 0.758 m. (x 2); the clear dimension across the cella is 6.217 m. (see n. 55). The total adds up to 14.428 m. The side walls of the cella are vertical inside and out.

[5] The curvature of the stylobate along the eastern half of the north flank gives a vertical difference of 0.037 m. On the south flank it amounts to 0.041 m. along the eastern half and 0.026 m. along the western half. The difference in elevation between the stylobate and geison course is: NW 7.708 m., N. center 7.700 m., NE 7.721 m., SE 7.711 m., S. center 7.693 m., SW 7.701 m., averaging 7.706 m.

[6] This system differs slightly from that used on the architect's following work, the temple of Poseidon at Sounion, where a single central geison block was employed (W.B. Dinsmoor, Jr., "The Temple of Poseidon: A Missing Sima and Other Matters," *AJA* 78 [1974] 211-14, ills. 1, 2 and 4).

[7] The central geisa on the north flank actually measure 1.670 m. at the west and 1.675 m. at the east while on the south flank they measure 1.692 m. at the east and 1.651 m. at the west. Here and elsewhere throughout this article, when the dimensions given vary only slightly from ones previously published, space will not be wasted in citing the discrepancies.



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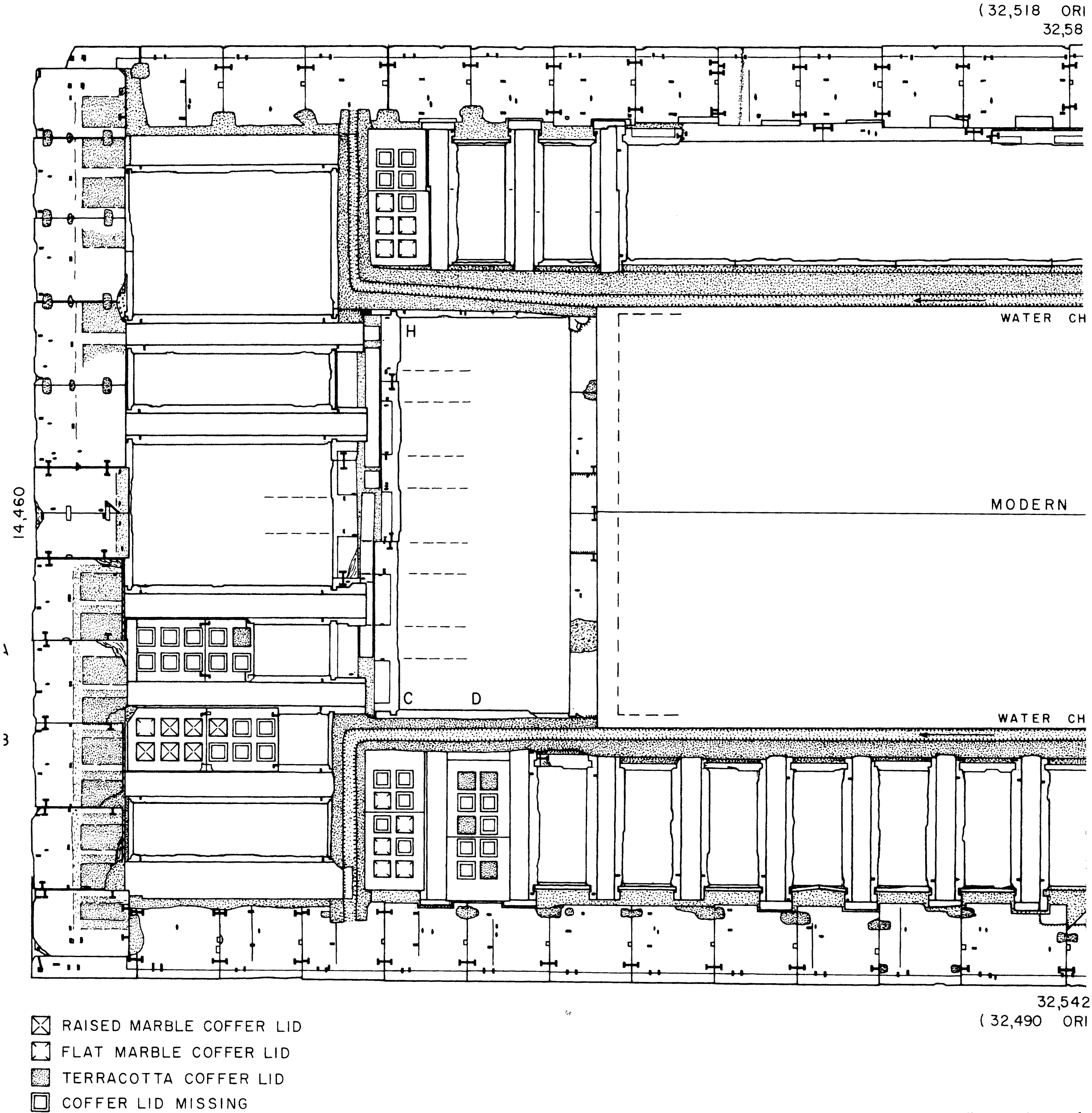


Ill. 2. State pla

which lie perpendicular to the face of the geisa. These dowel holes are, on an average, 0.149 m. apart[8] and 0.1334 to 0.1972 m. back from the hawksbeak nosing. They were for the attachment of the sima course to the geisa. At the center of the flanks the distances between the three sets of dowels are less than those between the normal ones, averaging only 1.283 m. on the north flank and 1.298 m. on the south.[9] At the outer corners of the building the distance from the nosing of the raking geison course to the center of the first pair of dowel holes averages 0.670 m.[10] For the remaining twenty-two sima blocks on each flank the average spacing between sets of dowel holes is 1.2995 m., actually varying from 1.2785 to 1.3145 m.

The last laid sima block of each flank was most probably one of the two which fell at the center of the building and presumably it had a common butt joint with its neighbor. Although in so many instances pry holes give valuable information for the sequence in which blocks were laid, such information is lacking here. Indeed, only two pries were cut for use in connection with the flank sima course, both of these on the south side of the temple. One appears on the west central geison while the other occurs on the third normal geison from the southwest corner (ill. 2). The strange system for anchoring the sima blocks in which pairs of dowels were utilized probably in itself obviated the need of pry holes since one of the dowel holes could always be used for prying.

A rectangular cutting appears at one joint edge of each geison block. These were pry holes which were used for lowering the next inner geison block into place. The corner geisa were placed first. On the south flank the second geison west of center was last laid, while on the north it was the first geison west of center (ill. 2).

There is another series of dowel holes, in pairs, which runs parallel to the face of the geisa. Measuring back from the hawksbeak nosing of the geison course these average 0.576 and 1.072 m. on the south flank and 0.555 and 1.050 m. on the north flank. They are accompanied by pry holes (pl. 37, fig. 1). These dowels were used to anchor a now completely missing course of blocks which were trapezoidal in shape so that their top surface might align with the pedimental slope which already appeared on the outer 0.15 to 0.16 m. of the flank geisa (ills. 2, 3, 4 and 8). The trapezoidal blocks were inserted to give bearing for the back of the sima tiles as well as to act as a stop for the wood rafters of the roof. This two-piece type of construction was less expensive in terms of material than would have been the carving from a single block of a geison with a sloping top surface.[11]

The trapezoidal blocks were normally secured in place with two dowels each.[12] They were carefully pried one against another and presumably all of them were clamped together at their top surface as they most certainly were at each end of the course where the clamp cuttings still exist on the inner edge of the corner raking geisa. There probably were dowels on the sloping tops of the blocks to anchor the back of the sima tiles; such dowel holes appear on the corner raking geisa to anchor the backs of the corner and of the first normal sima blocks. Very likely there also were notches cut in the back of the trapezoidal blocks to receive the ends of the wood rafters (ills. 4 and 8).[13] The jointing of these backer blocks paid little respect to the joints of the sima course, sometimes aligning with them but normally located somewhere in between. We know from the dowels on the geison course that the lengths of the blocks varied considerably, from 0.96 to 1.48 m., but the majority measured 1.24 to 1.32 m. Occasionally the line of the joint between these blocks is indicated on the geison course by a slight dressing down of the top surface of the geisa (ill. 2). These lines at times extend outwards as far as the front dowel cuttings for the sima, but the actual blocks must have stopped short of that

[8] They vary from 0.125 to 0.170 m. on center.

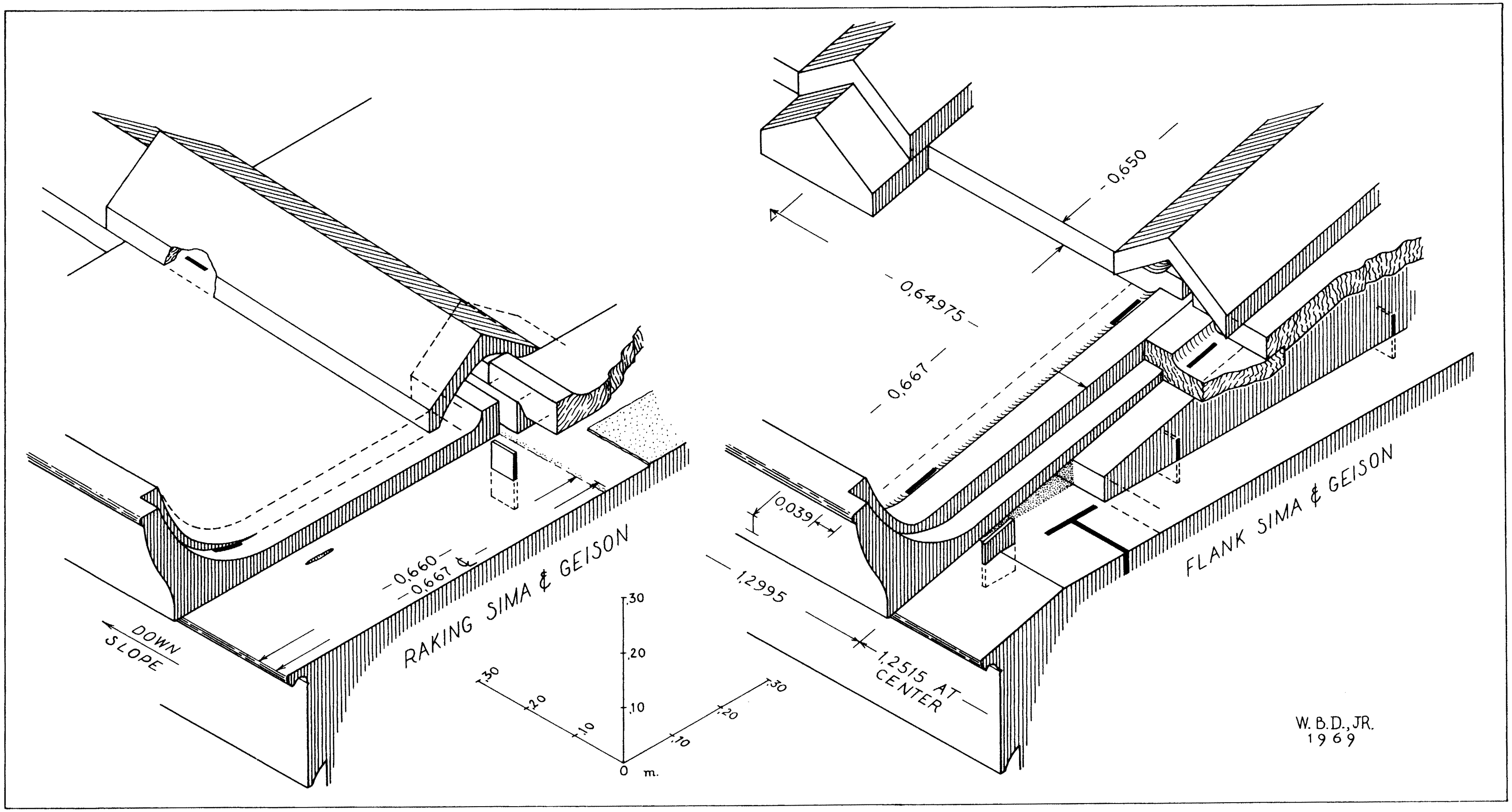
[9] 1.285 and 1.281 north, 1.295 and 1.301 south.

[10] 0.667 NE, 0.675 SE, 0.6675 SW, while the NW corner nosing is broken away.

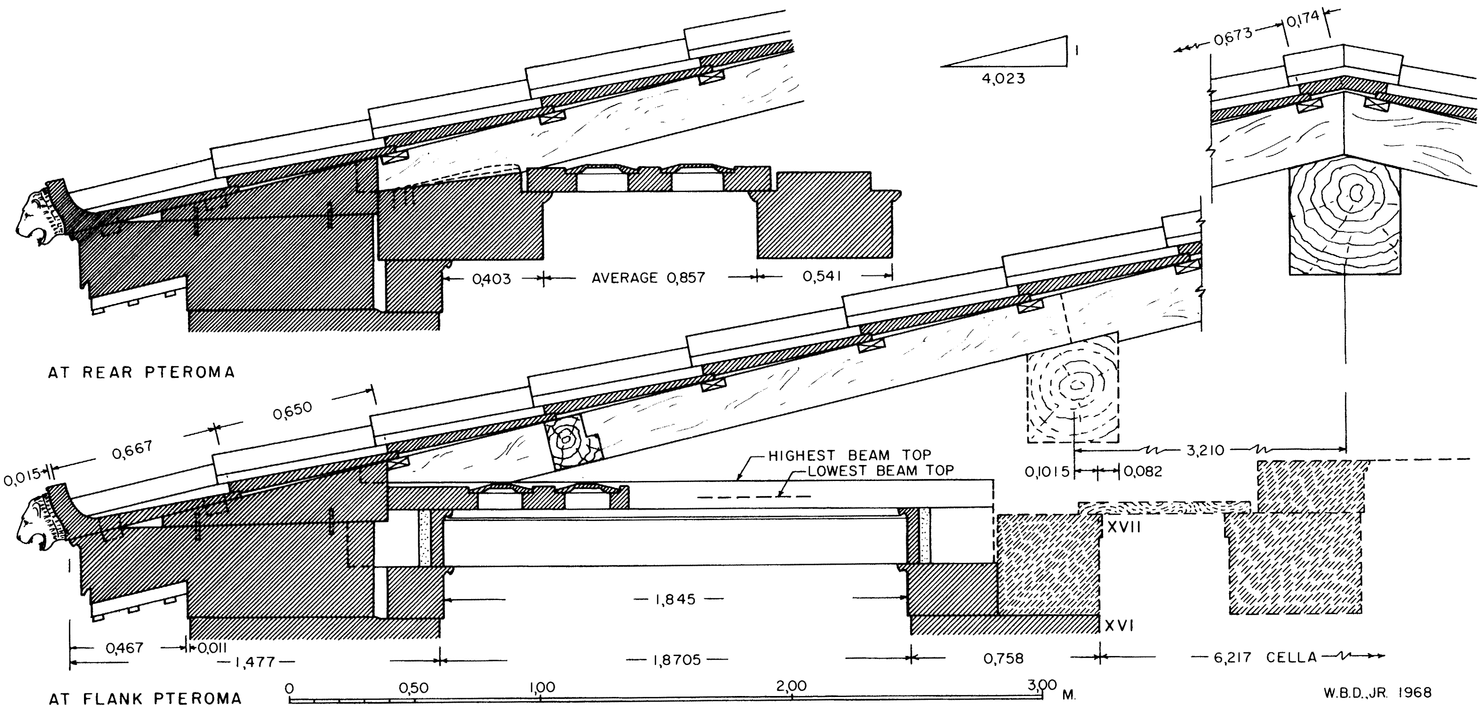
[11] This basically was the solution which the "Theseum Architect" used on all four of his temples although in his last work, the temple of Nemesis at Rhamnus, the sima itself embodied the trapezoidal form (see Hodge, 79, for sections of this series of geison and trapezoidal blocks).

[12] Usually there are two dowels for each block. Sometimes only one dowel appears and there are instances where no dowels were used. The reason for these anomalies is hard to fathom. Possibly it was felt that top clamps alone would suffice occasionally to hold the blocks in place.

[13] Hodge, 15-16, recognized the need for these blocks and states that they were at least 0.72 m. "broad" (deep). In fig. 4 he shows them only ca. 0.60 m. deep and butts the ends of the wood rafters against them, stating that he uses this simple solution rather than notched slots such as appear on the back of the similar trapezoidal blocks which were employed at Bassae. He overlooks the fact that the outer ends of the marble ceiling beams were cut down to the level of the geisa in order to accommodate deeper trapezoidal blocks of ca. 0.90 m.



Ill. 3. Isometric sections of raking and flank simas and geisa



Ill. 4. Sections at west end and center of flank peristyle

point because it is preposterous to think that they would have ended in a feather edge.

The reason for the occasionally worked-down top of the geison course under certain of these trapezoidal blocks is difficult to comprehend. The dressing, when it occurs, is normally only 0.002 to 0.004 m. deep. In one instance, at the southeast corner, there is a depression of 0.007 m. (pl. 37, fig. 1). The edges of the dressed-down surfaces could not act as setting lines since they usually vary a few centimeters one way or the other from the actual joint of the course above, which can be determined from the dowel and pry cuttings. The only answer which makes sense is that the top of the geison course was worked down under those trapezoidal blocks which were slightly too high and that this dressing-down was performed just prior to setting each block. Where the depressed area did not extend as far as the joint of the course above, the bottom edge of the trapezoidal block itself must have been trimmed.[14] We do not know the material of which these backers were made, since none have yet come to light. However, as they were buried within the construction, we must conclude that they were of poros, as were the back-up blocks of the tympanums. It is most strange that trimming operations were not confined to these more easily-worked blocks.[15]

The outer ends of most of the marble ceiling beams were cut down to the level of the top of the geison course to allow the trapezoidal blocks to extend back into the building as far as possible (pl. 37, fig. 2). The reason for this was to avoid having to chamfer the contiguous rafters to an almost feather edge (ill. 4). The marble beams, however, in unmethodical fashion, were not all uniformly cut down the same distance from the geison nosings. In fact the end of one beam is double-notched, at two different depths, at the location of the joint between two adjacent trapezoidal blocks. The distance from the geison nosing to the back of the ledge cutting on the marble beams averages 1.284 m. at the south and 1.255 m. at the north. It actually varies from 1.128 to 1.337 m., indicating that the depths, as well as the widths, of the trapezoidal blocks were somewhat random. It is uncertain how far forward these blocks extended. On the north flank there is a weathering line some 3.40 m. long which runs roughly 0.495 to 0.525 m. back of the geison nosing, but this is too far back to represent the forward line of the blocks since it approaches the dowel cuttings for these same blocks much too closely (ill. 2). The actual depth of this missing course was probably ca. 0.90 m. (ill. 4).

The trapezoidal blocks were laid in normal fashion, pried outwards into place towards the façades of the building. The final block was dropped into its slot near the center of the course.

INFORMATION FROM THE RAKING GEISON COURSE

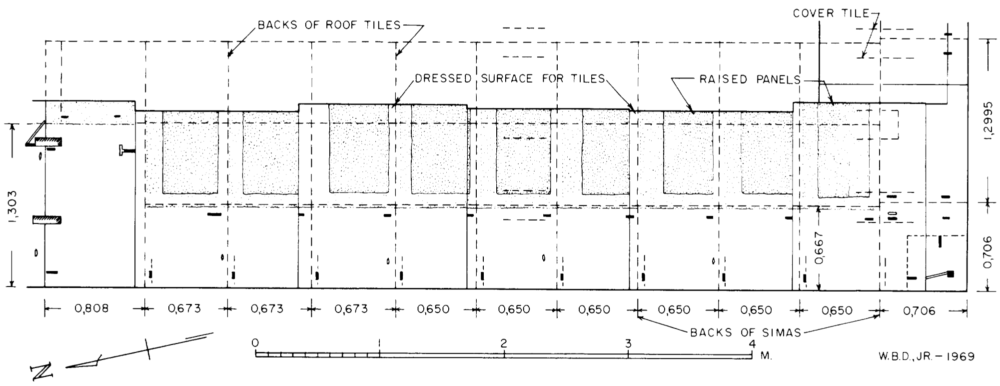
The raking geison course of each slope is formed of five normal blocks, half of the double-sloped block at the apex and the small section of raking geison which is carved integrally on the corner block of the horizontal geison course (pl. 37, fig. 3). On the three complete half-pediments the five intermediate blocks vary in length from 1.067 to 1.365 m., averaging 1.273 m. each, the halves of the apex geisa vary from 0.720 to 0.728 m. and the bottom section varies from 0.337 to 0.360 m. The total length on each slope is theoretically 7.433 m.[16] The raking geison blocks were pried into place up the pedimental slope towards the one at the apex.

In relation to the jointing of the geison course the jointing of the sima blocks is slightly staggered and fairly regular (ill. 5). The dowel and pry holes on the raking geisa indicate clearly the arrangement of the sima blocks. There is a distinct pattern of outer and inner dowels (pl. 37, fig. 4). The pry cuttings which were used for shifting the sima blocks into place fall between the outer and inner dowel holes. In many instances, however, rather than special cuttings, the geison joints themselves must have been used to provide leverage for the pry-bars. The northern geison course at the west gives less evidence than do those on the two southern slopes because many clamp and dowel cuttings

[14] Hodge has informed me that at the temple of Nemesis at Rhamnus the top of the middle step of the crepidoma, in the area beneath the stylobate, is worked with varying types of chiseling as if the surface had not been completely prepared beforehand and was given a final dressing just before each stylobate block was laid. An analogous situation to ours occurs under one of these stylobate blocks on the south flank where the top of the under-course is worked down 0.002 to 0.003 m. as a sunken panel. This depressed panel stops short of the line of the front face of the stylobate above it.

[15] An analogous situation presents itself in the Great Drain of the early fifth century B.C. in the Athenian Agora where the top of the hard breccia polygonal walls were, in various instances, cut down slightly to receive soft poros cover slabs.

[16] See supra n. 4.



Ill. 5. Plan of southwest raking geison course

have been filled and covered over with cement in modern consolidation work.

Under the system used, each normal raking sima was fastened with two dowels, one near its upper, outer corner, set at right angles to and 0.09 to 0.16 m. back from the geison hawksbeak, the other near its lower, inner corner, set parallel to and 0.58 m. back from the same line. The raking sima blocks had canonical rebated joints (see below). The outer dowels, which were close to and were parallel to the upper joint of each sima block, were covered by the overlap of the next tile up the line. The inner dowels, which were near and were parallel to the inner edge of the sima blocks, were covered by the first row of cover tiles (ills. 3 and 5).[17] These dowels indicate nine sima blocks between the corner and apex ones, the lower six with a length of 0.650 m. each and the upper three with a length of 0.673 m. each (ill. 5). The tiles were pried down the slope towards the corner sima blocks which were the first ones of the entire system to be placed.

The corner sima blocks with integrally carved acroterion bases were not fastened by such a simple system of dowels as were the others. Near the flank joint, adjacent to the last normal tile of the flank sima series, the flank method of attachment was utilized with two through-dowels, one front and one back, both of them perpendicular to the flank face and both of them hidden by the superimposed row of cover tiles (ill. 5; pl. 37, fig. 3). A third dowel appears near the raking edge of the corner sima, on its upper half. It runs parallel with the face of the raking geison course, contrary to the rest of that series of dowels up the slope (pl. 38, fig. 5).[18] The architect then added a fourth dowel for at least two of the corner simas.[19] It runs parallel with the face of the flank geison course (pl. 37, fig. 3; pl. 38, fig. 5). As will be shown later, one edge both of this and of the last mentioned dowel fell exactly in line respectively with the side and back vertical planes of the acroterion base above so as to make it possible to cover these dowels with lead from open slots in the vertical sides of the base (ill. 5). There exists yet another, a fifth, dowel for these blocks. It is located near the outer corner of the geisa and is very different in character from the others employed on the building. These dowel holes are 0.05 m. square, rather than rectangular, and are 0.06 m. deep (pl. 38, fig. 5). Also at variance with the system is the fact that, falling under the main body of the acroterion base, they, along with the dowels under the southeast and northwest halves of the apex acroterion bases, are the only ones in the entire roof construction which could not be leaded from above after being set in place.

17 See the restoration of Dinsmoor, *Hesperia* 9, p. 34 and n. 75. He tries to place the raking sima blocks so that a perpendicular and a parallel dowel would work together in tandem at the upper end of a block. With this system the perpendicular through-dowels would be exposed rather than covered, the pry holes would be useless, no cognizance is taken of the unfinished panels on the inner top surface of the geisa, the uppermost sima below the apex would have no inner dowel, and the lower corner sima would be elongated and would have three inner dowels in a line. Furthermore, the inner, parallel dowels on which his system is based are not spaced regularly enough to permit his modular dimensions. The final item which forces us to reject this system is the restorable lower corner sima block (see infra), the upper end of which lies only 0.706 m. up the slope of the raking geison course rather than the ca. 0.82 to 0.86 m. which Dinsmoor's system would demand.

18 This is the dowel, appearing at all four corners of the building, which Dinsmoor claimed did not exist, loc. cit. These dowels also fail to appear on the roof plan in Koch, taf. 42.

19 At the NE and SW corners. This dowel does not appear at the SE corner, and the evidence is missing at the NW corner.

Each of these square dowel holes has a pour channel which runs down to it from the joint of the raking geison up the slope. The upper ends of these pour channels, however, were hidden beneath the acroterion bases and as a result were inaccessible.[20]

The apex sima blocks with integrally carved acroterion bases were the last of the raking sima course to be set in place and were laid in two halves. Of these halves the northeast and southwest were the first to be placed. They were attached like the leaves of a book with two upper dowels which ran parallel to the face of the geison. The dowels terminated at the ridge, and therefore at the joint face of the half-acroterion base, so that they could be leaded after the half-base was set in place. One of these blocks also had a single lower dowel while the other had two. There are two pries near the apex of the western geison on the north slope for prying the south half of the acroterion base into place.

The last laid blocks, the other two halves of the central acroterion bases, were lowered into place and set with three dowels each, one near the top of the block and two near the bottom. Since these dowel cuttings were under the heavy body of the base and were set back from its edges, in order to lead them they would have required either sloping pour channels cut through from the joint edges of the sima block or else each of these two blocks had to be blind-doweled.[21] (One of these dowels may have been leaded in a different manner—see below.) The upper dowel hole for the southeast block is perpendicular to the geison face while the two lower dowel cuttings are parallel to that plane. The northwest block was set in a somewhat similar manner except that the upper dowel hole, unlike that of its diagonally opposite counterpart, is parallel to the geison face, runs into a large lewis cutting,[22] and has a pour channel which starts at the back of the base (pl. 38, fig. 6).[23] The two lower

[20] It is difficult to see how these pour channels were employed unless sloping extensions to them were drilled through from the face of the raking side of the corner sima blocks. One would normally expect that the concept of an exposed opening of a pour channel on a finished marble surface, although common in the Hellenistic and Roman periods, would have been inconceivable to a Classical Greek. However, an exactly similar condition occurs in the Erechtheion on the south anta of the west façade where sloping pour channels from the north face were used to lead ordinary dowels (Paton, Stevens et al., *The Erechtheum* [Cambridge, Mass. 1927] 193, pl. XX, 3 at A,16).

A suggestion has been made that the pour channels on the raking geisa actually continued on to the next dowel cutting up the slope and that the lower and upper dowels were leaded simultaneously. There is no evidence for this. In fact, it is asking a great deal from the lead to expect it to maintain a sufficiently fluid molten state long enough to fill one dowel hole and then to find its way past the iron dowel and down an almost inaccessible (hypothetical) pour channel back of the cutting to a second dowel hole which it must also fill.

[21] Such dowels were pre-leaded into the bottom of the upper block. At the moment when the block was to be set, molten lead was poured into the lower half of the dowel cutting which was carved in the masonry course below and the block was then lowered into place.

[22] There are two large lewis cuttings on each one of the apex geison blocks (ills. 2 and 5). Cf. A. Orlandos, ΤΑ ΥΛΙΚΑ ΔΟΜΗΣ 2 (Athens 1958) fig. 119,8. These are 0.22 m. long, 0.06 to 0.065 m. wide and 0.107 to 0.137 m. deep at the ridge. Each cutting has one sloping and one vertical end. The slopes are on opposite ends of the pairs of cuttings.

Orlandos, loc. cit., fig. 119,10, indicates that the well-made horizontal, rectangular cuttings on the joint ends of the geison blocks of the temple of Poseidon at Sounion were for lifting the blocks with tongs. Identical cuttings, however, appear on the joint ends of the geisa of the Hephaisteion. Orlandos shows them in fig. 119,8 but ignores them here as lifting aids since he already has utilized the lewis cuttings for this purpose and the cuttings on the joint edges are redundant. Why, in the Hephaisteion, should two systems for lifting the apex geison blocks into place be provided, especially since these apex blocks were the first of their course to be erected and it should have been a fairly easy task to seat them? It has been suggested that these horizontal cuttings were for dowels to align the geison blocks during erection (*AJA* 78 [1974] 211).

[23] This pour channel and the four at the outer corners of the roof are the only ones which exist in the entire roof construction. Koch considers the channel at the apex to be Roman and therefore suggests that the acroteria at the apices were removed by the Romans and then replaced, possibly with copies (one wonders why the base needed to be removed in order to take away the sculpture). He uses the plural form of pour channel, mistakenly implying that there was one at each end of the building (Koch, 12, n. 2; also 45 and the caption for abb. 23).

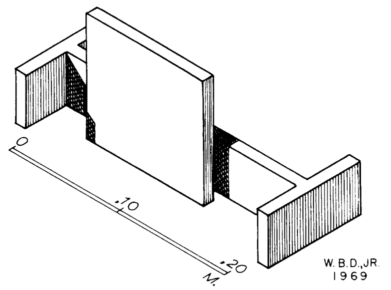
In actuality all five of the pour channels are of the same period and they were worked with extraordinary care, being very nicely rounded rather than being hurriedly chiseled in the normal V-form. There is nothing to indicate that they must be post-Classical. Pour channels were certainly in use by the late fifth century as on the Attic stelai, Agora I 845b, of ca. 414 (*Hesperia* 22 [1953] 279, pl. 81), in the podium of the Porch of the Maidens of the Erechtheion (Paton, Stevens et al. [supra n. 20] 193, pl. XXVII, 6, fig. 9) and in the pediment of the Parthenon (Orlandos [supra n. 22] fig. 153).

The only tangible evidence for possible later repairs comes not from the pour channels but from the myriads of pry cuttings on the geison course near the top of the northwest and southeast pedimental slopes. The pries are meaningless in the original construction of the building. Their only function would seem to have been to aid in shoving the half-acroterion base blocks up the slope and into place. But these blocks originally were the *last* of the series to be set on each pediment, dropped into place. At the moment of their installation the geisa down the hill with the extra pry cuttings had already been covered over by normal raking sima blocks. On the northwest slope there are three of these extraneous pries which imply that the half-acroterion base, the top normal sima tile and the adjacent roof and cover tiles were removed and replaced.

dowels for this block were again canonically set parallel with the face of the geison.[24]

At the northwest corner of the geison course there are instances of double dowel cuttings. As stated above, the corner simas with integrally cut acroterion bases were the first laid blocks of the entire sima series. Since four of the dowels on the northwest corner geison were doubly cut, two for the corner sima and two for the normal flank sima block next to it, the indication is that this corner was the starting point of the sima system, before the *modus operandi* was thoroughly established. The western cutting of each pair of dowel holes was not used. Another doubly cut dowel lies under the southwest corner sima, again the first laid block of its particular segment. In this case the eastern cutting of the pair was not used.

Various markings appear on the top surface of the raking geisa. There is a weathering line which runs down the slopes of both pediments, 0.65 to 0.66 m. back from the geisa nosings (pl. 38, figs. 7 and 8). This line gives the approximate depth of the raking sima course. Another 0.10 m. further back, at 0.75 to 0.76 m. from the nosings, appears a series of raised panels. These extend all the way to the back of the geisa with the result that their depths vary from 0.38 to 0.49 m., depending on the depth of the individual geison block (ills. 2 and 5). The panels have a thickness of 0.005 to 0.007 m. and represent part of the protective covering of the blocks which was not removed since, in these



Ill. 6. Juxtaposition of clamp and dowel on apex geison blocks

specific areas, it was covered by and lay clear of the first row of pan tiles which adjoined the raking sima course (pl. 38, figs. 7 and 8). The raised panels progress up the pedimental slope at intervals of ca. 0.65 m. Between the panels the protective covering of the marbles was worked down to the normal finished plane. The upper halves of these areas between the panels were then more finely chiseled to create smooth strips 0.09 to 0.10 m. wide (pl. 38, fig. 9). These smooth strips represent the bearing surface for the back part of the pan tiles where, with marble-to-marble contact, the bottom surface of the pan tiles must have been slightly chamfered.[25]

THE RAKING SIMA

Several fragments of the raking sima exist.[26] It is interesting to note that a mixture of marbles was employed here as it also was on the geison course.

On the southeast slope the situation is more startling. Here thirteen pries appear, only three of which make any sense in the original construction (ill. 2; pl. 38, fig. 8). At this end of the building it would appear that not only the half-acroterion base but the *two* top normal sima tiles and adjacent roof and cover tiles were reset. The reason for and the date of these pries is definitely unclear.

It seems obvious that there is no conclusive proof one way or the other for replacement or resetting of the acroteria and at this late date in the excavations there is little likelihood that further evidence will be forthcoming.

[24] The inner of these two dowels and also the single one for the south half of the same base and the inner one for the north half of the eastern acroterion base were all three most unaccountably set directly within the narrow cutting for the web of the double T-clamps. The area occupied by the dowel is sunk deeper than is the floor of the clamp cutting. Both the dowel and the clamp cuttings were presumably used, and it is incredible that the location of the dowels, which must originally have been determined on the underside of the bases and then cut to correspond on the geisa, was not shifted and recut. The clamps had certainly been set and leaded before the sima blocks were raised up for installation. The masons were forced to gouge the lead out from one side of the web of the double T-clamps and then, at the bottom of the cutting, to chisel a still deeper slot for firm seating of the dowel. The dowels could then be crowded into the clamp cuttings with the iron in contact and fresh lead poured in to bury the ill-wed pair (ill. 6).

[25] The architect would hardly have allowed marble-to-marble contact at the sharp bottom edge of the tile.

[26] Rather than repeat in a new catalogue the already published descriptions of the fragments from the sima course, reference is made here merely as to where the earlier descriptions are given. In the text there will be occasional differences in dimensions from those given in the earlier accounts. Two previously unpublished pieces are added at the end of this note. The following items with catalogue numbers **A 394**, **A 439**, **A 700** and **A 701** were previously and erroneously assigned to the temple of Ares.

Raking sima **A 439**, corner sima fragments **A 394** and **A 701**, and lion-head spouts **A 700** and **A 272** appear in *Hesperia* 9 (1940) 32-37.

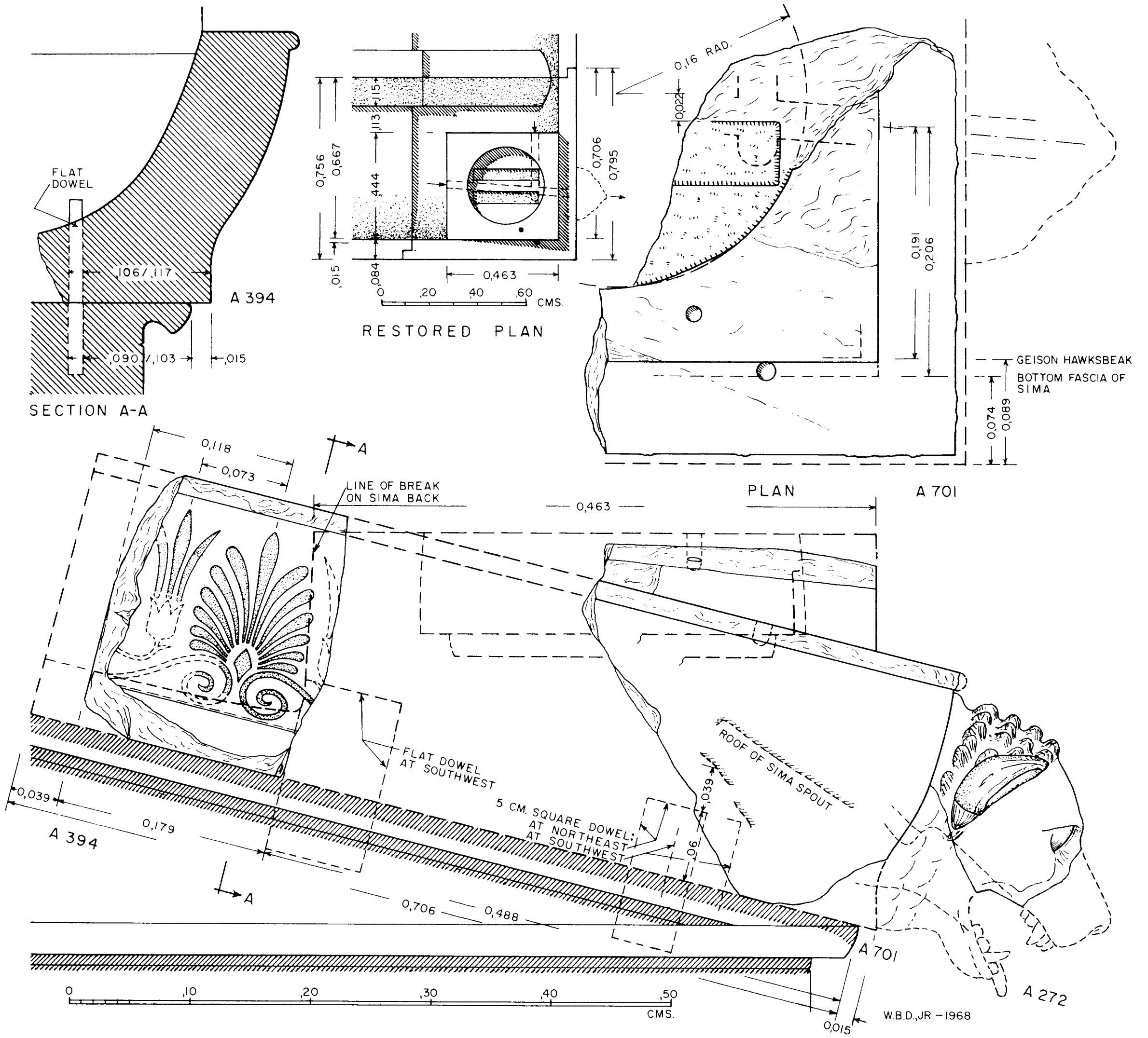
Raking simas **A 1095**, **A 1096** and **A 1097** and horizontal sima **A 1094** appear in *Hesperia* Suppl. 5 (1941) 110-14.

Lion-head spout **A 1853** appears in *Hesperia* 28 (1959) 27.

The unpublished fragment, **A 1895**, of Parian marble, is from the horizontal sima and was found in 1951 in a marble pile southeast of the Hephaisteion (pl. 39, fig. 12). It comes from the left half of a flank and preserves, on its right end, a rebated joint 0.034 m. wide. The full height of 0.222 m. is preserved. The P.L. is 0.301 m. and P.D. is ca. 0.142 m. It

The majority of the fragments from the simas is of Pentelic marble but two pieces, **A 1095** and **A 1895**, are of Parian marble. The blocks, judging from the weathering marks, overhung the geisa some 0.015 m.[27]

One of these simas, **A 394**, which is from a right slope, retains the upper end of a dowel cutting that exactly matches the oddly oriented outer dowel hole on the raking geison near the southwest corner of the building (ill. 7; pl. 39, fig. 10).[28] The upper end of the dowel on the geison lies 0.488 m. up the slope from the flank nosing of the corner geison (ill. 5; pl. 38, fig. 5).[29] The raking sima blocks utilized the overlapping, or rebated,



Ill. 7. State plan and restored elevation, section and plan of corner sima and acroterion base

is badly weathered and bears no trace of design. There is heavy water wear on the back.

The other unpublished fragment, **A 4469**, of Pentelic marble, was found in 1972 by John Travlos on the Kolonos Agoraios near the Hephaisteion. It comes from the top left end of a block and preserves the outer surface of a joint, but the fragment is too mutilated to be identifiable as being raking or horizontal. Although heavily weathered, it retains clearly more than one-half of an incised palmette which ends neatly at the joint. The crowning roundel is 0.014 m. high. P.H. is 0.148 m., P.L. is 0.075 m., P.Th. is 0.045 m.

[27] Dinsmoor, *Hesperia* 9, 34, gives 0.02 m. as the overhang from weathering traces, but the extant fragments indicate 0.014 to 0.017 m.

[28] Only the corner and apex sima blocks have outer dowels parallel with the face of the geisa. The rest of the outer dowels are perpendicular.

[29] The dowel is 0.09 to 0.103 m. back from the nosing of the geison. The dowel on fragment **A 394** is 0.106 to 0.117 m. from the bottom face of the sima. Considering the average overhang of 0.015 m. of the sima beyond the nosing of the geison, the two dowels fit perfectly. The sima fragment was

jointing system which was common to this course over the pediment in temple design, and our fragment **A 394** retains the inner surface of this rebated joint at its upper end, 0.179 m. beyond the end of the dowel. The outer overlap of the rebated joint is broken away. These overlaps, however, averaged 0.039 m. on the Hephaisteion (see below) and if we add this amount to the preserved dimension of 0.179 m. on the fragment we get 0.218 m. from the upper end of the dowel to the upper end of the sima block. On the raking geison, as already stated, the upper end of the matching dowel cutting is 0.488 m. from the nosing of the flank geison course. When we add 0.488 m. to 0.218 m. we get a depth of 0.706 m. from the nosing of the flank geison to the upper, exposed joint of the corner sima (ill. 7). As corroboration of this depth, at the southwest corner of the building the back of our restored corner sima block falls almost exactly midway between the upper end of the upper, inner dowel cutting for this block and the lower end of the lower, inner dowel cutting for the next normal sima up the slope, 0.64 and 0.76 m. from the nosing of the flank geison course (ill. 5).

On the back of sima **A 394**, in line with the upper end of the dowel cutting below it, there is a straight line of fracture which was created when the solid acroterion base broke away from the thin-walled sima. This line represents the back of the acroterion base and will be discussed later. **A 394** is obviously part of the sima block which belonged on the southwest corner of the Hephaisteion.

Another mutilated fragment, **A 701**, is also part of a corner sima block with acroterion base, coming either from a northeast or a southwest corner.[30] These corner blocks had, among other cuttings for their attachment to the geisa, a large dowel, 0.05 m. square, near the outer corner. The hole for this dowel would have appeared on our fragment if its bottom were not so broken. The depth of the dowel cuttings in the geison blocks is 0.06 m. Those cut in the bottom of the sima blocks would presumably have had about the same depth. Careful measurements show that at the southwest corner, where the dowel cutting on the geison is 0.11 to 0.16 m. back from the nosings of both the raking and flank geisa, a vertical clearance of 0.067 m. now exists to the critical part of the break in the acroterion base fragment. At the northeast corner, where the dowel is 0.140 to 0.190 m. from the north and 0.130 to 0.182 m. from the east geisa nosings, a vertical clearance of 0.099 m. now exists to the critical part of the break in the same acroterion base fragment. Admittedly the vertical clearance is too close for comfort at the southwest corner, but there is no reason to reject it from the northeast corner (ill. 7).[31] Here again we shall discuss this block more fully later on.

Of the four other extant fragments from the raking sima two give little information. **A 1097**, however, preserves a complete length of 0.641 m., which is slightly short of the norm. **A 439**, with both ears broken away, has a preserved length of 0.592 m. Here the missing rebates must have been slightly longer than usual, but these overlaps were not constant in their dimensions.

As mentioned earlier, 0.65 to 0.66 m. back from the nosing of the raking geisa there is a weathering line, created by the back of the sima tiles, which runs up the pedimental slopes, and 0.75 to 0.76 m. back from the nosing there is a series of raised panels which lay under the first row of pan tiles. A space of some 0.10 m. is therefore left between these markings (ills. 2 and 5; pl. 38, figs. 7-9). The pan tiles certainly projected further toward the gables than did the underlying panels, but they would not quite have abutted the back of the sima tiles. The cover tiles which protected the common joint would bridge a reasonable open gap of 0.01/0.02 m. (ill. 3).[32] It is known from the weathering line that the back of the raking sima lay ca. 0.66 m. in from the nosing of the raking geison course. If we add to this depth of sima one-half of an open

previously assigned to the temple of Ares by Dinsmoor (supra n. 27, 36) because he had not seen any of this set of four dowels on the geisa of the Hephaisteion and therefore thought that the fragment, with its dowel, could not belong to that temple. My new attribution of this fragment and of **A 439** is noted by Lucy Shoe Meritt, "The Stoa Poikile," *Hesperia* 39 (1970) 237, n. 12.

[30] This fragment was also previously assigned to the temple of Ares by Dinsmoor (supra n. 27, 32-35) because no trace of a 0.05 m. square dowel cutting to match the ones which appear on each of the corner geison blocks is present on its broken underside.

[31] Ill. 7 is a composite drawing showing in conjunction fragment **A 394** from the southwest corner and **A 701** from the northeast corner.

[32] Anathyrosis for the joints of roof tiles normally occurs only for abutting sima blocks or eaves tiles. The sides of normal pan tiles were usually finished with less care, and the tiles were installed with a slightly open joint between them.

joint with a total width of ca. 0.015 m., we arrive at a figure from the nosing of the raking geison to the center of the first joint, and therefore to the center of the first row of cover tiles, of 0.667/0.668 m.

Let us turn now to the pairs of dowel holes on the corner geisa (ills. 2 and 5). The distance from the nosing of the raking geison course to the center between these dowel cuttings at the measurable corners of the building varies very slightly from 0.6675 to 0.6755 m. and averages 0.670 m. This figure is almost identical to the one estimated above at 0.667/0.668 m. for the distance from the nosing of the raking geisa to the center of the first row of cover tiles. In fact it is apparent from ills. 3 and 5 that the cover tiles, not only at the corners but all along the flanks of the building, must have been fairly accurately centered over the pairs of dowels in order to conceal them completely.

From the pry and dowel cuttings on the raking geisa, from the corner sima fragment **A 394**, and from the total length of the pedimental slope of the raking geison course we have the length of each block of the raking sima course. Starting at the lower end, at the nosing of the flank geison, these are: 0.706 m., 6 at 0.650 m., 3 at 0.673 m. and finally, subtracting the sum of these from the total of 7.433 m., a length of 0.808 m. for the apex half-acroterion base (ill. 5). The upper, outer dowel on the upwards slope of each sima lies consistently within the underlap of 0.039 m. at the upper end of each sima block and was covered by the overlap of the next sima block up the hill, conforming to the general building pattern that all through-dowels within the construction were covered (ill. 3). That the three uppermost members of the sima course below the acroterion base should be 0.023 m. longer than the others is strange, but it is a situation which occurs consistently on all three measurable pedimental slopes. In order for the dowel and pry holes to be utilized, there is no other solution. Because of the 0.039 m. overlap, the apex half-acroterion base actually had a width on the slope of 0.847 m. (ill. 10).

THE HORIZONTAL SIMA

The horizontal, or flank, sima fragments give us a profile identical with that of the raking sima (ill. 9), the fact that an unusual jointing system was used (from which we can determine at which end of the flank the fragments originated) and the shape and size of the cover tiles.[33] From the two lonely pry holes on the geisa of the south flank and from the unusual jointing system of the sima course we know that the sima blocks were pried outwards, towards the corner blocks which were first set. The above information, taken together with the pairs of dowel cuttings on the geison course, allow us to reconstruct the entire horizontal sima.

Rather than the normal butt joint used on other temples, the flank sima of the Hephaisteion employed an overlapping joint system similar to that used for the raking sima and one which, elsewhere, was almost invariably reserved for raking sima courses only.[34] This rebating of joints on the flank of the building poses a question as to which joint, the exposed one on the face of the sima or the hidden one behind, should be centered between the pairs of dowels which attached the sima to the geisa.

Between the ninth pair of dowel holes from the northwest corner on the north flank of the geison course there is a strongly calcined line created by water corrosion from a roof leak (ill. 2). The line was caused by and roughly follows the edge of the lower lip of the rebated joint between the sima blocks. Near the face of the geison this weathering line meanders from 0.027 to 0.032 m. east of center between the dowel holes (pl. 39, fig. 11).[35] Since the average overlap of the rebated joint between sima blocks was 0.039 m.,[36] the inner, top edge of the rebated joint, over which the row of cover tiles behind was centered, was therefore, to all intents and purposes, spaced midway between the pairs of dowel holes, and the exposed joint on the face of the sima, represented by the weathering line, was off-centered (ills. 3 and 5). This is substantiating evi-

[33] See supra n. 26 for catalogue.

[34] For discussion of this abnormality see Dinsmoor, *Observations*, 113-16, notes 268 and 269. For other parallels see also E. Kunze & H. Schleif, *Olympische Forschungen* I (1944) 101, taf. 40 and E. Dyggve, *Das Laphrion, Der Tempelbezirk von Kalydon* (Copenhagen 1948) pl. XXII, fig. A.

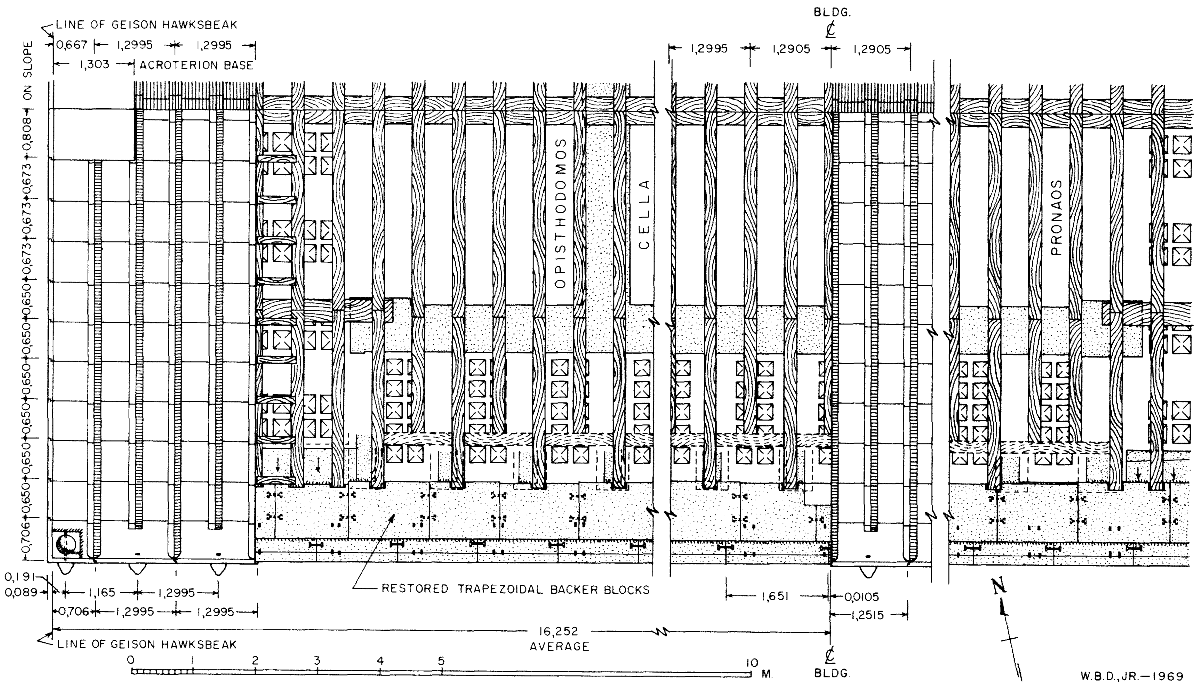
[35] There had to have been some accident to the roof to have caused the leak since the side edges of the sima tiles had normal water curbs. These raised edges can be seen on the back slope of the flank sima blocks (pl. 39, fig. 12). The end of the trapezoidal block which underlay this joint was not doweled to the geison course (ill. 2).

[36] Flank simas **A 1895** and **A 1094** have overlaps of 0.034 and 0.038 m. Raking sima **A 1097** has an overlap which varies from 0.043 to 0.047 m. No others are preserved. The average of these overlaps is 0.039 m.

dence for our earlier argument concerning the relationship between the first pair of dowel holes on the corner geisa and the joint between the raking sima course and the first row of pan tiles.[37]

We can now return to the problem of the length of the flank face of the corner sima blocks. It has already been indicated in the previous section that the distance from the nosing of the raking geison course to the center of the joint between the raking sima and pan tiles (the center of the cover tiles) was ca. 0.667/0.670 m. To this we must now add the joint overlap of 0.039 m. If we select the measurement of 0.667 m. and add the overlap we obtain a dimension from the nosing of the raking geison to the exposed joint on the face of the sima of 0.706 m. (ills. 5, 7 and 8). This figure is identical to the one obtained earlier for the length up the slope of the raking side of the southwestern corner sima. We can safely assume, therefore, that we are correct and that the corner sima blocks were 0.706 m. square on the geisa or 0.721 m. square on their own bottom plane with the inclusion of the overhang beyond the nosing of the geisa.

The overall geison course averages 32.504 m. in length. Each of the corner sima blocks utilized 0.706 m. of this space. The two central sima blocks, as mentioned earlier, were shorter than the normal ones with their pairs of dowels averaging 1.2905 m. apart. The joint at the center of the sima course must have been a butt type spaced midway between the central pair of dowels. The visible line of the rebated joint on the face of the sima at the other end of each of the two central blocks, however, fell 0.039 m. short of the center between the outer pairs of dowels so that, although the double row of pan tiles up the slope were 1.2905 m. apart, the central sima blocks had a visible length of only 1.2515 m. (ill. 8). We are now left with 28.589 m. for the intermediate twenty-two sima blocks which results in an average of 1.2995 m. per block (corresponding almost exactly to twice the length of the lower blocks of the raking sima). The jointing works quite well with the triglyph blocks below, slightly outside center on the outer part of the building and slightly inside center on the inner half of the building.[38]



ILL. 8. Partial plan of southern roof slope showing placement of rafters, ceiling beams and coffers

[37] Dinsmoor, loc. cit., argued hypothetically that it was the exposed joint on the face of the sima which was centered between dowel holes. He agreed, however, that the cover tiles were 0.23 m. wide and were centered over the rebated joint back of the sima face (loc. cit., 113, fig. 43). If his system were employed, one of the dowels of each pair would normally just miss being concealed by a cover tile and would be exposed. Since such care was exercised to hide all the other through-dowels of both the flank and raking simas, it would be unnatural to assume that some of those on the flanks would have been left exposed.

[38] The following table is adapted from Dinsmoor, *Observa-*

Over corner column		(0.465 + 0.260) — 0.706		= 0.019 outside
"	second "	(2.622 + 0.019) — (2 x 1.2995)		= 0.042 outside
"	third "	(2.581 + 0.042) — (2 x 1.2995)		= 0.024 outside
"	fourth "	(2.581 + 0.024) — (2 x 1.2995)		= 0.006 outside
"	fifth "	(2.581 + 0.006) — (2 x 1.2995)		= 0.012 inside
"	sixth "	(2.581 — 0.012) — (2 x 1.2995)		= 0.030 inside
"	seventh "	(2.581 — 0.030) — (1.2995 + 1.2515)		= 0.000

The first lion spout, on the corner sima **A 701**, lies approximately 0.191 m. from the nosing of the raking geison (ills. 7 and 8). Since the spouts were presumably centered on each sima block from this point on, the next lion would be spaced at 0.706 — 0.191 + ½(1.2995) = 1.165 m. The remaining lions would be 1.2995 m. apart, except that the spacings between the four central lions would be 1.2755, 1.2515 and 1.2755 m. The lion spouts therefore fell over the metopes below, starting slightly off-center towards the end façades but then gradually correcting and finally over-correcting as they approached the middle of the building. These figures, of course, are based on averaged dimensions and perfectly uniform blocks.

The preserved lion-heads are of two slightly different types. The more prevalent (**A 700** and **A 1853**) have two rows of hair curls. The lone fragment with four rows of hair curls (**A 272**), which is turned slightly towards the left if one is facing it, is likely to be from a corner sima where the drilled drainage channel is also somewhat angled (ill. 7).[39]

The depth of the flank sima blocks from their lower front edge must have been 0.015 (overhang) + 0.667 + 0.039 (underlap) = 0.721 m. (ill. 4). Unfortunately none of the fragments found to date preserves this original dimension. In fact, the tiles are broken off so near the face of the sima that the slots which were cut for doweling them to the geison course are missing.

THE CORNER ACROTERION BASE AND SIMA (Ill. 7)

The northeast corner block of the sima course, **A 701**, was previously published as belonging to the temple of Ares.[40] The statement was also made that the plinth cutting on the acroterion base was oval in shape, on the assumption that the oblong cutting in the floor of the plinth cutting was located at the center of the plinth. In actuality the bottom of the plinth cutting was quite circular, 0.32 m. in diameter, while the oblong cutting which is within it and which must have been for a strengthening tenon is off-center (pl. 39, fig. 13).[41] It seems most probable that there were actually two tenon cuttings which were parallel to each other, with ca. 0.044 m. between them (ill. 7).[42]

An uncommon feature of the acroterion base, not mentioned in previous studies, is that its lion-head spout was functional.[43] Part of the left side of the lion's mane is still attached to the sima. At what would have been its center there is a water spout, ca. 0.206 m. from the lower edge of the raking side of the block, or 0.191 m. from the geison nosing. It penetrates inwards, on a slight angle, 0.182 m. from the face of the sima before it is broken away (ill. 7; pl. 40, fig. 15). This drain penetrates too deeply to have been merely representational and, also, it bears strong water corrosion. The drain hole, extending back the entire depth of the acroterion base, would have had a total length of ca. 0.60 m. The drain was necessary

tions, 115. The basic difference between the two tables, aside from a slight difference in the lengths of the sima blocks, is that Dinsmoor had assumed the exposed sima joints to lie 0.04 m. closer to the end façades of the building.

39 This placing of the head was suggested by Prof. Evelyn Harrison.

40 Dinsmoor, *Hesperia* 9, 36-37 and McAllister, 28. None of this sima series is now attributable to the temple of Ares (see supra).

41 The plinth cutting for the corner acroterion of the temple of Asclepius at Epidauros is likewise "grossièrement" circular and is close in diameter to ours, roughly 0.32 to 0.36 m. as compared to our 0.32 m. The base is also almost square, as is ours (0.522 x 0.54 m.), and may have supported a Nike. Cf. G. Roux, *L'architecture de l'Argolide aux IVe et IIIe siècles avant J.-C.* (Paris 1961) 105, pl. 31,4.

42 A pair of tenon cuttings were employed in the plinth cutting for the central statue in the Dionysion at Thasos as well (pl. 39, fig. 14). This structure is dated in the first half of the third century B.C. Cf. P. Bernard & Fr. Salviat, *BCH* 83 (1959) 288-335.

43 Similar cases of functional lion-head spouts under acroterion bases occur at the temple of the Athenians at Delos (F. Courby, *Exploration archéologique de Delos* 12 [Paris 1931] 136-37, figs. 160, 161) and at Calydon (Dyggve [supra n. 34] pl. XXII, fig. c). Another instance occurs at the temple of Poseidon at Sounion, built by the same architect who planned the Hephaisteion (Dinsmoor, Jr. [supra n. 6] 224, ill. 13; pl. 43, fig. 15).

because there was no other escape for the rain water which cascaded down the slope of the raking sima.

A still more striking feature of the corner drainage is the existence on the broken bottom of our fragment of part of a second drain hole. This runs at right angles to and intersects the first channel so that both of them drained to the same lion spout (pl. 40, fig. 15).[44] This second drain, also with strong water corrosion, shows that the acroterion base did not extend laterally as far as the first row of cover tiles, but that a dead slot existed which also had to be drained (ills. 7 and 8).

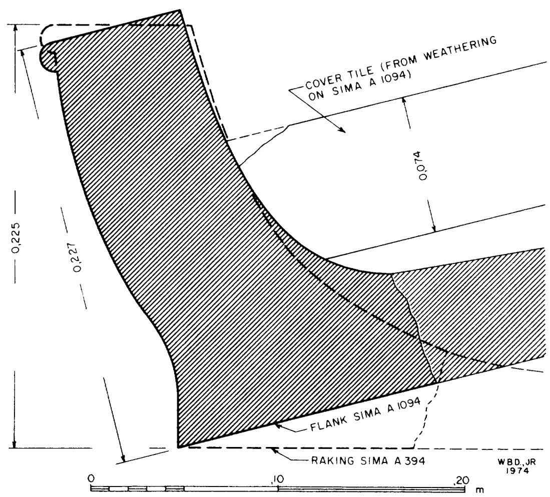
As mentioned earlier **A 394**, the upper part of a corner sima block, has on its back surface a break line which represents the rear corner of the acroterion base (ill. 7; pl. 40, fig. 16). The top of the break, which terminates ca. 0.02 m. below the top of the sima, represents the upper surface of the acroterion base at this point. Since we can place fragment **A 394** in its exact spot on the temple, we can restore the depth of the acroterion base, 0.463 m. measured horizontally from front to back.

From **A 701** we have ascertained that the plinth cutting was 0.32 m. in diameter. This cutting starts 0.062 m. from the outer vertical face of the base which lay towards the end façade of the building. If we double this last dimension we get a restored width for the acroterion base of 0.062 + 0.320 + 0.062 = 0.444 m. One should now turn for a moment to the dowel cuttings on the geison course under the base for corroboration of this dimension. It is readily apparent on ill. 5 that not only the back but also the inner face of our restored base fall exactly over the far edges of two of these cuttings. The dowel holes were evidently located so that they would be accessible for leading from the sides of the base after this block had been set in place.

We are now finally able to restore what was a fairly symmetrical corner sima block, 0.721 m. square at its bottom (0.795 by 0.7425 m. at its top), on which was carved an acroterion base 0.444 by 0.463 m. in which was nearly centered a plinth cutting 0.32 m. in diameter (ill. 7). The dead slot between the inner side of the base and the first row of cover tiles was 0.113 m. wide.

The top surface of the acroterion base on **A 701** is sheared off, but only very slightly. There are two holes drilled vertically in **A 701**, one on top of the base and the other on the top surface of the raking sima below. The latter, fairly well preserved, is 0.019 m. deep while the other would have been ca. 0.031 m. deep. The purpose of these holes is unclear.[45] They may have held some support for the acroterion.

Of the corner acroteria themselves we have no definite knowledge. They may have been flying figures which, for a building of this size, should be about 3/4 life size, or they might have been floral forms.[46]



ILL. 9. Combined section of flank and raking simas

[44] Dyggve, ibid. The Calydon drain bends under the acroterion base, approximating an [S], so that the part of the drain directly back of the sima face is half under the base and half exposed.

[45] The apex acroterion base of the temple of Athena Nike, again carved in two halves, has many drilled holes both on the base and on the top of the sima below. The deepest of these is 0.014 m. while some are only 0.003 to 0.004 m. in depth. There is no plinth cutting. The northeastern corner acroterion base of this temple, again with no plinth cutting, also has many drilled holes: five in a line on top of the flank sima; two on top of the raking sima; a curved line of holes near the back of the base ending at the southeastern corner in a circular cluster. These were carved with a pointed drill, leaving a small, deeper circular cutting within the larger one. Normally the larger holes are ca. 0.02 m. in diameter and vary from 0.008 to 0.014 m. in depth. Two holes still contain metal. Cf. Patricia Neils Boulter, "The Akroteria of the Nike Temple," *Hesperia* 38 (1969) 133-40, pls. 35-37. On the corner sima of the temple of Poseidon at Sounion there now remain three drilled holes, one within the plinth cutting (which would have been covered by the acroterion) and two others on the finished top of the base. Cf. Dinsmoor, Jr. (supra n. 6) 226, ill. 13; pl. 43, fig. 16.

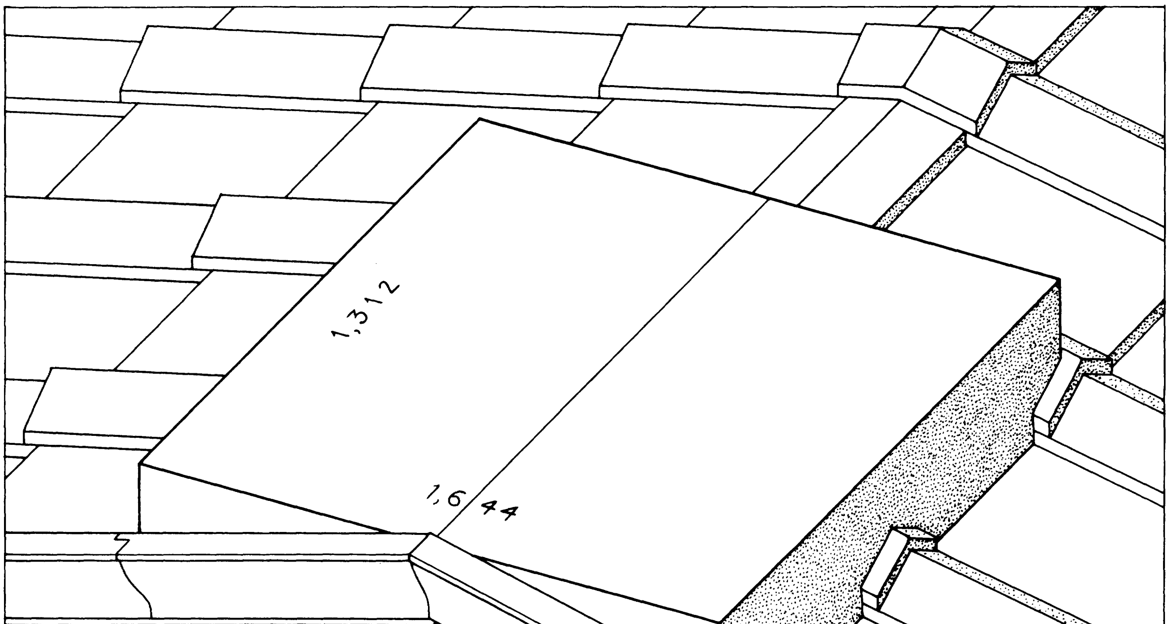
[46] A. Delivorrias has informed me that at the National Museum in Athens there are fragments of a flying figure, of Parian marble, which may belong here. H.A. Thompson has proposed a life size female figure of Parian marble, **S 182**, which was found at the Athenian Agora—cf. *The Athenian Agora, A Guide* (Athens 1962) 126.

THE APEX ACROTERION BASE AND SIMA (Ill. 10)

No recognizable fragment of an apex, or central, acroterion base with its sima facing has come to light. However enough evidence remains on the crowning geisa to suggest a general restoration. It has already been determined above that the bottoms of the bases were 0.808 + 0.039 (overlap) = 0.847 m. long on each slope (ill. 5). The apex geisa retain the weathering lines of the back of the blocks, 1.297 and 1.303 m. back from the geison nosing. The back of the bases ended, therefore, just short of the center of the second row of cover tiles from the façade. That the full thickness of the heavy base extended back the entire distance is indicated by the pour channel for the dowel on the west apex geison block just north of the ridge (ills. 2 and 5). This pour channel would have been unnecessary (since a through-dowel would have sufficed) if the back of the base had been thinned down to a normal tile thickness. The great depth of base enabled the weight of the superimposed acroterion and of the block itself to be balanced over the tympanum wall below.

From the dowel cuttings on the geison course it is obvious that each base was made in two halves, one on each slope. The system is identical with that employed on the nearby Propylaea and Athena Nike temple. Each block, as in the Propylaea, must have had a slot cut along the bottom of the joint face so that it could overlap the sima and pan tiles down the slope (ill. 10). Likewise each block must have had a triangular cutting on this same side to receive, rebated, the uppermost tile of the first row of cover tiles. The second row of cover tiles must have been partially set into a groove on the back of the acroterion base. The conjectural size of the base proper, measured horizontally at its top surface, is 1.644 m. wide and 1.312 m. deep. It is impossible to say whether there was a plinth cutting for anchoring an acroterion on its top surface or not.[47]

[47] A group of two female figures, tentatively identified as the Hesperides, has been assigned as the apex acroterion of the east front of the Hephaisteion by H.A. Thompson, "The Pedimental Sculpture of the Hephaisteion," *Hesperia* 18 (1949) 247-50; *The Athenian Agora, A Guide* (Athens 1962) 128-29. The identification of this ephedrismos group is challenged by



ILL. 10. Isometric of restored apex acroterion base

SIMA DESIGN

The profile of both raking and flank simas is a flattened cyma reversa with a bottom fascia (ill. 9; pl. 39, fig. 10). The simas, 0.222 to 0.227 m. high, are crowned with a roundel which varies in height from 0.013 to 0.018 m. on the extant fragments, averaging 0.0153 m. The lotus-and-palmette design below this is partially preserved on the raking fragments **A 439**, **A 1096** and **A 394** and on the horizontal fragment **A 1094**; there is an almost indistinguishable trace on the raking face of the corner sima **A 701**.[48] The modular spacings of the design vary. On **A 439** these are 0.138 m. on center; on **A 394** the half-spacing preserved is 0.073 m. which, when doubled, would be 0.146 m.; on **A 1094** they average 0.134 m.[49] From the palmette near the upper end of the corner sima block **A 394** the modular spacing of the design, repeated down the slope, would have ended with a half-palmette at the corner (ill. 7).

Below the lotus-and-palmette design on fragment **A 394** there is a horizontal line 0.039 m. above the bottom of the block; on **A 1094** there is again a single line, only 0.036 m. up from the bottom; on **A 439** two lines can be detected, up 0.040 and 0.043 m.

WOOD FRAMING

The most obvious traces of the wood roof construction consist of the cuttings behind the tympanum blocks for the ridge beam and the two purlins. The slots for the ridge beam measure: East, 0.45 m. wide and 0.452/0.495 m. high; West, 0.457 m. wide and 0.435/0.483 m. high.[50] The slots for the purlins have widths of 0.383 m. SE, 0.372 m. SW and 0.380 m. NW, while the information for the one at the NE is gone. The SW cutting has a narrow horizontal ledge along the inner side wall, 0.66 m. below the top of the geison at this point (pl. 40, fig. 17). It is quite possible that this ledge indicates the position of the bottom of the purlin, allowing as it does for a height of purlin of 0.454 m. on the high side.[51] The bottom of the purlin would lie 0.691 m. above wall course XVI of the cella (ill. 4).[52] With a Doric Foot of 0.32619 m.[53] the actual beams would probably have measured in width and in depth at their highest points: for the ridge, 1-3/8 by 1-1/2 D.F., equaling 0.4485 by 0.489 m.; for the purlins, 1-1/8 by 1-3/8 D.F., equaling 0.367 by 0.4485 m. The center of each purlin averages 3.210 m. from the center of the building, and so 4.004 m. from the nosing of the flank geison course.[54] As a result of this, the center of the purlins is only 0.1015 m. from the inner plane of the cella walls, and the inner face of the purlins overhangs the inner face of the walls by 0.082 m.[55] This supports Dinsmoor's theory that the walls of the cella were erected further apart than originally planned.[56] In actuality, however, the purlins did not structurally need to

Charles H. Morgan, "The Sculptures of the Hephaisteion, III," *Hesperia* 32 (1963) 95.

[48] For the design pattern see Dinsmoor, *Hesperia* 9, 33.

[49] See also Dinsmoor, ibid., 34. Fragment **A 439** shows that the modular spacing of the ornament disregarded that of the sima joints. This is shown again by the average length of the sima blocks, 0.65 m. and 1.2995 m., which, if divided evenly, would allow spacings of only 0.13 m. rather than 0.134 to 0.146 m. There were probably fifty-two or fifty-three groupings of ornament on the raking sima of each pedimental slope.

[50] These cuttings step in and become more narrow at the back of the beam slot. See Hodge, 11-13. However, the trimmed down ends and inserted wedges in Hodge's reconstruction of the beam seem impossible just as the secondary triangular cap does which he places on top of the beam. His member is weakened considerably by these ministrations. There is no reason why the ridge beam should not have had an integral section for its full width and height with the top cut on a double slope. There may have been integrally cut tenons at the ends of the beam where the cuttings narrow, but it is doubtful. They would have been unnecessary since the outer 0.19 m. of the slot provided enough bearing. The cutting for the south purlin on the east end of the temple also narrows in width after the initial 0.19 m. (cf. Koch, abb. 55).

[51] The side wall of the cutting both above and below the ledge was worked in ancient times. The slots for the purlins were obviously all cut after the backer wall of the tympanum had been erected. It may have been easier to cut the openings down through an entire course of masonry than to end them at the exact, intermediate level required to support the purlins. Supports could always be added.

[52] This clearance of 0.691 m. easily allows, as Dinsmoor says, for a missing epicranitis course XVII with a height of 0.409 m.

[53] Dinsmoor, *Observations*, 33, n. 87.

[54] On the west front the purlin cuttings are 3.023 to 3.395 m. south and 3.027 to 3.407 m. north from the ridge. On the east front the cuttings are 2.997 to 3.380 m. south and 3.040 to (missing) north from the ridge.

[55] The only course across the cella which can be measured accurately is the seventh above the orthostates (course X) on the inside of the west wall. The others have broken blocks. This course, from south to north, measures 1.243, 1.250, 1.250, 1.249 (excluding a crack of 0.002 m.), 1.225 = 6.217 m. The purlins are centered 6.420 m. apart, or 6.053 m. apart to their inner faces. The cella width of 6.217 m. minus 6.053 m. leaves 0.164 m. which, divided by two, leaves 0.082 m. for the overhang of each purlin. Hodge, 10, suggests that beyond their initial end spans these purlins may have been shifted outwards to lie entirely over the cella walls, for ease of construction. One wonders, however, why heavy, expensive wood purlins would be needed at all over the cella walls. Cheaper bracing of the roof rafters here could have been effected and probably was.

[56] Dinsmoor, *Observations*, 38-39.

extend beyond the depth of the antae and because of the greater width of these antae as compared with that of the walls there would, at these points, be no overhang of the purlins (ill. 8).

The only extant evidence of wood bracing, in the form of cuttings, is located above the columns of the pronaos. The bracing was for the ridge beam. At the west end of the central marble ceiling beam on the east end of the building there is a slot, 0.08 m. wide, cut across the top of the beam. Closely, but not absolutely, in line with this are slots on the tops of the adjacent marble beams at either side. These extend for a distance of 0.165 and 0.170 m. across the southern and northern beams respectively (ill. 2; pl. 40, fig. 18).[57] The slots, which vary from 0.07 to 0.09 m. in width, probably held a continuous wooden nailing strip to which bracing members were attached or, perhaps, the bracing members were tenoned directly into these slots. The type of bracing suggested is a simple fan type with a vertical post and with two supports sloping outward in either direction from the ridge beam.

The double slope of the top of the ridge beam, as represented by the cuttings back of the tympanum walls, lay consistently 0.243/0.244 m. below the top of the raking geisa. This height, apparently designed as 3/4 D.F. (0.24464 m.) was likewise that of the roof rafters which spanned the cella and the area between the ridge beam and purlins. The sloping tops of the purlins, however, were in line with the under surface of the raking geisa, only some 0.20 m. below the top of the geison course. The designed height of the roof rafters over the colonnade was therefore apparently 5/8 D.F. (0.2039 m.). The difference in rafter heights is reasonable in that the lower ones had a span which was only about 4/5 that of the upper ones (ills. 4 and 8).[58]

The rear edge of the outermost row of marble roof tiles rested on the top surface of the raking geison course. Over the rafters, however, the back of these pan tiles must have rested on wood leveling strips, necessary not only for more solid bearing but also because the rafters themselves could hardly be perfectly cut or aligned.[59] These leveling strips could not continue onto the geisa; rather, their top surface and that of the raking geisa finished flush. The strips ended, therefore, on top of a last rafter which lay directly behind the raking geison course. We have no way of knowing whether the rafters were reduced in height to allow these strips to pass over them or whether the rafters were merely notched on either side to receive the ends of short leveling strips. The latter seems more reasonable since the rafters were already quite shallow.[60]

The only evidence for the width of the rafters might have come from the notches which were probably cut on the backs of the trapezoidal blocks which lay on the flank geisa. Since none of these blocks has come to light, we can merely assume that the rafters were approximately square.

As with his later temples the architect here created great difficulties for himself in the framing of the roof by keeping the coffered ceilings of the colonnades as high as he possibly could. Because of his tight planning the wood rafters conflicted spacially with the marble ceiling construction and had to be chamfered extensively at their lower ends (ill. 4).[61] In order to alleviate this situation to some degree the architect also chamfered the outer end of some of the marble ceiling beams over the flank colonnades and the entire top surface of the outermost east-west marble beams of the ceilings at the ends of the building for their complete length (in ill. 4 the varying profiles of the sloping tops of these beams are indicated by dotted lines).

In almost every instance each second, or *alternate*, rafter coincided to some degree with the marble ceiling beam below it, on which it had to rest (ills. 4 and 8). However, the lack of a single modular unit for the design of the building created serious problems. There was no regularity between the spacings of the columns, roof rafters and marble ceiling beams:

[57] The slots may have been aligned originally. The marble beams probably shifted during the modern repairs of the pronaos columns and east peristyle ceiling of 1936-1937 and they may not have been replaced precisely.

[58] Hodge, 15 and fig. 4, shows the rafters 0.24 m. deep throughout.

[59] Although terracotta roof tiles often rested in mud on top of wood planking, evidence from the wall cuttings of the Propylaea in Athens shows that, there at least, the marble tiles rested on wood strips which ran perpendicular to the rafters and were ca. 0.041 m. high. On this basis the roof of the Erechtheion was similarly restored (Paton, Stevens et al. [supra n. 20] 369 and e.g. pls. XVII, XXIII).

[60] Hodge, 14, eliminates wood battens.

[61] Hodge, 15, states that his rafters of 0.24 m. height would clear the ceiling construction of the flank peristyle. Even with our shallower rafter depth of 0.20 m., however, clearance was out of the question. Hodge avoided the real difficulties in his fig. 4 by optimistically raising the ridge beam and rafters at the center of the building an amount equal to a rafter height higher than they actually were.

Column spacings	=	2.581 m.
4 rafter spacings at 0.64975 m.	=	2.599 m.
2 ceiling beam spacings at 1.330 m.	=	2.660 m.

The pair of marble ceiling beams which bracket the centerline of the temple are not, in fact, equidistant from this imaginary line at all, as the roof rafters were (ills. 2 and 8). They are several centimeters too far to the east, on both flanks. As a result, at the west half of the temple each *alternate* rafter near the center of the building fell on the outer half of a marble beam. This condition gradually corrected itself and then, at the far west end of the flank ceiling, opposite the opisthodomos, over-corrected to the extent that the *alternate* rafters partially overhung the inner face of the beams below. At the east half of the temple the situation was more drastic. At the first marble ceiling beam east of center a wooden rafter already lay on the inner half of the beam. This condition worsened constantly the further east one progressed until, opposite the pronaos, the last *alternate* rafter missed its supporting ceiling beam entirely (ill. 8). When these *alternate* rafters partly overhung a marble beam they necessarily had to rest to some extent on the frames of the coffered ceiling. Although the entire arrangement was ill-planned, this system would have worked, and obviously did work, because the ends of the marble beams and the outer edges of the coffer frames which rested on the ledges of beams could carry and transmit the superimposed loads down to the entablature.

The design of the roof almost becomes unbelievable when one considers the *intermediate* roof rafters, those which lay between the *alternate* rafters above the peristyle ceiling and which lay behind the joints of the sima course. In ill. 4 it is obvious that these *intermediate* rafters, if extended for the entire span, would have rested on top of the thin coffer lids of the ceiling which have a thickness of only ca. 0.019 m. This situation is impossible. It is incomprehensible that the architect could not have foreseen the problem. He learned from it, however, and even over-compensated in his next design, that of the temple of Poseidon at Sounion, where he doubled the number of marble ceiling beams so that there were the same number of beams as rafters.[62]

In order to complete his roofing the architect was forced to employ more elaborate wood framing than was usual. This could have been done in one of at least three ways. *Intermediate* rafters might have been omitted and the direction of the framing changed so that there would have been four cross-members which would have spanned between *alternate* rafters, in place of battens, to pick up the back ends of the roof tiles. This scheme would use an excessive amount of wood. A second scheme could have been to lay a continuous wooden beam perpendicular to and on top of the marble beams at approximately their midpoint in order to give support to shallower *intermediate* rafters which might then be placed in the normal direction. The differing heights of the tops of the marble beams would make this difficult, however, and the added concentrated load near the midpoint of these ceiling beams would be structurally unsound. Furthermore, there is no evidence on top of the marble beams of means for attaching wooden ones. A third scheme, that of inserting one cross-member, or header, between the *alternate* rafters near their lower end and then framing into this a normal *intermediate* rafter which was cut short, is the one selected here as being the most practical (ills. 4 and 8). An identical system could have been used at the eastern end of the flank ceiling, opposite the pronaos, where a *pair* of *intermediate* rafters had to be accommodated.

PAN TILES AND COVER TILES

Aside from the flank and raking sima tiles there once existed on the roof 956 normal pan tiles, 1026 cover tiles, 46 ridge tiles and 47 ridge cover tiles. Variations of dimension and detail must have occurred in these roofing members since they were all hand-carved, by different hands, from marble. Also, as happened with the geison and sima courses, the type of marble was probably not consistent. Although these variations make it very difficult to assign to the Hephaisteion with assurance any of the tile fragments which have been found scattered in the excavations of the Agora, certain ones which were discovered on the building itself appear to be authentic and a few others from elsewhere are plausible.

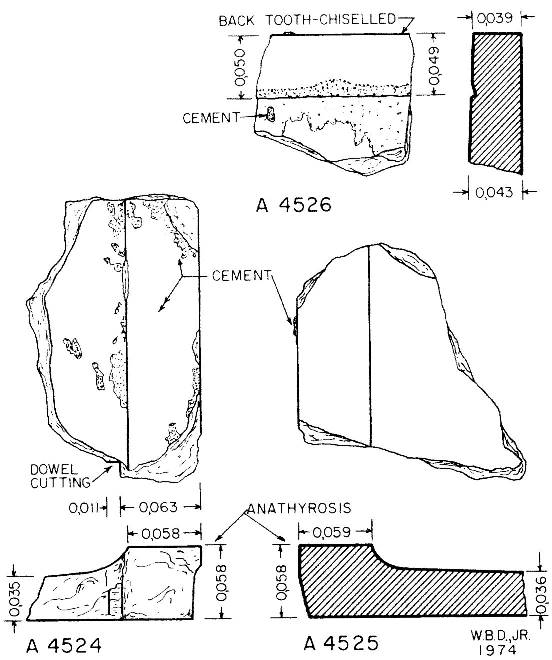
In 1818 the British architect Joseph Woods drew a section through the curbed side of a roof tile which was on top of the building.[63] The top of the curb was rather wide, 0.061 m. The height, which was 0.0735 m., indicates that it probably

[62] Dinsmoor, Jr. (supra n. 6) ill. 6.

[63] Dinsmoor, *Observations*, 111, n. 252 and Koch, abb. 61.

came from the inner side (under the row of cover tiles) of a raking sima (see infra n. 65). Several years later Eduard Schaubert sketched the boss of a cover tile which had been carved on the rear, center, of a flank sima.[64] This boss was 0.21 m. wide and is indicated as having a very slight top slope.

In 1974 Homer A. Thompson collected four tile fragments which were lying scattered on top of the temple. These have been catalogued as **A 4524** to **A 4527** (ill. 11). They most likely had been



ILL. 11. Roof tile fragments found on the Hephaisteion

removed from the Byzantine barrel vault which covers the cella and, indeed, they all bear traces of cement. Although far from being proof in itself, the provenience of these pieces is strongly suggestive of their original place of use. There are, moreover, other strong indications that they actually did belong to the roof of the Hephaisteion.

The fragment **A 4524** gives the strongest proof of the original provenience of these tile pieces. It is obviously of the same series as a second one of the fragments, **A 4525**, and yet it, alone of the quartette, is of Parian marble while the rest are of Pentelic. The piece, which preserves the side curb of the tile, has anathyrosis. This anathyrosis is treated in a style extremely similar to that employed at the joints of the simas of our building, and, in fact, one would expect at the roof level to find this closed type of jointing only on the simas since pan tiles utilized open joints at their side edges. A still more telling point, shared by this fragment and by **A 4525**, is the design of the curbing. The width of the raised lip is distinctive in that it is greater than that usually employed on tiles. It is this distinguishing trait that again relates our fragments to the temple since it is also shared by the fragment drawn by Woods in 1818 which had a width of 0.061 m., a figure that compares closely to our 0.058 and 0.059 m.[65] The final and most important bit of evidence which ties our fragments to the temple is the existence of a through-cutting for a dowel which lies parallel to and near the side edge of **A 4524** (ill. 11). This orientation and positioning of a dowel is peculiar to the Hephaisteion and leads us to place our fragment fairly exactly on the roof. Dowels were used only for the sima tiles (never for the pan tiles). Our piece cannot have come from the side edge of a raking sima since the point where the inner dowels existed on these members (ill. 5) was near the front end of the tile where the height of curb was much greater than our 0.058 m. Nor can our piece have come from the side of a normal flank sima tile where the edges were rebated. Its only possible provenience was from one of the four flank sima blocks at the center of the temple where the common joint was butted. **A 4525** could also have come from one of these four sima tiles or else it might have originated near the back end of the side edge of a raking sima.

In that the later provenience of fragments **A 4526** and **A 4527** was the same as that of the other two members of the quartette of marbles described above, there is a fairly strong case for their also having belonged to the Hephaisteion. **A 4526**

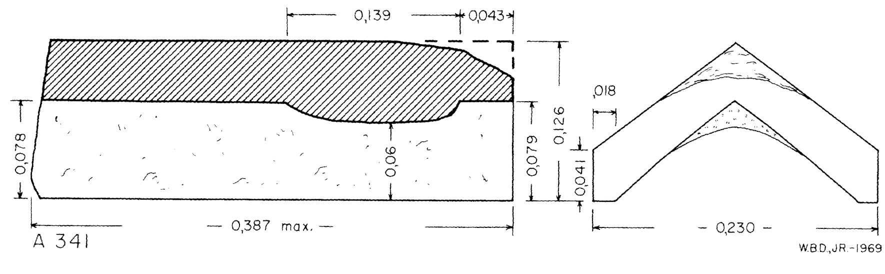
[64] Koch, 66, abb. 64. The attribution of this fragment to the Hephaisteion is not at all certain, however. In 1968 a similar, and quite likely the identical, fragment was recovered from a marble pile north of the temple (**A 3693**). It is somewhat more battered than the one shown in Schaubert's sketch in that the attached pan tile is broken off very close to the boss on all sides. The boss has a width of 0.209 m., a length of 0.279 m. and a vertical height of side of 0.042 m. The thickness of the pan tile is 0.038 m. The slope at the top of the boss, however, is greater than the non-dimensioned one of Schaubert's; it rises 0.053 m. in 0.1045 m., or more than 1 : 2. The overlap on the boss of the cover tile up the hill was 0.045 m.

[65] **A 4524** and **A 4525** have what is apparently a normal height of curbing of 0.058 m. The excessive height of 0.0735 m. of Woods' fragment implies that its original provenience must have been the side edge of a raking sima, the thickness of which canonically increased considerably from back to front.

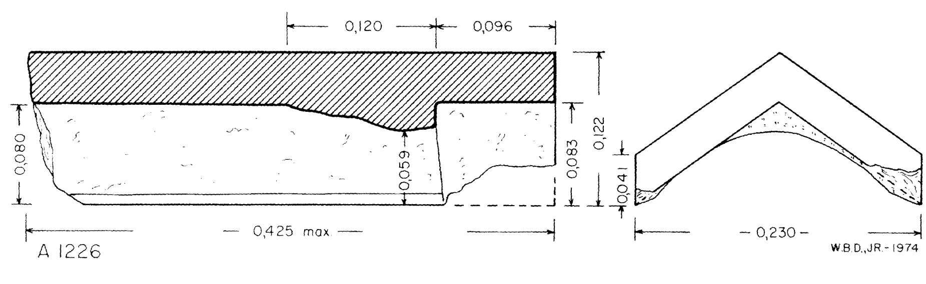
(ill. 11) is from the back end of a pan tile. From heavy weathering it shows an overlap of the next tile up the slope of 0.049/0.050 m. More important, it possesses no raised lip at the back of the tile, the characteristic stop against backlashing of rain water.[66] **A 4527** contains little information. Broken all around and with a maximum preserved dimension of 0.188 m., the only useful information it presents is the thickness of the tile, 0.037 m.

A second series of roof tiles which might possibly have come from our temple is one which was assembled by Colin Edmonson (ills. 12-14). Before we look at these, however, we should turn for a moment to the weathering traces of a Corinthian cover tile on the back of the flank sima **A 1094** (pl. 40, fig. 19). This block, by strong water wear markings, gives the size and shape of the cover tile which abutted it and which was centered on the back of its rebated joint.[67] The half-width is 0.115 m. (i.e. a total width of 0.23 m.) and the top slope is relatively steep, 6.44 in 10. The width of this cover tile was recognized by Dinsmoor.[68] The outline of the tile shows that, in this row at least, the lowest cover tile pitched more sharply than did the higher ones. The vertical sides of the tile (the height of which is not recoverable here) were shaved down to form a slight angle with the pan tile floor of the sima (ill. 9). This situation probably occurred while shaping the bottom and end of the tile to fit tightly against the curved back of the sima, and the marble may have been cut down more than was intended.[69] This did not really matter since the bottom row of cover tiles could not be seen from below.

Among the tiles collected by Edmonson were two fragments of cover tiles, **A 341** and **A 1226**, both front ends and both 0.23 m. wide (ills. 12 and 13). Although the nosing overlaps vary from 0.043 to 0.096 m. and the treatment of the bottom resting surfaces differs, both the basic and the secondary dimensions of the fragments are very close to each other and conform fairly well to the crucial weathered outline on the back of sima **A 1094**. The top slopes of these pieces are 7.3 in 10 and 7.045 in 10. Their vertical sides are 0.041 m. high. Both are of Pentelic marble. Their finding places were



ILL. 12. Cover tile **A 341** possibly from the Hephaisteion



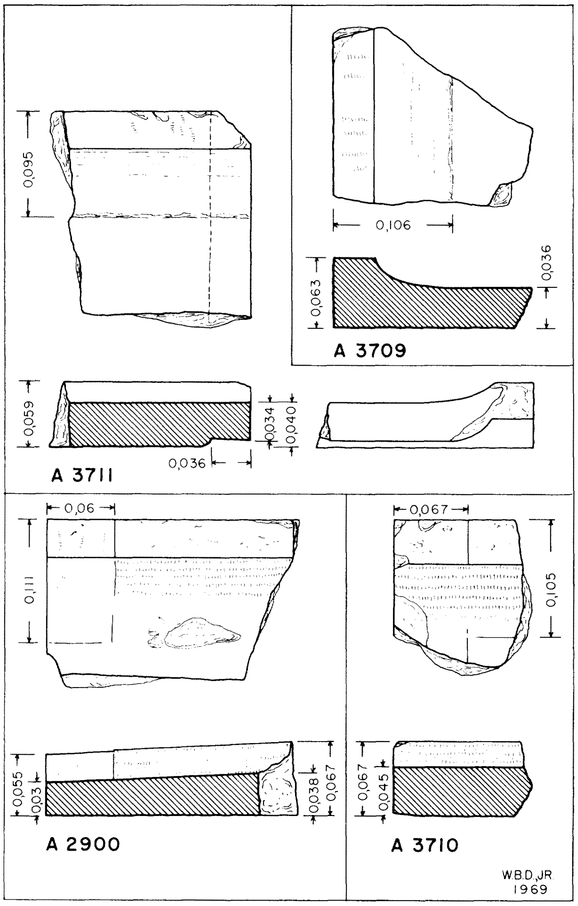
ILL. 13. Cover tile **A 1226** possibly from the Hephaisteion

66 A series of eight marble tiles at the Agora, including **A 1123**, **A 1124** and **A 1917** through **A 1919**, likewise have no rear raised lip. They are of good workmanship but are too large for the Hephaisteion. They were found, reused, flooring a pit of the second-third century after Christ.

67 The cover tiles of this lowest row were spaced twice as far apart as were the others up the slope, i.e. 1.2995 m. on center, over the joints of the sima course only. The alternate rows of cover tiles, which lay back of the lion-head spouts, ended in normal fashion at cover tile bosses which were integrally carved on the sima tiles near their back end (ill. 3).

68 Dinsmoor, *Observations*, 113, fig. 43.

69 The extreme top of our cover tile, from the weathering traces, was either broken or cut down horizontally where it met the back of the sima. At a later date in the history of the building the same cover tile with flattened top was shifted 0.015 m. to the right, away from the joint, possibly because of roof repairs.



Ill. 14. Roof pan tiles possibly from the Hephaisteion

remote from the temple but their context is late, which provides no hindrance to their attribution.

Pan tile fragment **A 2900**, although found 182 meters south-southeast of the temple, combines material, workmanship and dimensions which would suit the building, and its context is again late (ill. 14). Its thickness is 0.030 m. at the back, increasing to 0.038 m. at the forward break. There is a faint line 0.111 m. in from the side of the tile which may represent the edge of the cover tile. With a normal, slightly open, joint between pan tiles a cover tile 0.23 m. wide would work admirably here. This fragment was treated in the same manner as was **A 4526**, which was found on top of the temple, without a raised lip at the back.

The other fragments (ill. 14) were retrieved from a marble pile at the southeast corner of the Odeion. **A 3710** is again a rear fragment with a faint line for the edge of the cover tile, 0.105 m. in from the side, and with no raised lip at the back. **A 3711** is a front fragment of a pan tile with a weathering line caused by a cover tile 0.095 m. in from the side, with a front overlap of 0.036 m. to cover the back end of the next tile down the slope, and with no provision for recessing a raised stop on the back of the next lower tile. **A 3709**, an intermediate side fragment, is 0.036 m. thick and has a weathering line caused by a cover tile 0.106 m. in from the side.

There is still a third series of tiles which has been ascribed to the roof of the Hephaisteion.[70] The finding spot gave an excellent reason for their attribution in that it was only a few meters north of the temple. Also, the context, very properly, was of the second half of the third century after Christ. However, one should possibly be a bit wary of accepting them. The rear fragment of a pan tile, **A 2682**, aside from having an exceptional thickness, possesses a raised lip along its back end. The cover tiles, **A 2683** and **A 2684**, are also suspect when compared to the weathering marks of a cover tile on the back of flank sima **A 1094**. Their width is only 0.215 m. vs. 0.0230 m. and their top slope is only 5.1 in 10 vs. 6.44 in 10. If the boss of a cover tile which was drawn by Schaubert belonged to the Hephaisteion, however, and if his sketch is correct with the tile width of only 0.210 m. and with the gentle top slope shown, then there was such latitude in the design of the roofing members that it would be hard to exclude any Parian or Pentelic marble fragment of good design and workmanship.

Except for the four central rows and the four uppermost rows of tiles, our pan tiles followed the Classical norm of being visually square in plan, 0.64975 m. between centers of cover tiles and 0.650 m. front to back exposure. In actuality, since they would not have abutted tightly under the cover tiles, each individual tile was ca. 0.015 m. narrower and also, in order to underlap the next tile up the slope, ca. 0.039 m. longer. The nonconforming rows of pan tiles varied only slightly from these dimensions, as outlined earlier.

No ridge tiles have yet come to light but they should have been 0.338 m. wide, which is the horizontal calculation of twice 0.174 m. on the slope (ills. 4 and 10), should have had vertical faces 0.041 m. high, and would have followed the pitch of the pan tiles.

[70] McAllister, 28, fig. 16.

POSTSCRIPT

Since this study was made the Greek Archaeological Service, during the years 1973-1974, has done a great deal of consolidation work on the roof of the temple. The work still continues even at the time of this writing. As a result many of the clamp and dowel cuttings which appear on the accompanying state plan have been covered over with cement and are lost to view. It would seem, therefore, that this is probably the final complete study of the roof which can be made.

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Fig. 1. Dressed down surface on flank geison course for trapezoidal block

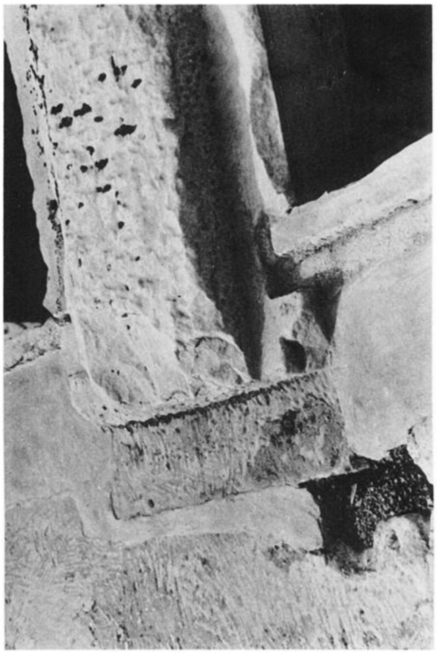

Fig. 2. Cut down end of ceiling beam

Fig. 3. Disposition of dowel holes for SW corner sima block

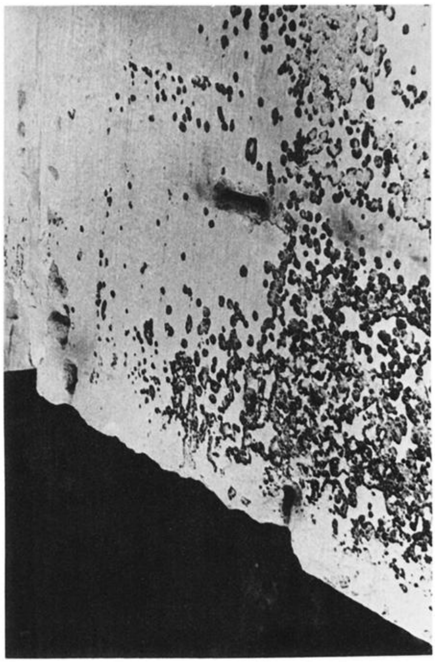

Fig. 4. Dowel holes for normal raking sima blocks

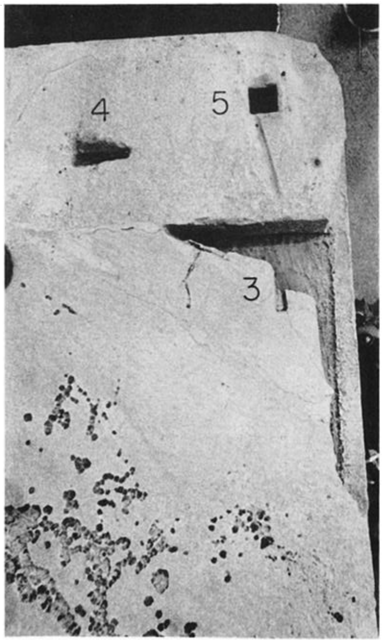

Fig. 5. Outer three dowel holes for SW corner sima block

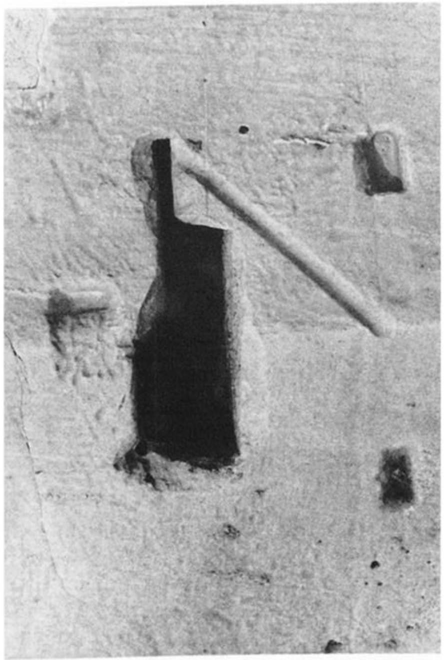

Fig. 6. Lewis, dowel and pry cuttings and pour channel on western apex geison block

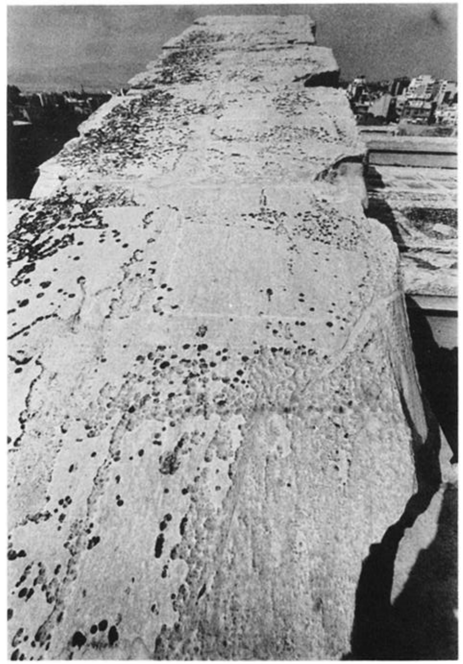

Fig. 7. Weathering line and raised panels on SW raking geison course

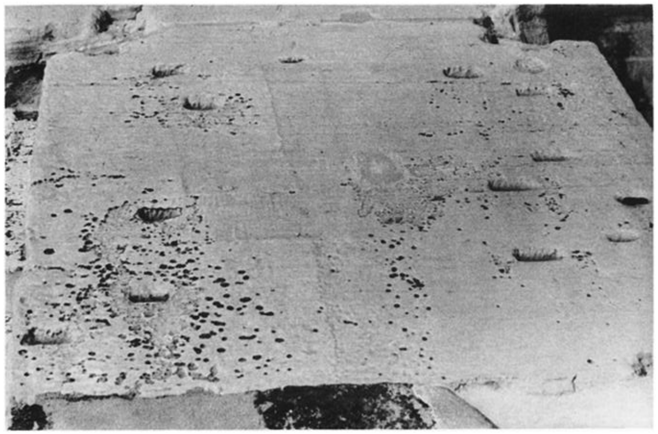

Fig. 8. Weathering line and raised panels on SE raking geison course and extraneous pry cuttings near apex

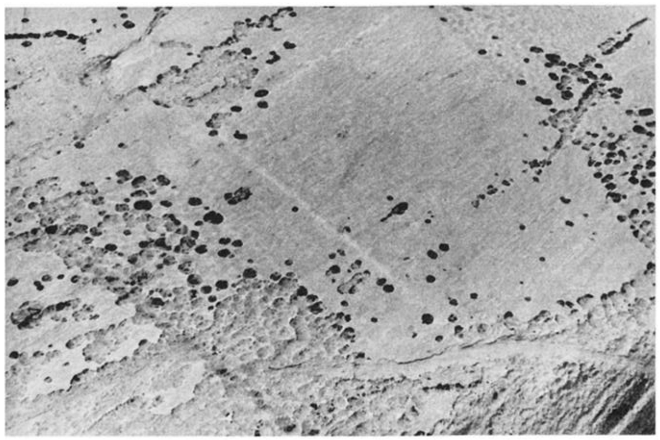

Fig. 9. Detail of raised panels on raking geison course

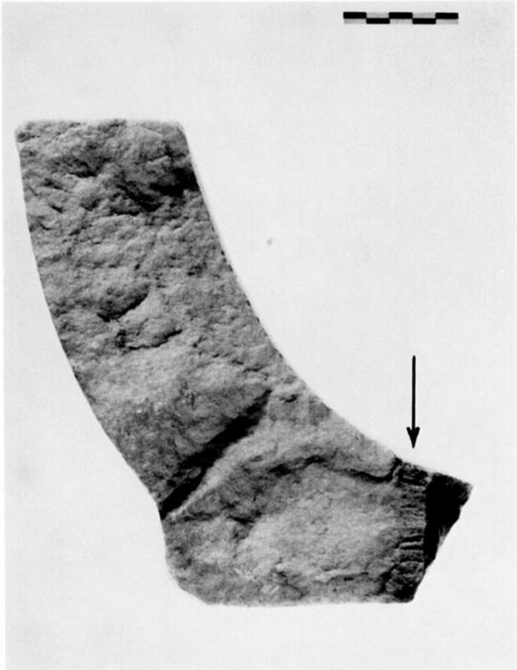

FIG. 10. Dowel cutting on sima **A 394**

FIG. 11. Calcined line from roof leak at joint of flank sima

FIG. 12. Back of flank sima blocks **A 1094** and **A 1895** showing water curb

FIG. 13. Top of corner acroterion base **A 701**

FIG. 14. Plinth cutting in Dionysion at Thasos with pair of tenon cuttings

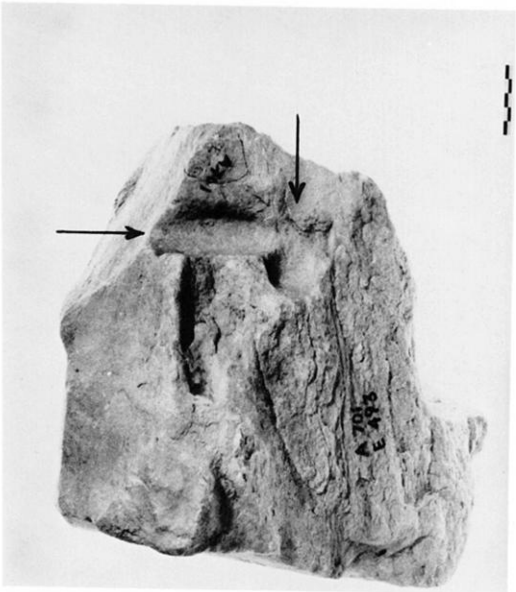

Fig. 15. Underside of **A 701** showing top of drain channels

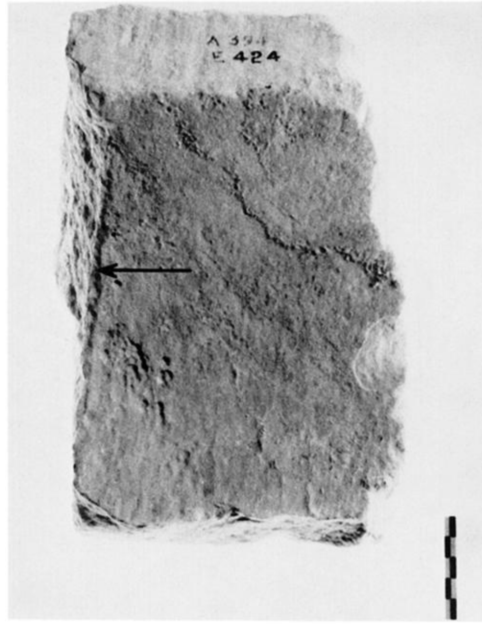

Fig. 16. Break line of back of acroterion base on raking sima **A 394**

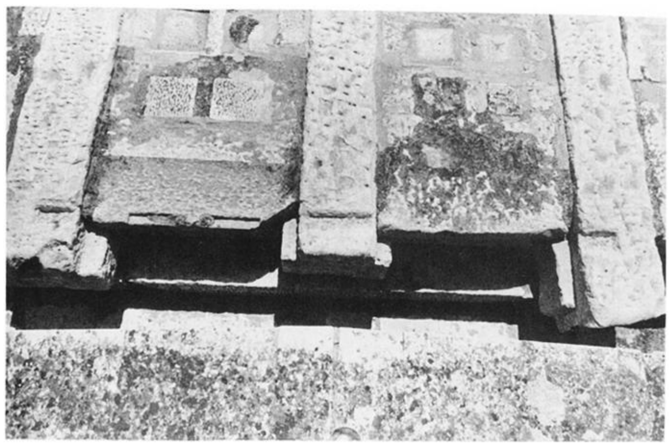

Fig. 18. Slots on ceiling beams over pronaos columns for wood bracing

Fig. 17. Ledge in SW purlin cutting

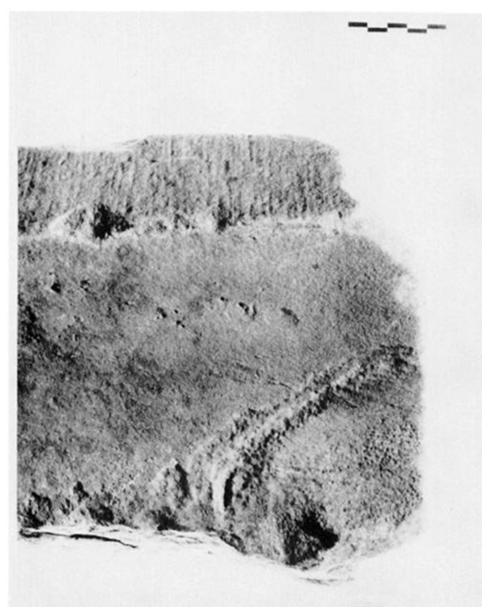

Fig. 19. Back of flank sima **A 1094** showing weathering of cover tile