

# THE BEAMWORK ILLUSTRATED AT PRAMBANAN\*

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The balustrades surrounding the terraces on which are built the three main shrines of Prambanan in Central Java are decorated on the inner side with reliefs illustrating Indian epics. The scenes showing the different episodes often include some architectural details. The sculptors, to produce these views, used several representational techniques. The simplest is an orthogonal projection of a building (Figure 1) which is often combined with a perspective effect obtained by reducing a facade. Aerial perspective is also used (Figure 2), and also a method deriving from this: an almost axonometrical view upwards (Figure 3), in contrast to the aerial view, which looks down. None of these devices is followed rigorously and a concern for accurate representation does not prevail to the same degree in all three shrines. Details of buildings are completely absent in the southern shrine, numerous but unvaried in the central shrine, and few but carefully illustrated in the northern shrine.

The three buildings which we shall try to reconstitute are, for this reason, on the inner side of the balustrade of the northern shrine. Two are near the northeast corner, and the third on the western facade. The first construction is entirely without partitions and is raised on piles; it consists of a main building with an adjacent lean-to. The sculptor has used aerial perspective for the roof of the lean-to, but for the main building has employed an orthogonal projection with a face folded on the same plan.

On the inside, the two floors shown in aerial perspective (Figure 2). The pillars are illustrated in orthogonal projection but the sculptor has utilized the possibilities which the third dimension gave to indicate different planes. Thus, the rabbeting in the pillars to take the beams for the floor is shown as slightly projecting. The details of the beamwork appear above all in the folding of the gable of the main building, but to produce the external shape we have also used the side illustrated in orthogonal projection. It can be noted here that on the two sides is a roof with two projections like those carved in the round on the stone models found in the Jakarta and Trowulan museums.

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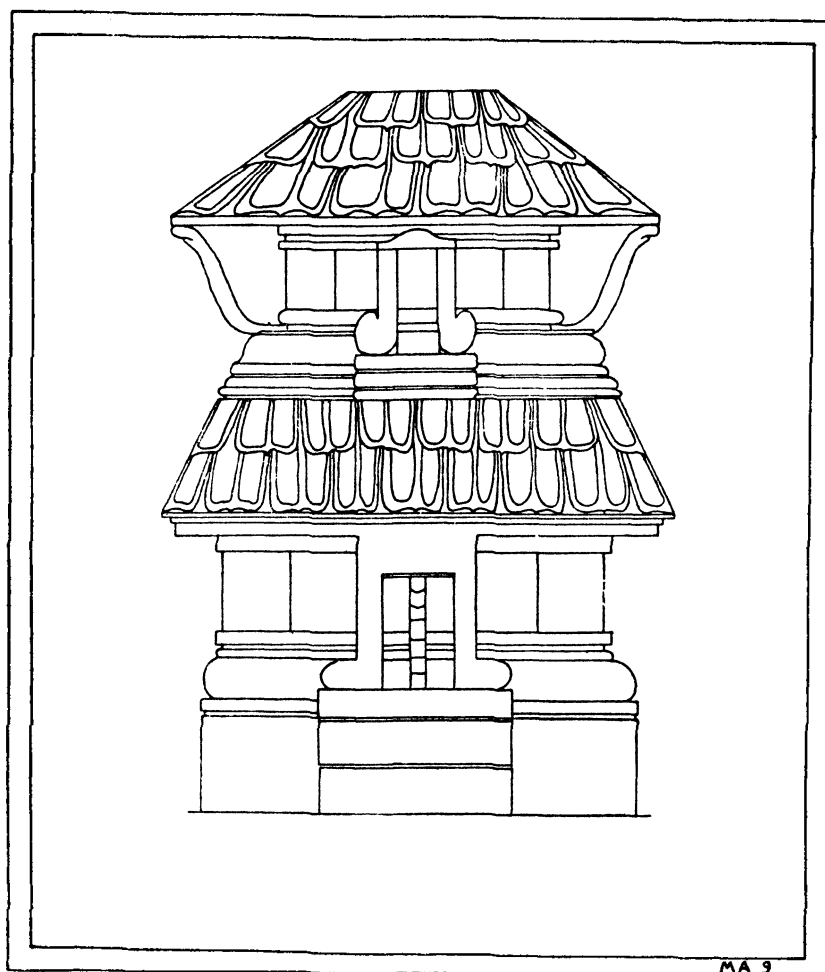


Figure 1. Prambanan Temple, north balustrade, west side, central panel (MA9).

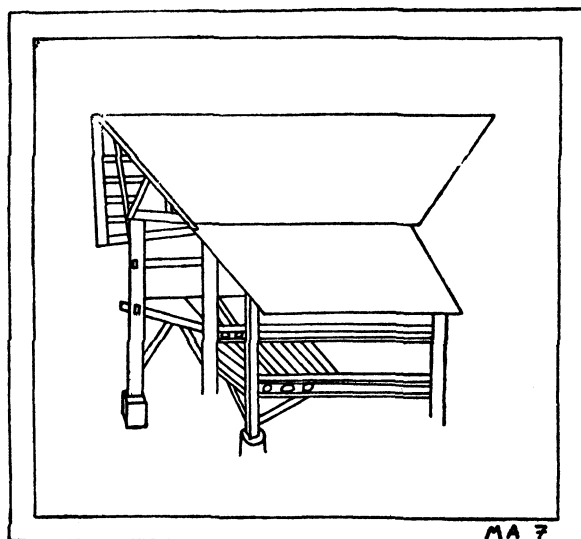


Figure 2. Prambanan Temple, north balustrade, north side, west panel (MA7).

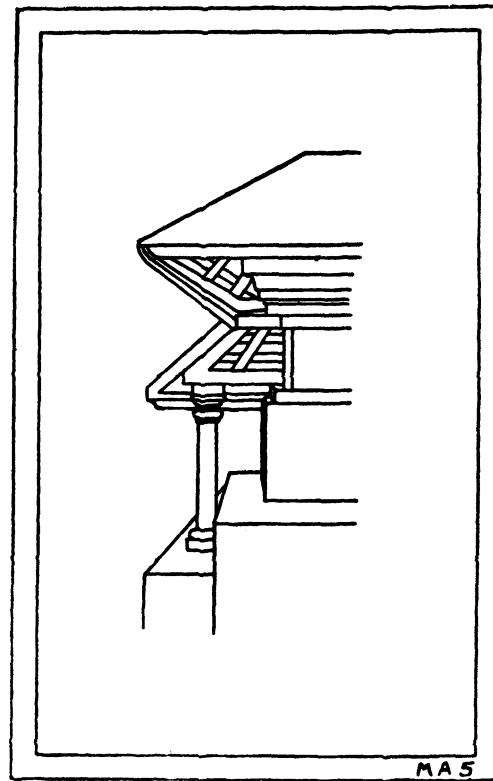


Figure 3. Prambanan Temple, north balustrade, north side, west panel (MA5).

The ridge-pole is supported by a sloping bracket at each end of the building and taking support from the tie-beam of the gable. These two brackets are of considerable technical interest. The ridge-pole was not only held in place but also in tension, which would have done away with every king-post and give a large internal volume.

Yet in our reconstitution (Figure 4) we have shown a king-post in dotted lines. It seems likely that for a building of some size, to avoid bending under the weight of the roof, a simple king-post placed on a tie-beam was essential. Moreover, even to this day, the carpenters of Central Java support the ridge-pole.

This type of tensioned beam existed before the construction of Prambanan. It is shown in Borobudur (north side, west wing lower level of the first gallery). The beamwork is completed by rafters fixed to the top of the ridge-pole and at the base on the stringer. Laths are placed on the rafters at widely spaced intervals, to hold the roof material which is not shown. The stringer is doubled longitudinally. This stiffening is still used now even though, as the gables are no longer sloping, it is possible to place a tie to the ridge-pole, as is often done in Cambodia in similar cases. The beams supporting the floor are inserted in the pillars and held in position by pegs going right through the butt-end. These beams have their strain reduced by the struts which rest on the pillars. The floors appear to be formed from pointed billets between two beams the whole length of the building. The floor of the lean-to is at a lower level than the main building.

The second construction selected for detailed study is in stone (Figure 3), built on a very high and solid base; on the longitudinal side, facing the viewer, the building is extended with a lean-to roof resting on columns. The roof of the main building has four sides. An orthogonal representation of this type of roof is the most common, leaving no indication of the structure, but here, the sculptor has managed to show us the underside of the roof, and the following reconstitution is possible.

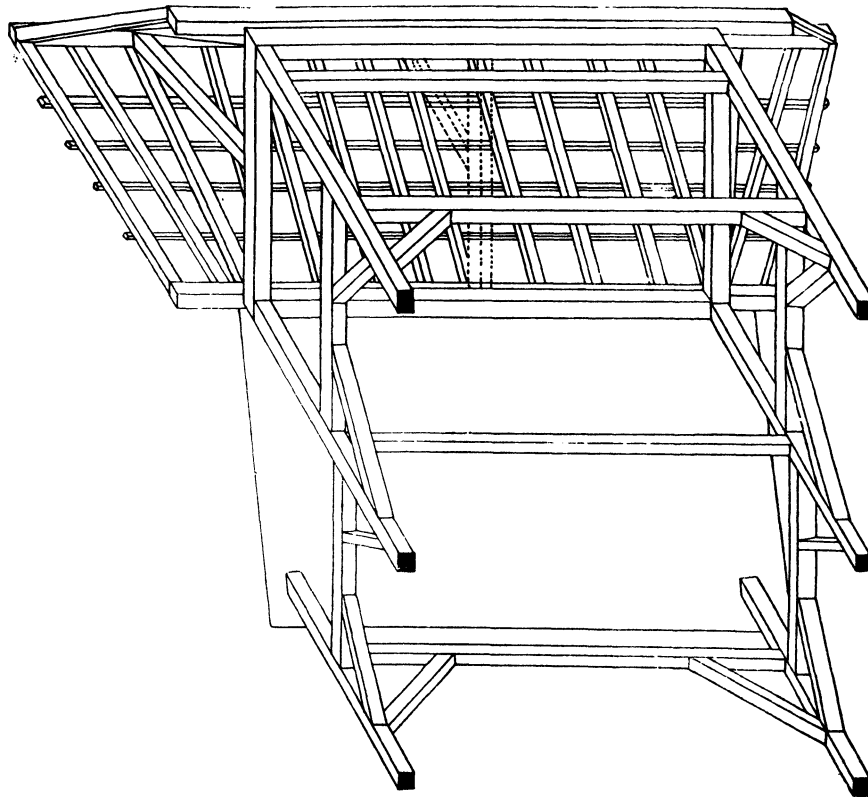


Figure 4. Reconstituted beamwork of the building shown in Prambanan Temple, north balustrade, west side, central panel: see figure 2 (MA8).

We think (Figure 5) that a radiating beamwork is indicated, the rafters of which would be inserted at the top into the ridge pole, then over the masonry into a stringer and ending at their base in a wall plate located slightly behind the guttering edge of the roof. The materials used to cover the roof are not shown, but some birds are shown pecking at its surface, so it is possibly thatch. In this type of beamwork, still very common in Java and Bali, it was not necessary to insert intermediary trusses because the ridge-pole was compressed throughout by the rafters inserted in the stringer whereas, in the previous example, the roof-line was in tension by brackets leaning outwards and allowing the rafters to be free on the wall plate on the projecting part of the building.

In the two examples described, the materials used in the roof covering are not shown. This is generally true in Prambanan, except for two very similar buildings: one on the west balustrade of the southern shrine, the other on the west balustrade of the northern shrine. We shall describe the latter. It has two storeys though perhaps it is only the outer building of a much more important construction outlined in the rear of the relief. The ground floor is built on a level base, crossed by a stairway leading to a door whose movement is shown. The door is surrounded by a carving interrupting the ogee moulding on which the windows rest. The whole is surrounded by a cornice which is partially broken by the door frame. Above the markedly projecting cornice resting directly on the doorway are shown two rows

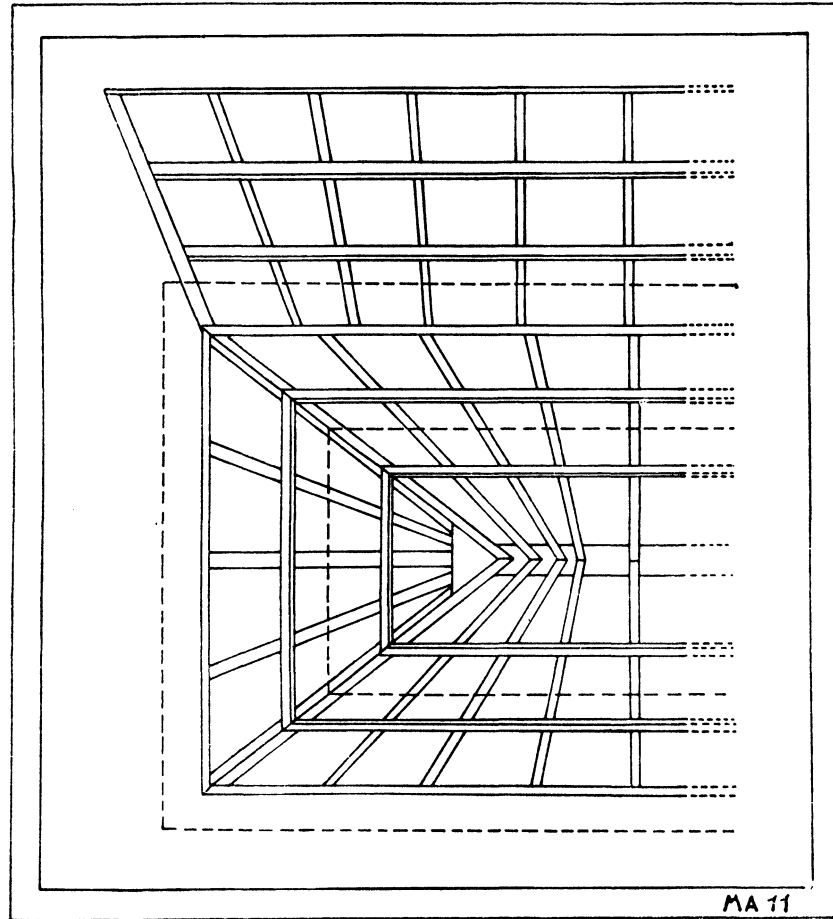


Figure 5. Reconstituted beamwork of the building shown in Prambanan Temple, north balustrade, north side, west panel : see figure 3 (MA11).

of broad flat tiles. We believe that these were made of terracotta, with a raised central point, the sides and the center slightly depressed to allow for a rapid run-off of rainwater. The upper row of tiles is inserted beneath a small projecting string-course forming the ridge tiling. Above this the outline of the base is carved, broken by a stairway leading to a doorway. In consequence, this represents, as with many temple constructions, a false storey corresponding to no internal volume.

This last structure is covered with a four-sided roofing extending well beyond the structure. Some braces were doubtless placed only at the corners to maintain the greatest overhang. The roofing consists of three rows of tiles similar to the ground floor; there is no carved ridge tiling. This illustration is of the greatest importance, showing that, besides the stone shrines, wooden shrines existed with a similar disposition: a ground floor upholding one or two false storeys corresponding to no internal volume. As for the beamwork, this building shows us that lath work was used to place the tiles. It is likely that the beamwork is also radiating here, as in the previous example, but instead of a few parallel beams to the wall to hold in place the thatch or broad wooden wedges, it was necessary to fix laths on the rafters for each row of tiles.

The location of the different types of roof frames illustrated in the shrines is detailed in the following summary description of all the architectural representations on the monument, beginning on the axial east doorway and keeping the structure on the right, the reliefs being consequently on the left. In all cases, the buildings are shown in orthogonal projection, except where indicated.

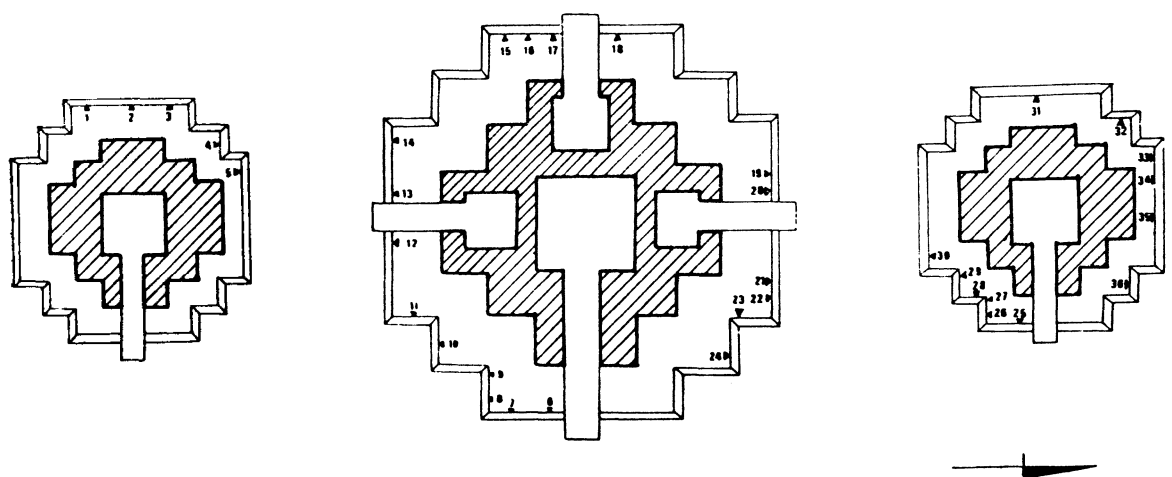


Figure 6. Location of all the buildings illustrated on the bas-reliefs at Prambanan.

**A. The South Temple (Candi Brahma)**

1. On the west side, central panel, unfortunately flaking away, is a building, whose tiles are shown as in Figure 1.
2. Also on the west side, a building with lean-tos, having a two-sided roof and projections, the sloping bracket is accurately shown, as well as the perpendicular beams.
3. The same side is a two-storeyed building with a reduced facade and a two-sided roof, and under the tie-beam of the gable represented on the reduced facade is a small lean-to roof which links the two high longitudinal stringers. On this building the lower stringer goes all round and is possible that between the two stringers spaces were provided for aeration. (See Plate 1.)
4. On the north side is a small shelter on piles with a two-sided roof doubtless without any projection.
5. On the north side is a small shelter very similar to the previous one, shown on stone in very poor condition.

**B. The Central Temple (Candi Siva)**

6. On the east side, southern section, is a building with a four-sided roof.
7. On the same panel is a boor with an indication shown in perspective of one of the door-leaves.
- 8-14. On the south side, eastern section, are shown six buildings with four-sided roofs. This is doubtless the same construction serving as a backdrop for different scenes.
15. On the west side, southern section, is a building with a reduced facade showing a gable. This construction has two floors, the upper one appearing to be quite low; it may be that because of the tension in the ridge there were no fixed intermediaries, allowing the whole space to be filled.
16. On the same panel is a building with a four-sided roof.
17. Still on the same panel is a building with a two-sided roof without a reduced facade clearly showing the extent of the lateral projections.
18. On the west side, northern section, is a building shown in aerial perspective, the wallings of which could be removed by raising them.
19. On the north side, western section, is a building having a four-sided roof.
20. Also on the north side, western section, is a building with a two-sided roof and a reduced front showing the beams perpendicular to the brackets, as is normal, but here the sculptor has respected the proportions of the cut of the wood; the lower beams are shorter than the upper ones.
21. On the north side, eastern section, is a building with a two-sided roof and a reduced front.
22. On the same panel is a two-storeyed building with a surrounding lean-to roof above the ground floor and a four-sided roof on the upper floor set back from the lean-to roof of the ground floor.

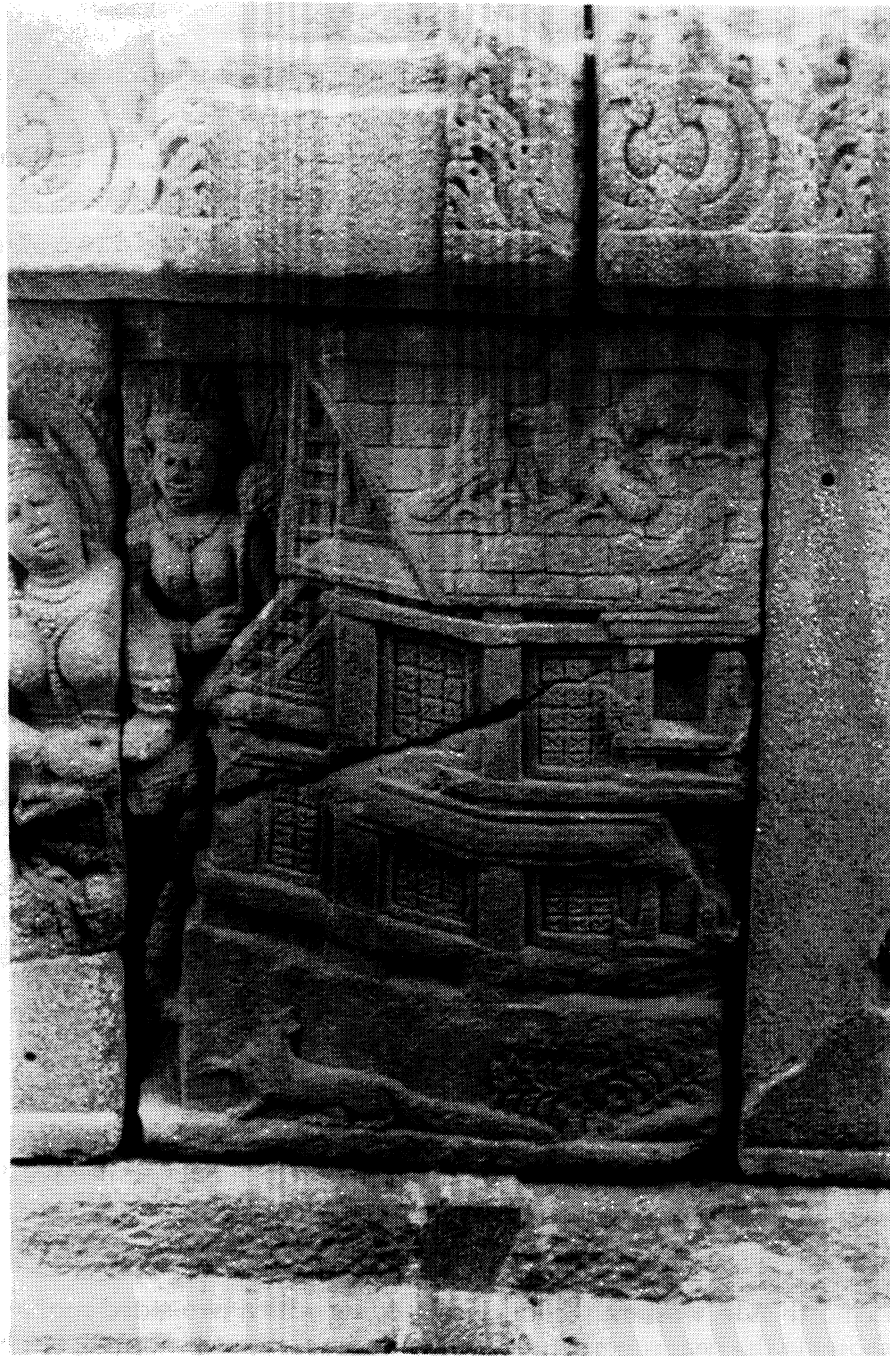


Plate 1

23. On the east side, northern section, is a building shown in aerial perspective, the partitions of which can open.

24. On the east side, northern section, is shown a two-storeyed building on piles with a reduced facade and a surrounding lean-to roof on the ground floor; the roof of the upper floor has two sides and a stretched ridge; the slope of the visible brackets is parallel to that of the projection and the extension of the perpendicular beams is regular. (See Plate 2.)



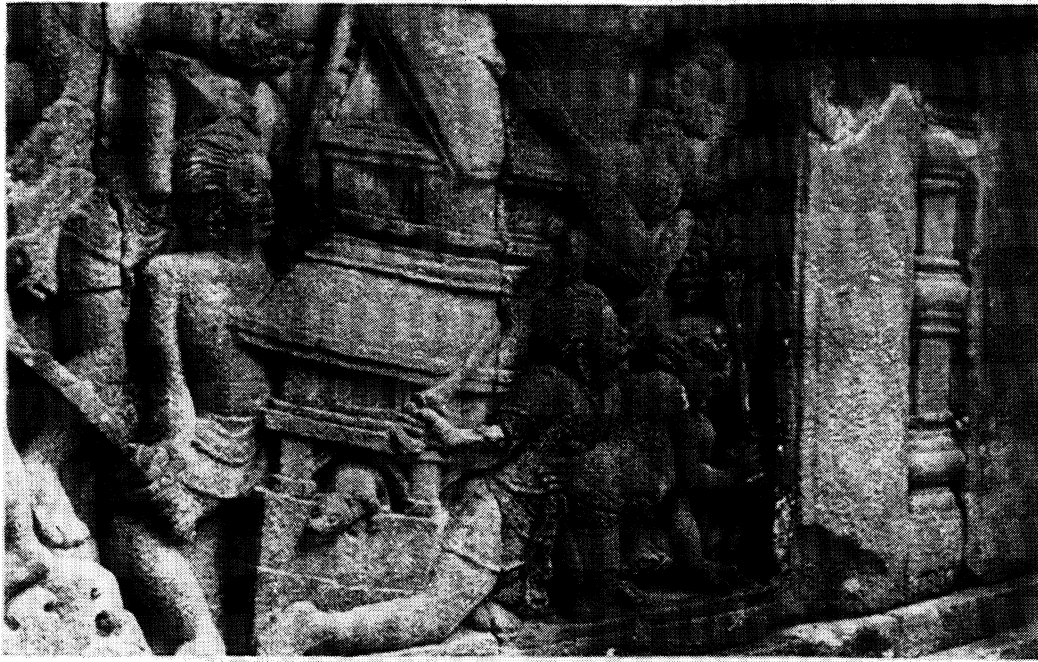


Plate 2

**C. The North Temple (Candi Visnu)**

25. On the east side, southern section, is a building with a four-sided roof.
26. On the south side, eastern section, is a building shown in orthogonal projection but with elements of aerial perspective, having a two-sided roof and partitions which can be raised longitudinally; they are made of wickerwork.
27. On the same panel, is shown a building with a four-sided roof.
28. On the east side, on the first step south, is a small building shown in aerial perspective whose four pillars are illustrated.
29. On the south side, on the eastern panel, is a building with a four-sided roof.
30. On the south side, in the central panel is a building with a two-sided roof, with one of the gables reduced. (See Plate 3.)
31. On the west side, the central panel is illustrated in Figure 1.
32. On the west side, on the northern panel, a building is outlined.
33. On the north side, on the western panel, a building is illustrated in Figure 2.
34. On the same panel, another building appears, illustrated in Figure 3.
35. On the north side, on the eastern panel, is a building with a four-sided roof.
36. On the same panel is shown a small pavilion on piles, in aerial perspective.



Plate 3

In addition to the elements described above, modern beamwork has kept numerous traditional cuts. Among those noted near Prambanan are timber frames with two projections which are rare and in all cases without sloping brackets. In contrast, many four-sided roofs can be seen very similar to those illustrated in the reliefs, notably in the village of Tengal Bendo, where the roof frame has a double stringer, the radiating rafters resting on the ridge, itself upheld by a king-post. In the *kraton* or palaces of Yogyakarta and Solo, there are many oblong timber frames. Above an entrance of the Yogyakarta *kraton* can be seen a radiating beamwork without a ceiling and without a king-post, which is very close to many of the models of Prambanan. Finally, if all the roofs with a ridge in tension have disappeared in Java, they still exist in Sumatra, notably among the Batak, and in the huge Toraja houses in Sulawesi.

*Translated by Michael Smithies*