Methods Narrative

Our analysis began with the recording of various architectural details based on the field notes, maps, and profiles from the SSI excavations. The SSI crews routinely completed architectural data forms for each structure, which also provided a wealth of information in a standard format across all architectural features. The recorded variables we relied upon included feature number, HA, temporal assignment, architectural style, and various counts and measurements of architectural details.

We refer the reader to the supplemental text in which all of the variables are defined and calculated with sufficient detail to promote their use in future applications. Three examples of the construction-costs calculations for individual structures are also presented. An electronic copy of the Pueblo Grande database will be made available to researchers upon request.

The projected length (PROLONG) and width (PROWIDE) of the floor (in meters) equaled the maximum length and width of fully preserved floors. When the partial remains of a structure were sufficiently complete, we safely estimated the full length and width of the floor based on the house’s symmetry. In particular, entryways were typically centered on the long axis of the house and hearths were placed in front of the entryway, thereby dividing the length of the structure in half and allowing the full-size projection of the floor to be determined.

We measured the maximum length (ELONG) and width (EWIDE) of the entryway (in meters) from field maps. The distance between the outside edges of the entry walls was recorded as the width. The length of simple, break-in-the-wall entries was set equal to zero.

The average wall width (WWIDE, in cm) of the adobe surface structures (i.e., Massive-walled adobe and Post-reinforced) was recorded on the SSI architectural form. In contrast, because the walls of pithouses were not preserved, we assumed a constant thickness of adobe of 5 cm on the exterior of pithouse walls for all pithouse styles. This thickness is an average based on examples of burned daub found at Grewe (Crary and Craig 2001:42).

Upright supports in Hohokam dwellings included the major roof supports and often shorter posts for holding up raised benches and shelves. The roof supports (SUPPNUM) were enumerated based on the location and size of the postholes in the floor. We did not keep track of exact posthole diameters, but the large examples (typically 25-30 cm across) located in the central part of the floor and away from the walls, were counted as roof supports. In contrast, postholes that probably corresponded to interior-feature supports were typically half that size.

When the floor was only partially preserved, but a roof support could be reasonably assumed to have been present in the missing portion of the house, based on symmetry, our count of the roof supports (SUPPNUM) included those assumed cases. Admittedly, the builders’ use of non-linear-shaped trunks of mesquite trees for roof supports can be misleading on occasion. Consequently, we were conservative in our estimates of roof supports, possibly leaving some posts uncounted.

The primary beams in the roof rested on top of the upright roof supports, and spanned the distance between the main supports anchored in the floor. In all of the houses recorded for the present study, the main roof supports were arranged in a line parallel to the long axis of the building. It follows, therefore, that the number of primary beams (PBEAM) corresponded directly to the count of the uprights (SUPPNUM). Roofs supported by one or two main posts required one primary beam. Structures built with three or four main supports necessitated two or three primary beams, respectively.

Often the floors of Hohokam houses were only partially plastered or left unprepared altogether. The SSI field maps indicated where on the floor the plaster had been applied. We measured the length (PLLENGTH) and width (PLWIDTH) of the plastered surface (in meters) from the field maps. The thickness (PLTHICK) of the plaster coating was also recorded (in cm) on the SSI architectural forms.

The area of the floor demarcated by the postholes for the interior-feature supports (IPAREA) was measured in square meters from the field maps to determine the size of the raised constructions. When multiple raised features were present, the sum of their square footage was recorded for the structure.

Finally, the wall-post densities in the front (PDFRONT), back (PDBACK), side (PDSIDE), and entry (PDENTRY) walls were determined by counting the postholes in the wall and dividing the total by the wall length to yield the density of posts per meter. The front, back, side, and entry walls of only a few structures, however, were sufficiently intact along their entire lengths to count the total number of postholes corresponding to the wall posts. Instead, many house remains included only well-preserved wall segments from which the number of wall posts could be counted. And, still more structures lacked any wall segments at all from which a total posthole count could be made. Obviously, these circumstances created problems for recording wall-post densities, which we resolved in the following ways.

When only a wall segment was well preserved, it was assumed to be representative, and the density of wall posts within it was accepted for the wall as a whole. When intact wall segments were absent altogether, we relied on estimated densities, which were formulated according to architectural style. For example, consider the case of a Narrow-walled adobe pithouse with a front wall in which the postholes were too sparse to yield a reliable wall-post density. We estimated the density by averaging the wall-post densities for the well-preserved wall segments in all of the Narrow-walled adobe pithouses in the SSI project area. The average values were: Type S-1 and S-2 – 3.84; Deep, Post-supported – 2.25; Deep, Adobe-lined – 1.94; Narrow-walled adobe – 2.82; Post-reinforced – 2.41; Massive-walled adobe – 0.

Our next step was devoted to the many calculations needed to measure the labor costs for each of the Pueblo Grande structures. We relied on base rates obtained from published experimental studies that translate the amounts of building materials into labor costs measured in person-hours (e.g., Erasmus 1965; Wilshusen 1988). Perhaps the best way to describe these calculations begins by breaking down the three primary components for construction costs: 1) the labor to dig and mix the adobe, 2) the labor to cut and transport the wood, and 3) the labor to erect the walls, floor, roof, and internal features of the structure.

Calculating Adobe Costs

Adobe labor (ADOBELAB) is the total number of person-hours spent mixing the adobe (MIXING) plus digging the adobe (DIGGING**).** MIXING is calculated as the total amount of adobe (TOTADOBE) divided by the constant .05, which represents the cubic meters of adobe that can be mixed and applied in one person-hour (Craig 2001b:123). For Post-reinforced and Massive-walled adobe structures, the formula for DIGGING assumes a constant of .52 cubic meters per person-hour (Erasmus 1965:285) to convert TOTADOBE into person-hours of digging. This formula was adjusted for pithouses to take into account the depth of the house pit. Because the prehistoric ground surface is no longer preserved, we estimate the depth of S-1, S-2, Rock-lined, and Narrow-walled adobe pithouses to be a constant 30 cm and the depth of Deep, Adobe-lined and Deep, Post-supported pithouses to be a constant 50 cm, based on previous studies at Grewe and Pueblo Grande (Craig 2001b; Mitchell 1994). DIGGING was calculated for pithouses as the product of the estimated depth, length (PROLONG), and width (PROWIDE) of the house divided by the constant of .52 cubic meters of dirt moved per person-hour.

TOTADOBE is comprised of the adobe from the wall of a structure (WADOBE), the roof adobe (RADOBE), and the floor adobe (FADOBE). The calculations for WADOBE are made according to the variation in wall construction associated with different architectural styles. For all pithouse styles, the formula for WADOBE equals the product of the perimeter (PERIMETER) of the structure, the width of the wall (WWIDE), and the height of the wall. The wall height is a constant of 1.8 m based on previous procedures followed at Medler Point (Craig et al. 1998) and Grewe (Crary & Craig 2001).

For Massive-walled adobe houses, the rock component in the walls account for about a third of the wall volume. Consequently, the computation for WADOBE is adjusted accordingly (FACTOR).

For Post-reinforced structures, wall posts are incased in the adobe walls. Each wall post is assumed to be 1.8 m long with a diameter of 20 cm, yielding a volume of .0565 cubic meters.[[1]](#footnote-1) This constant multiplied by the estimated total number of wall posts in the structure (TOTALPN) equals the total volume of wall posts. The total volume of the walls minus the volume of the wall posts (FACTOR) equals the adobe volume in the walls (WADOBE). TOTALPN, in turn, is the sum of the wall posts in the front wall (FRONTPN), back wall (BACKPN), the two side walls (SIDEPN), and the two entry walls (ENTRYPN). Each of these counts is estimated using the wall length and post density in each wall (see Appendix for the FRONTPN, BACKPN, SIDEPN, and ENTRYPN formulae).

The roof adobe (RADOBE) is the amount of adobe in the roof in cubic meters. RADOBE was calculated by multiplying the roof area (RAREA) by the thickness of adobe in the roof, which is presumed to be .05 m (Craig 2001b:118; Crary & Craig 2001:43). Because the roof covers both the floor area and the width of the walls, RAREA is calculated accordingly in square meters (see Appendix for the formula). FADOBE is the amount of plaster on the floor in cubic meters. It is calculated as the product of the length (PLLENGTH), width (PLWIDTH), and thickness (PLTHICK) of the floor plaster.

Calculating Wood Costs

Wood labor (WOODLAB) is the number of person-hours spent on cutting (CUTTING) and transporting (TRANSPORT) wood. Calculating CUTTING and TRANSPORT depends on the total wood (TOTWOOD). TOTWOOD is the sum of the weight of the wood used to build the structure including roof supports and primary beams (BIGWOOD), secondary beams (MIDWOOD), wall posts (SMALLWOOD), roof closing materials (CLOSING), wall closing materials (WCLOSE), and internal raised features (IPWOOD). CUTTING is calculated by dividing TOTWOOD by the constant 50 kg/hour (the weight of wood that can be cut in one person-hour; Craig 2001b:123; Erasmus 1965). Similarly, TRANSPORT is calculated by dividing TOTWOOD by the constant 96 kg/hour (the weight of wood transported in one person-hour over a .5 km distance; Craig 2001b; Erasmus 1965). We used .5 km because it is the distance from Pueblo Grande to the Salt River, where riparian areas were probably exploited for wood supplies.

BIGWOOD is the total weight in kilograms of the roof support posts (SUPPNUM) and primary beams (PBEAM). The total number of posts and beams is multiplied by an assumed50 kg per beam to yield the total weight (Craig 2001b:118).

MIDWOOD is the total weight of secondary roof beams in kilograms**.** Unfortunately, remains of the roof rafters are poorly preserved in the archaeological record, although reasonable approximations can be derived. Based on modeling for the Grewe study, Craig (2001b:118) developed a formula based on house size to yield a likely frequency of secondary beams used in the roof construction. That number is then multiplied by 15 kg, which is the assumed weight of secondary beams. Our assumption is based on experiments conducted as part of the Dolores Project (Wilshusen 1988) and are consistent with Craig’s (2001:118) use at Grewe and Meddler Point (Craig, et al. 1998:252).

SMALLWOOD is the total weight of the wall posts in kilograms. It is calculated as the total number of posts (TOTALPN) multiplied by 10 kg, which is the assumed weight of a single wall post (Craig 2001b:118; Wilshusen 1988). The total number of wall posts in a structure includes the uprights in the back (BACKPN), front (FRONTPN), side (SIDEPN), and entryway (ENTRYPN) walls.

BACKPN is calculated as the product of the wall post density for the back wall (PDBACK) and the length of the back wall (PROLONG). FRONTPN equals the wall post density in the front wall (PDFRONT) multiplied by the length of the front wall (PROLONG) minus the width of the entryway (EWIDE). SIDEPN represents the number of wall posts in the two side walls combined. It is computed as the wall post density in the side walls (PDSIDE) multiplied by the combined length of the two side walls (PROWIDE x 2). ENTRYPN is the number of wall posts used to construct the entryway, including the posts framing the two parallel walls of the entry enclosure. The number is derived by multiplying the density of wall posts in the entry (PDENTRY) by twice the length of one entryway wall (ELONG x 2).

CLOSING is the weight of the materials that covered the roof. It is the roof area (RAREA) multiplied by the weight of an assumed 25-30 cm-thick layer of brush and dirt per square meter (29 kg; see Craig 2001b). Similarly, the weight of the closing materials for the walls (WCLOSE) depended on the total wall area and the weight per square meter (29 kg). The total weight of the raised floor features (IPWOOD) equaled the area of the features (IPAREA) times the 29 kg constant for the weight per square meter.

Calculating Building Costs

The labor required to erect the building materials into a habitable and durable living enclosure is determined by the size of the roof (RAREA), walls (WALLAREA), internal features (IPAREA), and an assumed building rate of 2.5 person-hours per square meter of construction (Craig 2001b:122-123). RAREA and IPAREA are discussed above. WALLAREA is the product of the PERIMETER and the assumed height of the walls (1.8 m).

Calculating Total Costs

Now that the cost calculations for the various components of construction have been formulated (adobe labor, wood labor, and building labor), it is a simple matter to sum the expenditures to derive a total labor cost for the structure (TOTLAB). Also of interest is a relative measure familiar to modern homebuyers – the cost per square meter of habitable space. We compute it by dividing TOTLAB by the total floor space (PROLONG x PROWIDE) to yield the number of person-hours per square meter.

1. See the ethnographic information cited by Crary and Craig (2001:52-53) and an archaeological example (2001:42). [↑](#footnote-ref-1)