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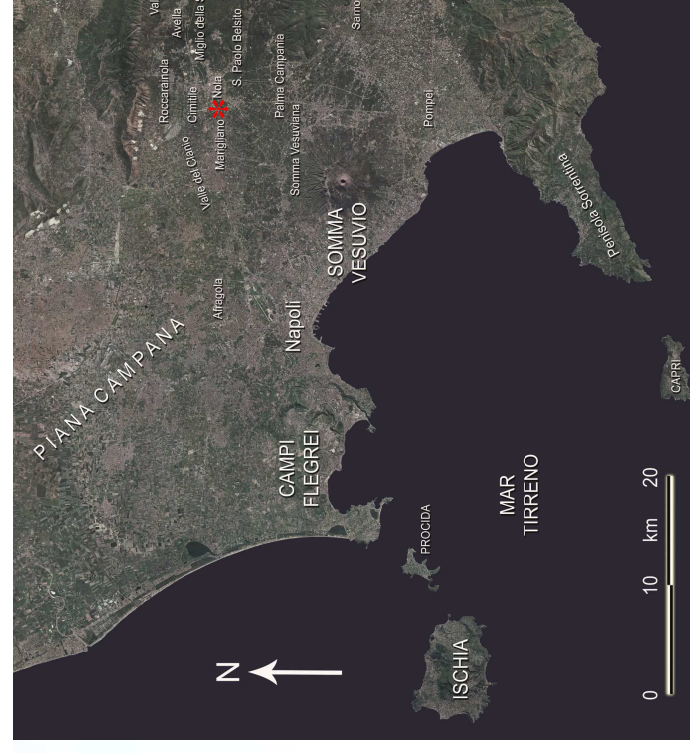
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Architecture of Early Bronze Age huts in the protohistoric settlement of Nola (Croce del Papa area - Naples - Italy)

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The discovery of Nola settlement (2001) is the starting point for the study of the Early Bronze Age architecture, especially for the rectangular type with apse "rettangolare absidata" in the Campania plane. An ash cast (1) of the housing structures was produced by the Vesuvio during the final surge of the so called "Avellino Pumice" eruption (3550 ± 20 cal. BP, XX-XIX secolo a.C.) which accurately preserved the majority of the architectural and technical details used during the huts construction. In Nola, the study of these casts confirmed both the high technological carpentry knowhow and the surprising ability in empirical calculations applied to the longitudinal orientation of the hut's axis, to the inclination of the roof's brims, to the diameters of the essential pillars and, above all, to the extraordinary metric proportions among them. The size analysis revealed a common general metric pattern used for the construction of the housing structures and a precise correspondence between these units and those used during the roman period. As for the complex wood structure: the load-bearing structure was made by a line of axial poles (2), varying in number according to hut's length, and located at an average distance of 4,17 meters. These poles were set in holes of around 60-80 centimeters in depth, and earthed up, occasionally with considerably smaller poles. In structure 2 (3), a width of 4,50 meters (15 feet) was used as basic module whereas the apse depth that corresponded to the radius of curvature, was 2,20 meters, i.e. 7 feet (about half of the width). Axial poles were linked on top by a ridge beam which in order to avoid the shifting was probably located in hollows situated in the extreme upper part and anchored to the pillars with ropes or wood rods. A mortise-and-tenon joint, uncovered in hut 4 during the excavation of the collapsed roof and walls, seams to validate this hypothesis (4). Poles in different shapes and diameters were accommodated along the internal hut perimeter and were visible for about 1/3 of the general height of the structures; they were 1,20/1,30 meters equidistant (about 4 feet) and were rooted to the ground at about 40 centimeters depth with a lateral joint to locate the bench beam. Spaces between perimeter poles were closed by infill-walls made by branches (around 2 centimeters in diameters) horizontally arranged and connected to the internal perimeter load-bearing structure by a radial system of modules secured to the pillars with ropes (5). Structure 4 (replicated on real scale at the Archaeological and Vulcanological Park of San Paolo Belsito - Naples), shows the part added to the original one, a sort of covered patio where the infill-wall is made of shoots interlaced with vertical pickets which are inserted in the perimeter load-bearing pillars interstices (6, 7). Closing panels were carefully made to avoid heat dispersion; together with the roof-wall structure, they created a cavity/air-space which isolated the inside from the outside and worked as a cooling system during summer time. Most likely, to increase the insulation, a sort of plaster made by a thin layer of clay was added as documented by structure 4 excavation. Externally, the infill-walls were earthed up by a banquette slightly shoe shaped, 10-12 centimeters thick and 2 feet large, depending on the roof-wall inclination, that avoided the rain-water coming from the roof to leak in the housing structure (8). The external edge of the banquette, uplifted from the ground line, was brushed by the roof-wall poles which allowed the hut thatching to extend to the ground. The roof-wall structure was made by reclined poles, or false roof rafters, about 6-8 centimeters in diameters (4,5 inches), most likely anchored to the ridge beam and to the collar brace with ropes; these poles were located 44 centimeters (1 roman cubit) from one another and horizontally jointed by purlins (about 3 centimeters diameters) equidistant 22 centimeters (roman *palmus major*) so that a dense rectangular lattice was made in order to avoid the roof bundle from banding (9, 10). The resulting double pitched roof structure gave a great rigidity and compactness to the wood framework and had the function of distributing loads and absorbing the wind stress by transferring it to the load-bearing structure. The thatched roof, made of mat-rushes, swamp reeds (*Phragmites australis*) or wheat steams had good insulating properties: it was waterproof, it protected the housing cabin and it guaranteed optimal microclimate conditions inside the structure. The sheaves were accurately compacted so that spaces between the stems were reduced and they were grouped in bundles of at least 23 centimeters thick since this process was essential for the roof good waterproof proprieties (11, 12). The sheaves were blocked on the outside by the pressure of a batten, located at approximately one third of the height to avoid them from being lifted by the wind (13).



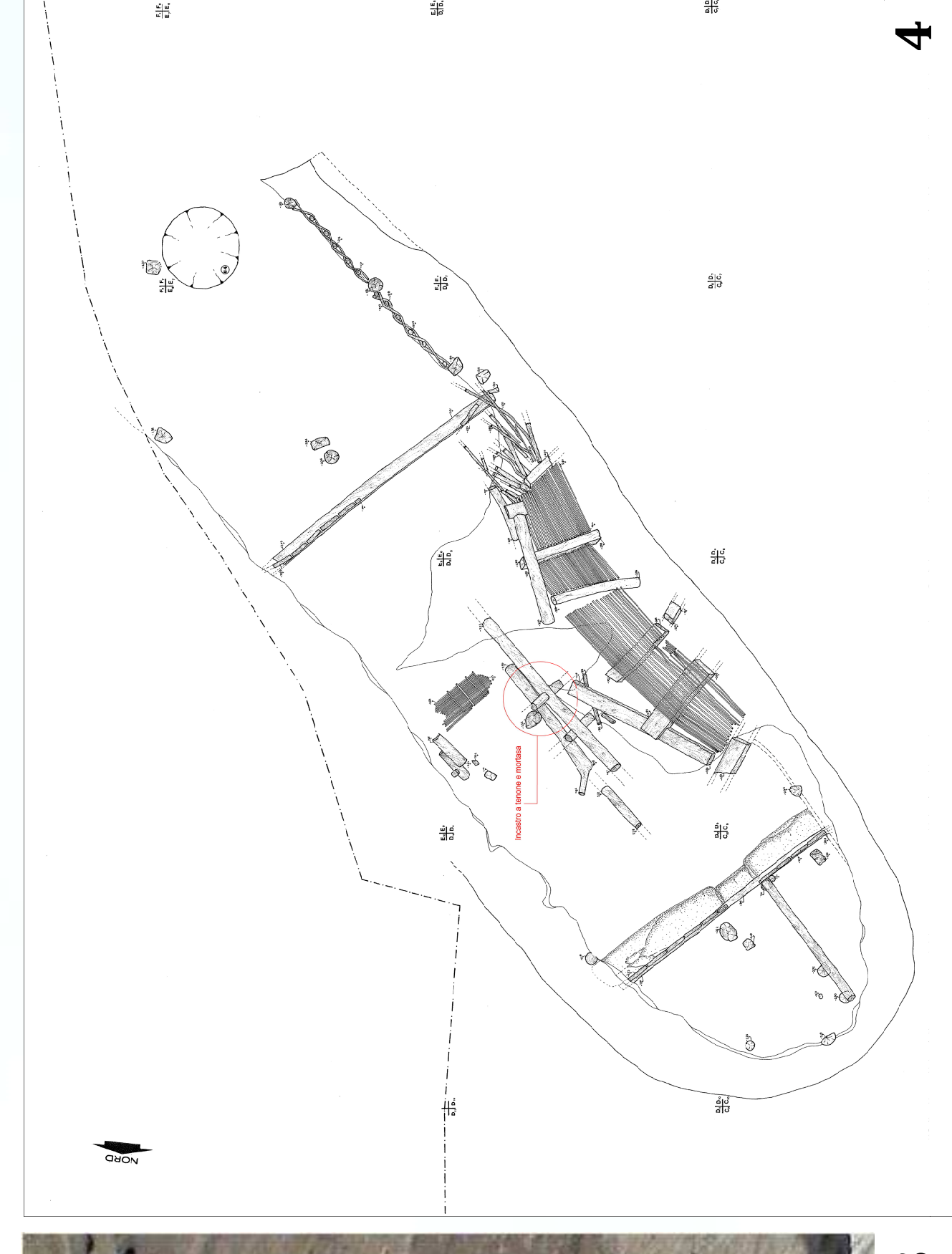
1 Croce del Papa. Structure 4 ash cast



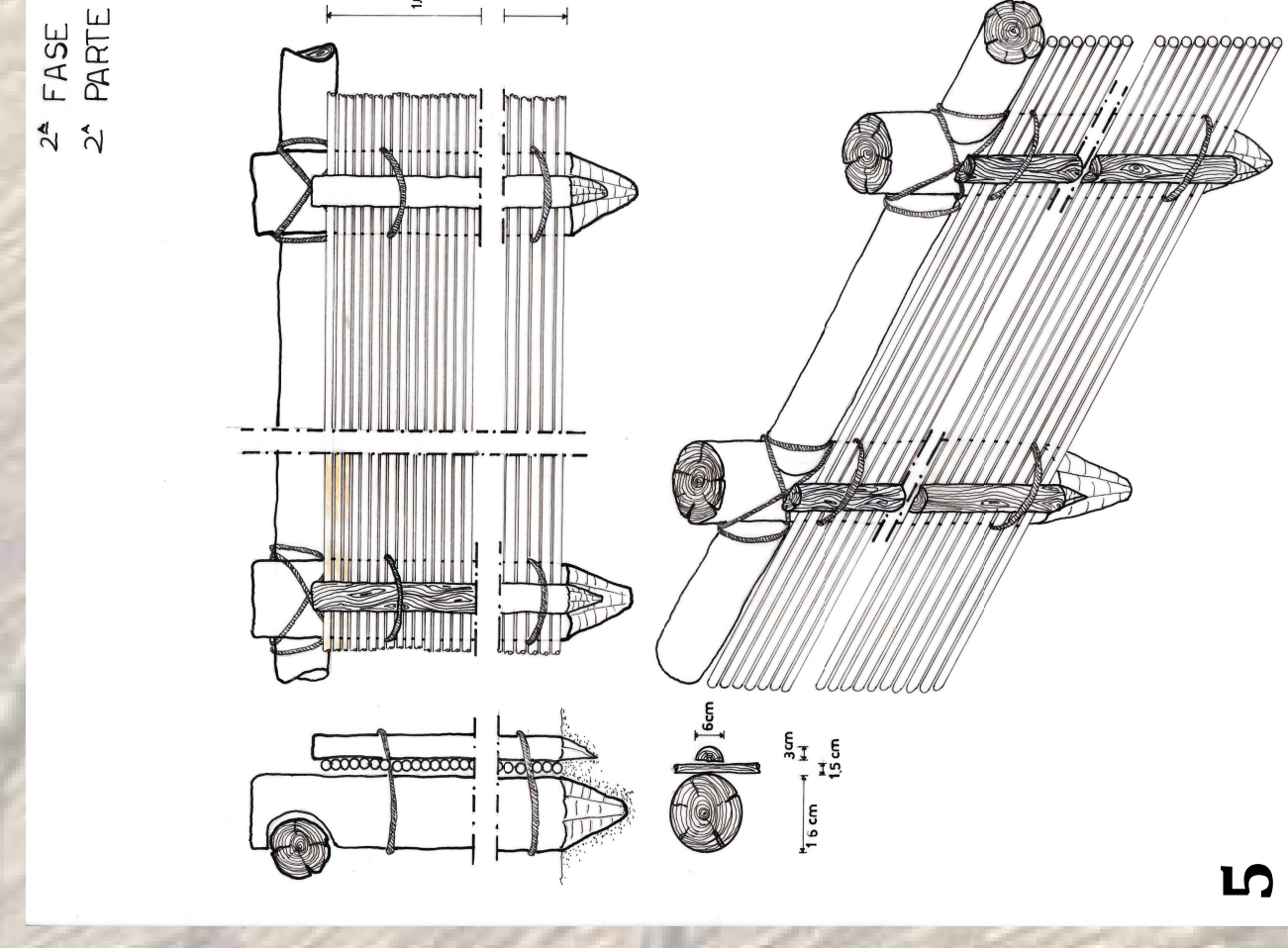
2 Longitudinal view of the axial pole's hollows from struct. 4



3 Structure 2 (base module meters 7x4,50x3,75)



4 Hut 4 load-bearing structure plan with mortise-and-tenon joint



5 Building detail of infill-walls anchoring



6 Making of perimeter walls with interlaced shoots (Park of San Paolo Belsito)



7 Natural cast of perimeter walls



8 Perimeter banquette with reclined pole holes, at the base of the structures



9 Natural cast of the reclined poles and of the horizontal battens of the roof-wall



10 Making of the roof-wall in hut 4 replica (Park of San Paolo Belsito)



11 Natural cast of the swamp reeds covering



12 Making of the covering in hut 4 replica (Park of San Paolo Belsito)



13 Roof batten placement (Park of San Paolo Belsito)

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