PARAMETRIC STUDY OF SUPERADOBE DOME MECHANICAL BEHAVIOR

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Superadobe Technology consists on filling long circular polypropylene sacks with a moist mixture of stabilized earth; placing and compacting one ring on top of another thus describing double curvature monolith. An ecofriendly and economical self-construction method: although practical experience has shown good performance of these buildings upon natural events such as extreme temperatures, high winds and earthquakes [1], the mechanical behavior of a Superadobe dome has not been sufficiently characterized theoretically and documented, and this is needed in order for the technology to be regarded as a valid construction method in countries where it is unknown. Among the magnitudes which describe the mechanical behavior of a Superadobe dome we find [2]:

- Maximum value of wind load that it can withstand until slipping or turn-over
- Maximum weight in relation with base soil resistance
- Risk of buckling between rings
- Maximum modulus of vertical and shear stresses on the set of rings surfaces
- Maximum hoop compression and tension stress on the set of individual continuous rings
- Maximum bending moment stress on the most exterior point of contact between ring and ring

The behavior of Superadobe structures (above magnitudes), depend upon various parameters, such as the radius of curvature of the arch which describes the roof (length of the outer compass), the radius of the base of the building (length of the central compass), sack width and height, mechanical properties of the mixture such as elastic modulus, Poisson's ratio, density, cohesion and friction (static) coefficient between rows, etc.

An iterative algorithm written in python calculates such magnitudes (Superadobe behavior) from varying inputs (parametric study), storing the results in a local data base, from which initial design thresholds and patterns are being found to form a design criteria for safe Superadobe buildings. The predicted behavior of some

Superadobe models as calculated by the algorithm is contrasted with finite element simulations done in Ansys Workbench 19.1.

REFERENCES

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