

Archiprix International 2009

University of Arizona, College of Architecture - Tucson, United States

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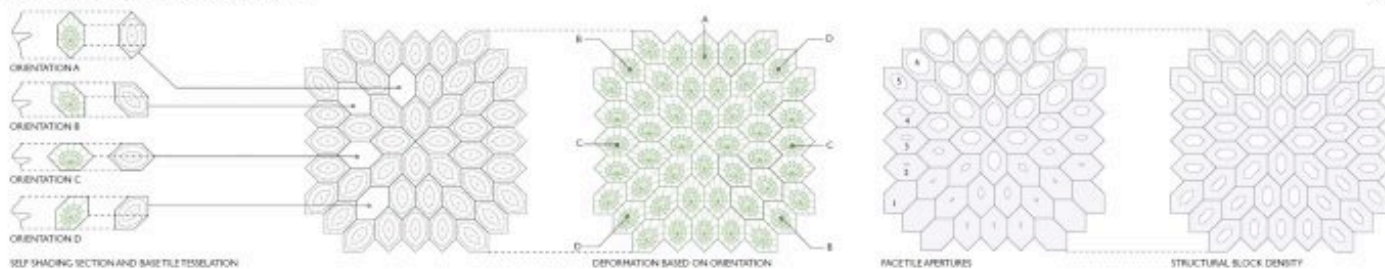
## EcoCeramic Research

### Integration of ceramic materials with digital design in Arizona

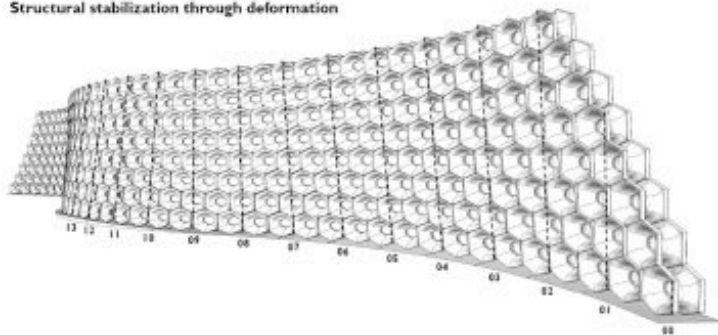
At the turn of the 20th century, handcrafted ceramic tiles mounted on structural steel framing were a highlight of building technology. Nationwide, more than 15 companies employed thousands of workers who made each tile from custom-built moulds interpreted from architects' drawings. Now only three such companies remain, two of which are primarily involved in the preservation of historic buildings. Yet the natural process of erosion of the Earth's surface produces clay five times faster than we could ever expect to use it. While terracotta has many desirable properties as a building material — vitrified glazed finishes (durability), thermal mass characteristics (energy efficiency), humidity controlling properties (environmental comfort), plasticity of form (structural stability) — modern building techniques require a resilient construction system with a streamlined design and manufacturing process: EcoCeramic. The applied research, EcoCeramic, focused on innovative methods and on integrating traditional ceramic materials with digital design and manufacturing processes. Using the extremely arid climate of Tucson, Arizona, as an extension of the Emerging Material Technologies Ceramics Laboratory, building modules were developed with surface geometries that mitigate the environmental impact of the desert. The geometric development of a modular ceramic wall, as an active surface, creates a topological environmentally positive relationship between the material and ourselves, resulting in a phenomenological awareness of the articulated surface and its compliance with local ecology. Within this context, EcoCeramic Research seeks to redefine traditional ceramics as an ecosophical building material. This research phase involved the fabrication, testing and optimization of materials as full-scale prototypical units, the correlation of the design data into a desired performance profile, and the manufacture of ceramic composite building modules currently being assembled as a testing facility on Arizona University campus. Additionally, it included the design and fabrication of several moulds for press-formed multiple iterations of composite test modules with varying degrees of multidimensional complexity, as well as the performance of initial strength tests to gather data on design-performance criteria.

## EcoCeramic Research

FOR-0114  
Patterns 01



Structural stabilization through deformation



Catenary vaulting

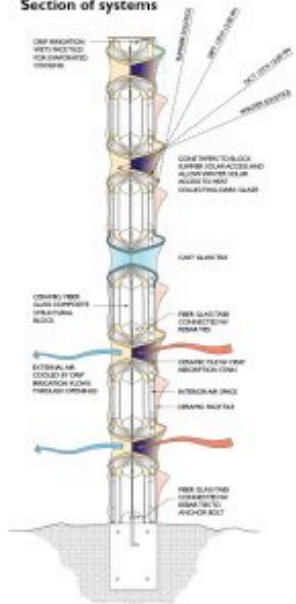


Patterns

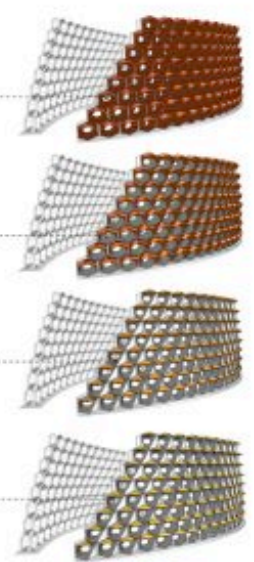
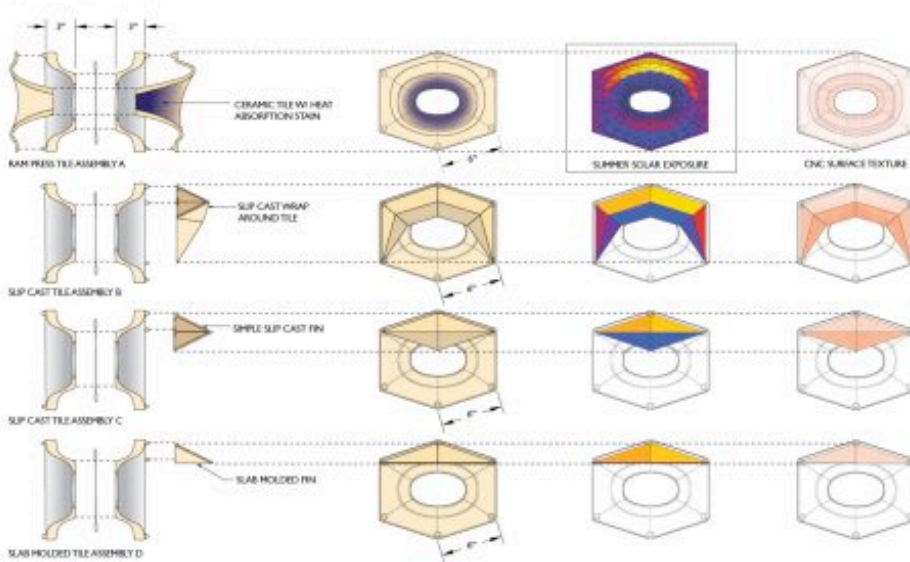
# EcoCeramic Research

PO9-0134  
Assembly 02

### Section of systems



### Alternative face tiles

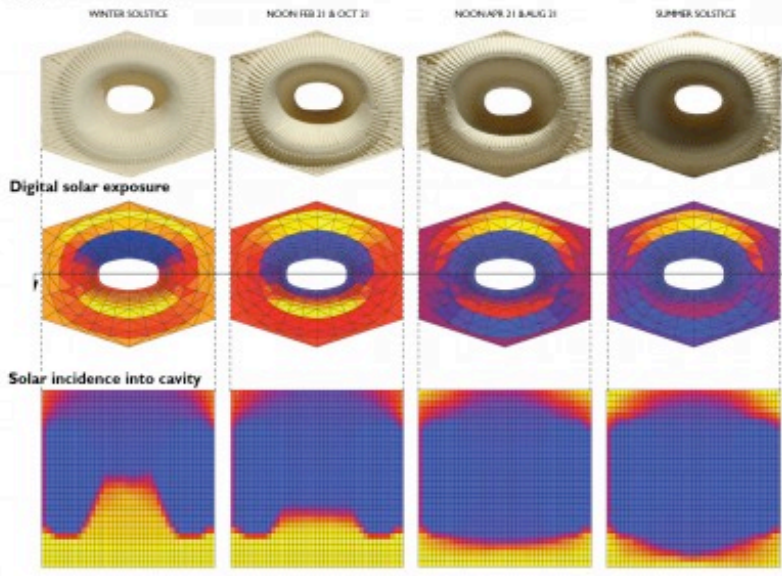


Assembly

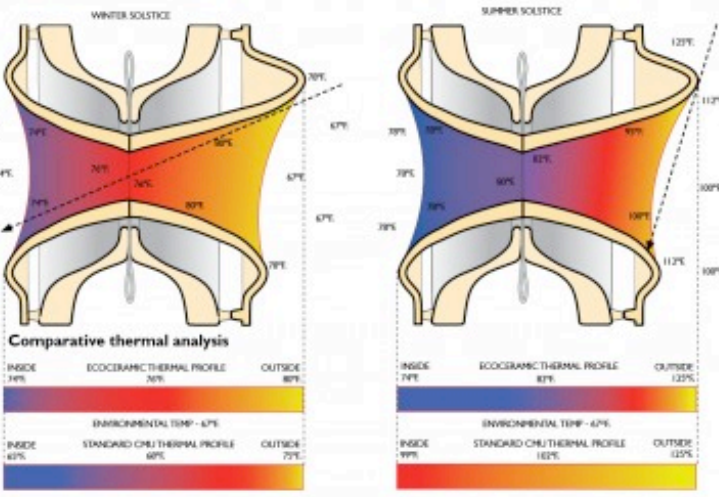
# EcoCeramic Research

PO9-0134  
Thermodynamics 03

### Physical shading analyses

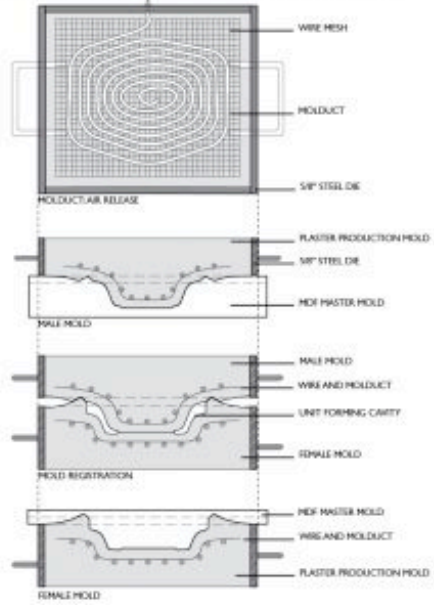


### Thermal section



Thermodynamics

# EcoCeramic Research



Pressurizing the plaster production mold

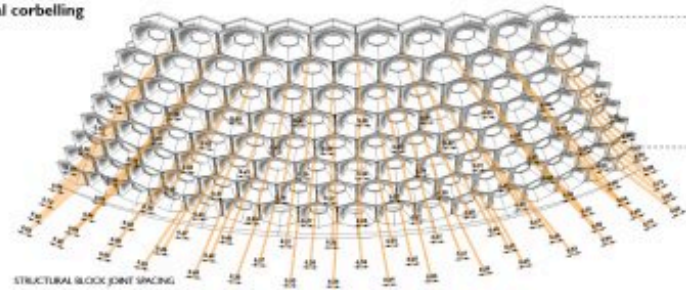
## Fabrication 04



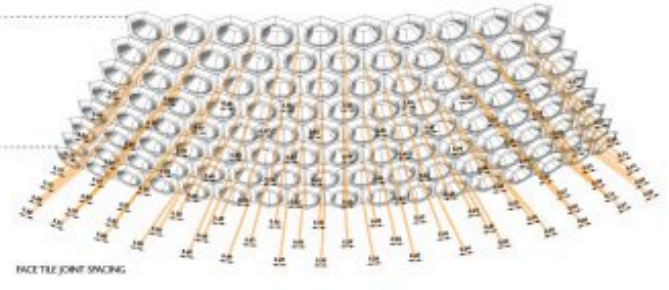
## Fabrication

# EcoCeramic Research

### Digital corbelling

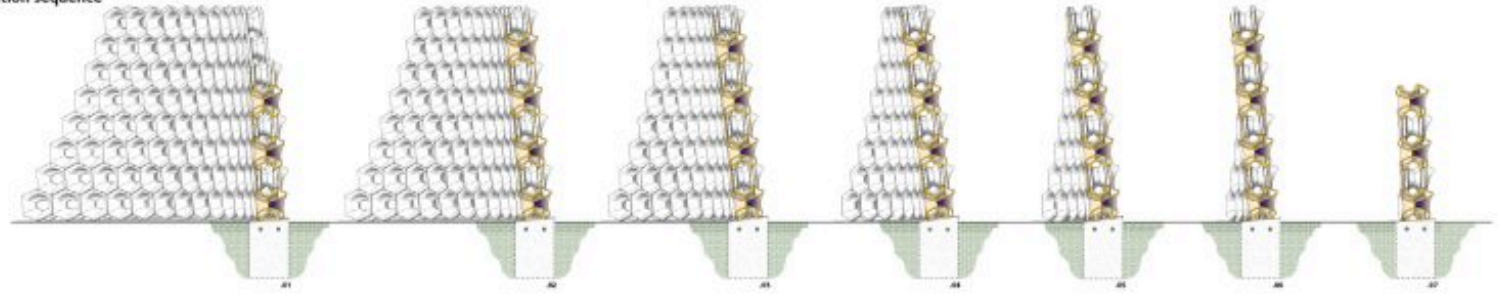


STRUCTURAL BLOCK JOINT SPACING



FACE TILE JOINT SPACING

### Section sequence



## Construction 05

## Construction

# EcoCeramic Research

In situ

PO#-0134  
In Situ 06



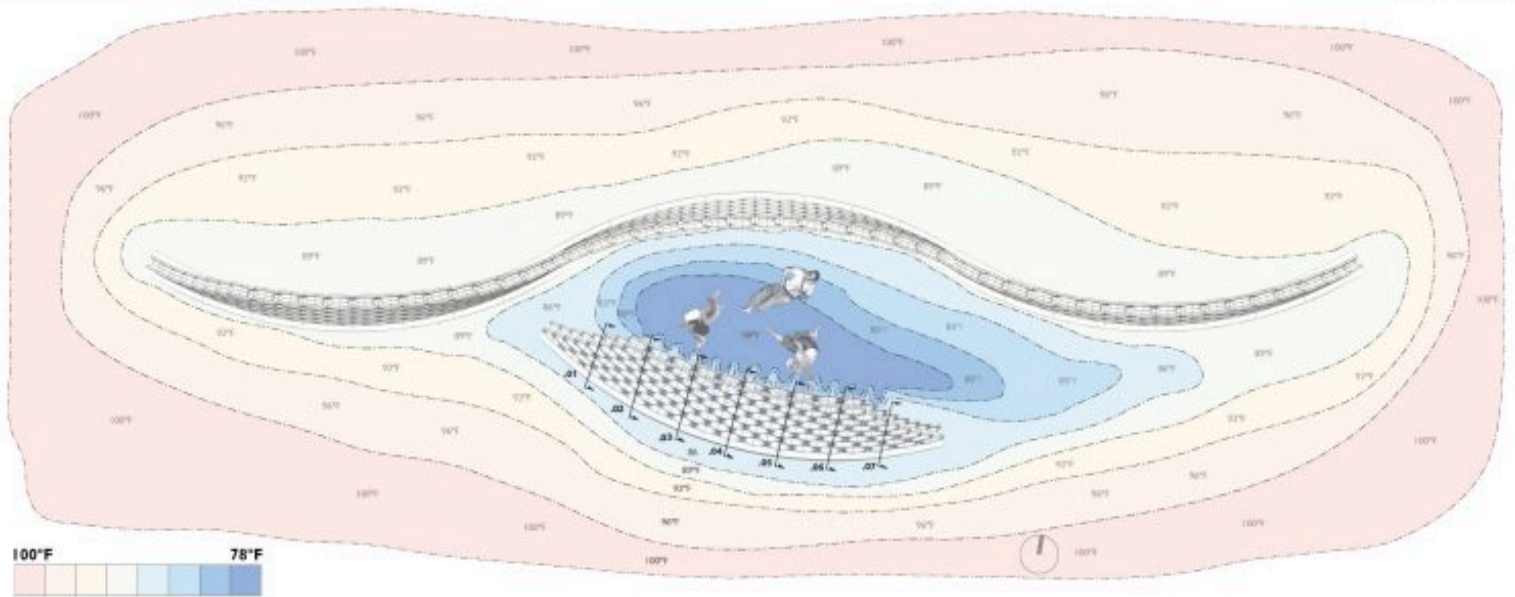
Physical prototype



In situ

# EcoCeramic Research

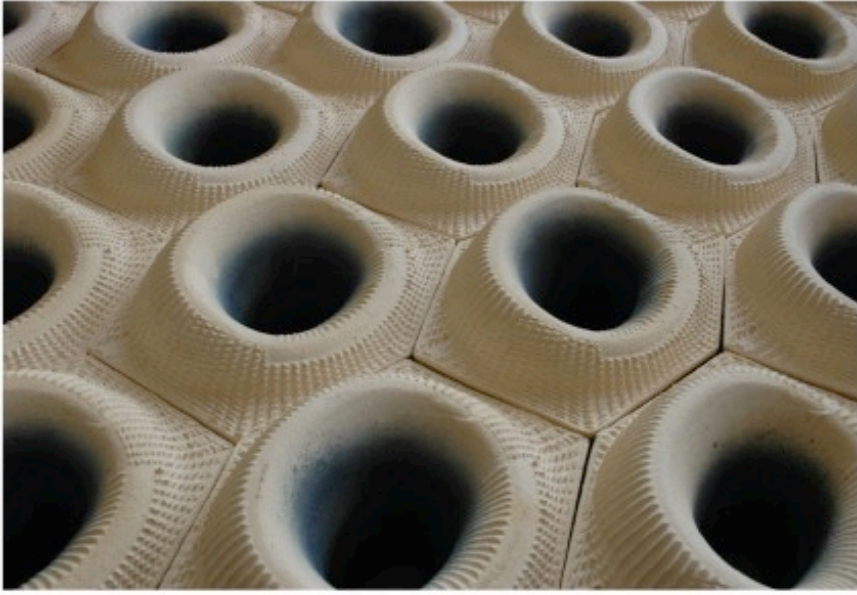
PO#-0134  
Thermal Plan 07



Thermal plan

# EcoCeramic Research

Ceramic face tiles w/ heat absorption stain



Ceramic tile production



PO9-0134  
Mass Production 08

Mass production

Project link: [www.archiprix.org/project.php?id=2577](http://www.archiprix.org/project.php?id=2577)