New Ideas in Component Building Systems

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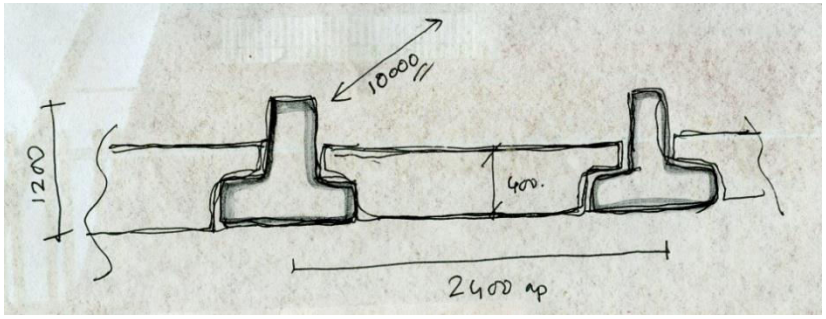
Architect

Presentation at PEPSCON 2014 , Hyderabad

Component building system in Traditional Architecture…

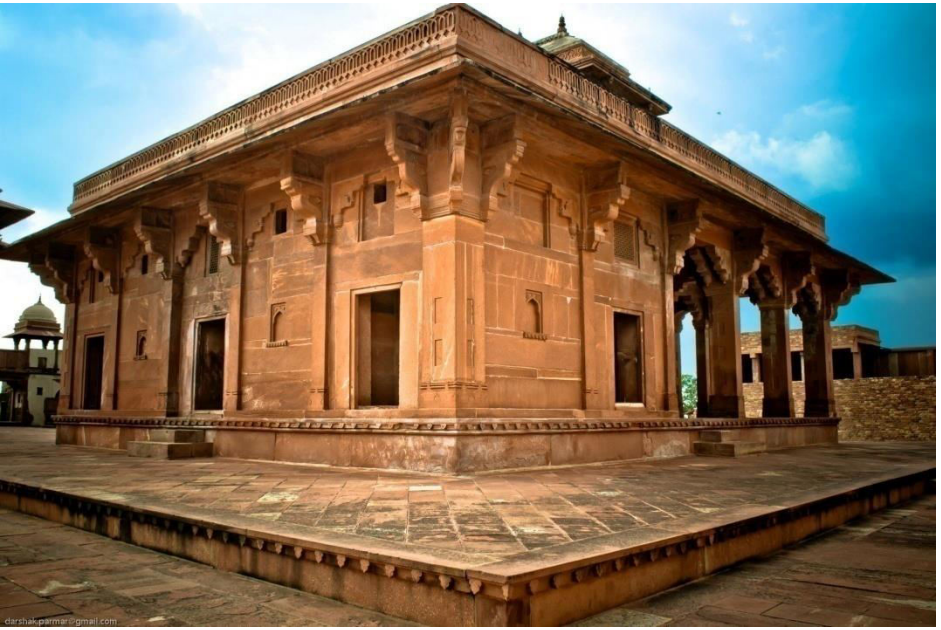


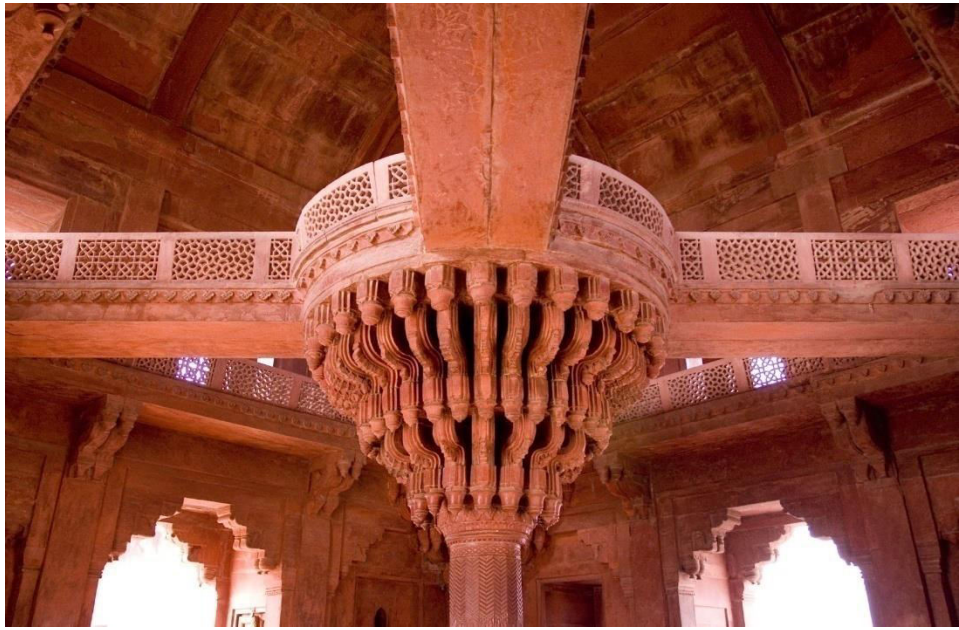
Inverted ‘T’ Stone beams in Hampi



Tandur stone in Rural Andhra Pradesh…


Sand stone in Traditional and Modern Rajasthan..



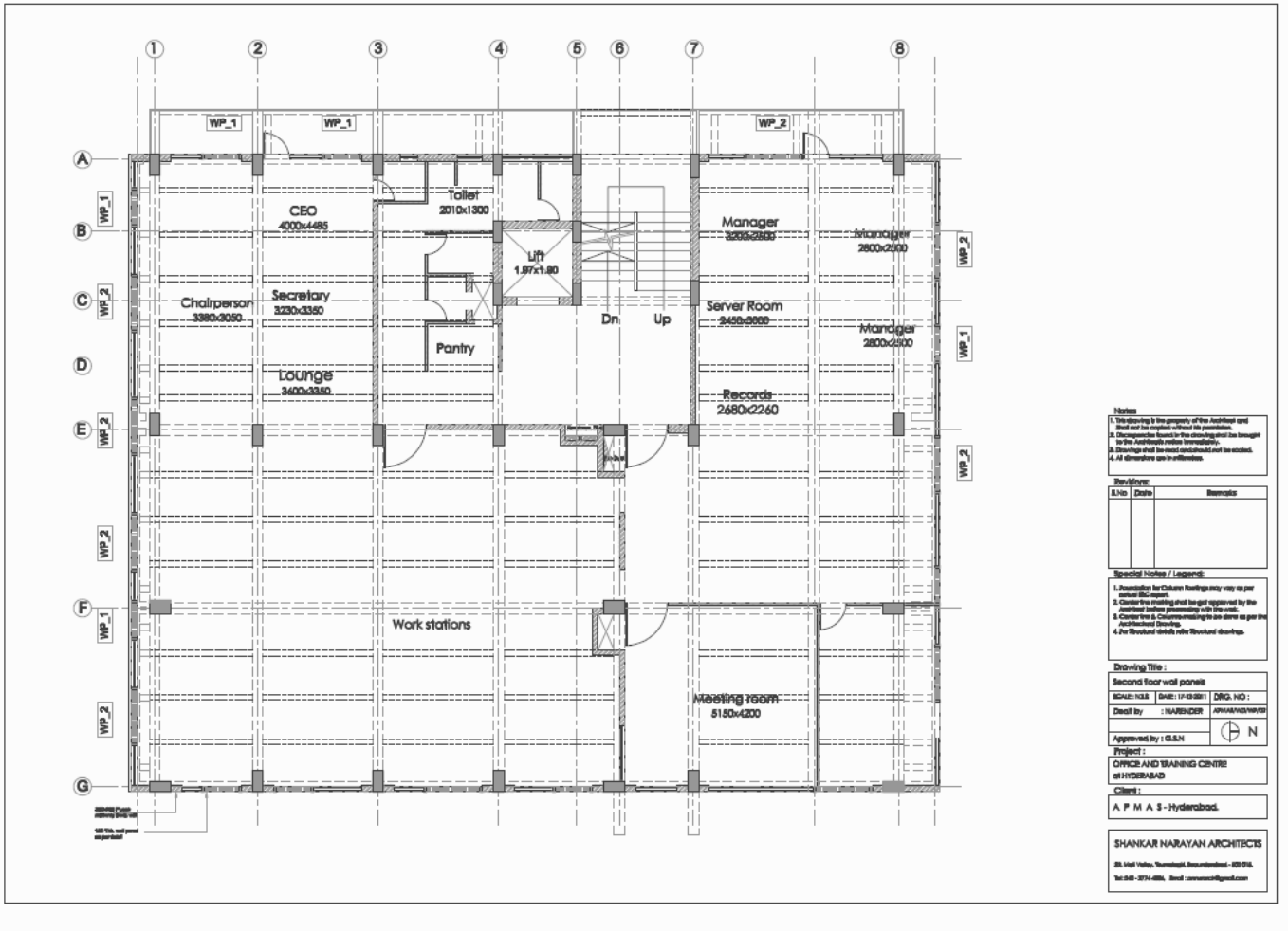


Stone usage in Mughal Architecture…

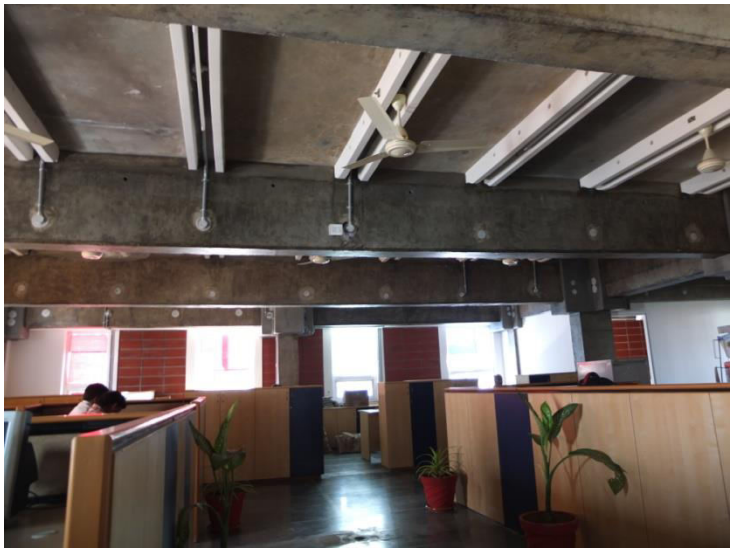
APMAS Office and Training Centre Hyderabad

Stilt + 5 Floors, 3000 sqm, 2011 – Present

Architect : Shankar Narayan Architects
Structural : V.V Ranga Rao, S L Structural Consultants
Contractor : 3koll Constructions



Training Halls



Completed Interior

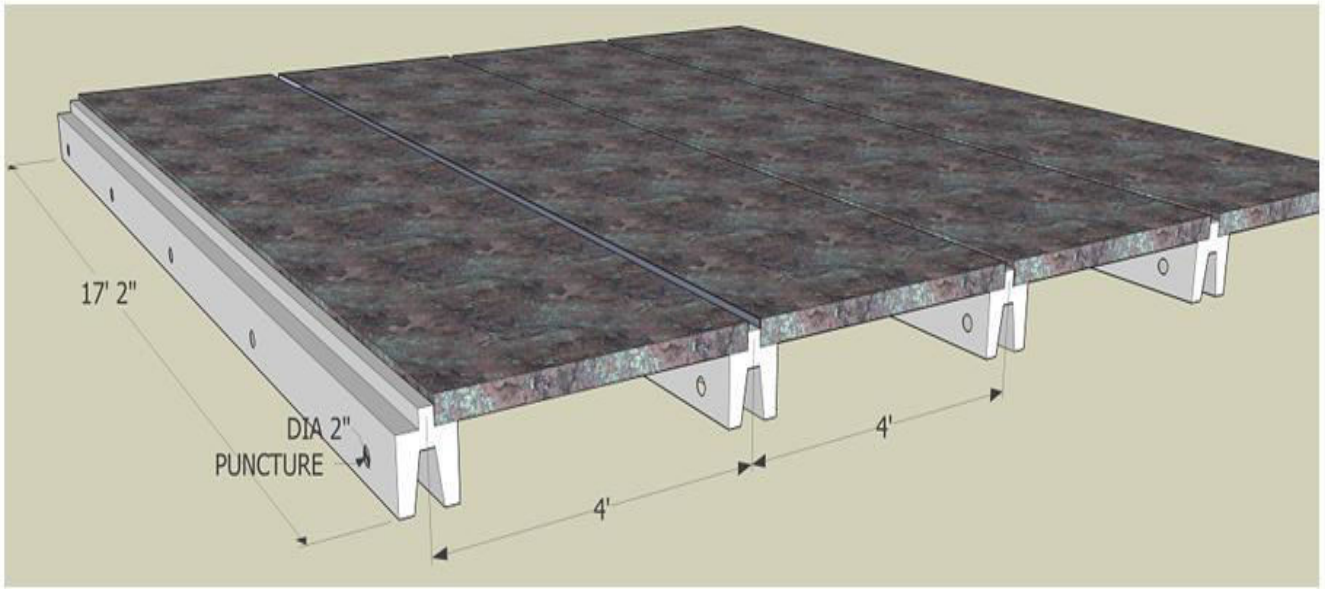
Details of Beam connections

East Facade

FERROCEMENT- NATURAL STONE COMPOSITE FOR INTEGARTED FLOOR SLABS

PATENT PENDING

- Natural stone slabs (Cudapah, Tandoor, Kotah) are know to have good structural properties to act as floor systems. Due to brittle nature, they have been used as flooring resting on subbase. Slab.
- The thickness ranges between 25mm to 75mm. Natural stone slabs have sedimentary formation and high compressive strength. Flexural tensile strength and tensile strength of this material is generally low as they tend to have brittle failure.
- To avoid brittle failure of stone slab, it is essential to adopt the material which allows micro cracking. Ferrocement, thus becomes ideal composite.



COMPONENTS
PATENT PENDING

- Precast Joists (RCC/ Ferrocement)

  While we know the standard shape joists, in the present invention, we have developed an integrated joist profile to serve the following

  a). Structural beam

  b). To carry conduits

  c). To house lighting fixtures

  d). Optimized to have lowest dead weight

  e). Elegant shape

Precast Stone composites (stone slabs & Ferrocement)

Can be used as direct floor

Can be used as walls

Can be used as treads

Connectors were welded on top of beam

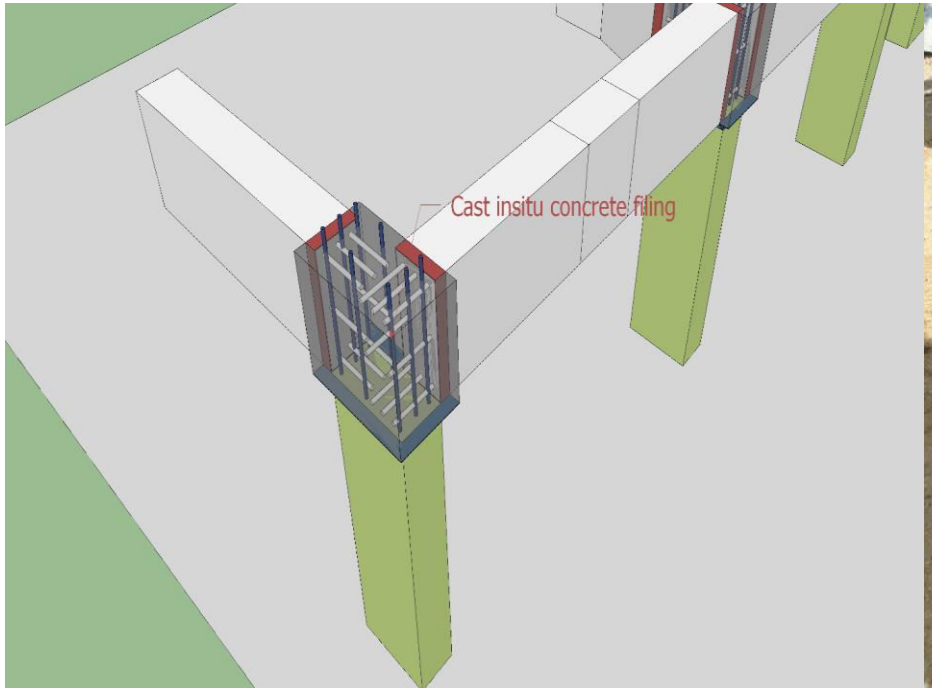
Erection of Joists

First slab	Individual panel resting on precast joists. Partially precast beams. Column capitals.
Second slab	Composite stone panels with integrated joists. Partially precast beams. Column capitals.
Third slab	Modified Composite stone panels with integrated joists Fully precast beams with provisions for shear connectors. Column capitals.
Fourth slab problems. & Above	Conventional system due to erection

Further Improvements

Composite panel system was developed for APMAS which consisted of integrated joist- panel system to avoid all other operations.

Connections at main beams was in situ



New type of connection was conceived for this project which not only allows site margins but also makes the joint monolithic to make connected elements act together.

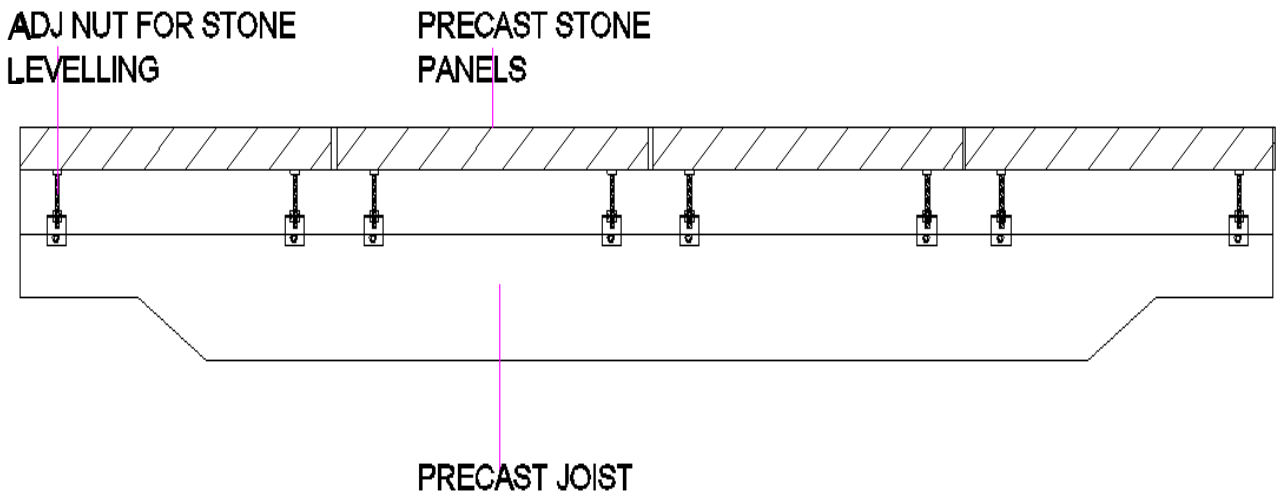
This additional step of erecting precast joint may be time consuming but saves time in subsequent operations related to insitu connections etc.

BMPTC has agreed to fund this innovation through IIT, Hyderabad.

Erection of Stilt floor Individual Joists and stone panels

Beam bars and column bar locations were pre coordinated to avoid erection and placement problems.

Metal plate was formed with preformed holes to cast columns



TEMPORARY CLEATS ARE PROVIDED TO JOIST WITH ADJUSTABLE NUT ARRANGEMENT

STONE PANELS REST ON BOLT HEADS AND ALSO CENTRALLY SUPPORTED

CHECK NUTS ARE ADJUSTED TO LEVEL STONE SLABS

APMAS

Precast walling with Hollow Terracotta block

Field and Laboratory Tests

Stone panel systems were tested in both filed as well as in Lab

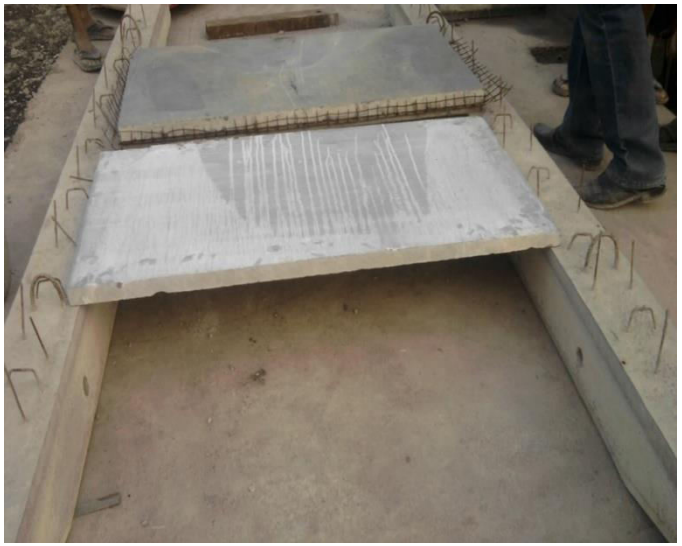
Field test was done by stacking bricks for load test

Impact test was done by dropping a concrete block 3 times

Full panel test was done at casting yard for load of 4 kN/Sqm intensity on 3 panels

Failure load test was done on 3 panels using Automated Controls at IIT, Hyderabad under guidance of Prof KVLS and Dr Surya Prakash

DROP LOAD TEST (IMPACT-TEST)



Normal stone broke instantaneously

Marking to drop Load

Load of 15 kg being dropped

Surface after impact (completely intact)

Performance is found to be at par with equivalent RCC floor system and technical papers were presented

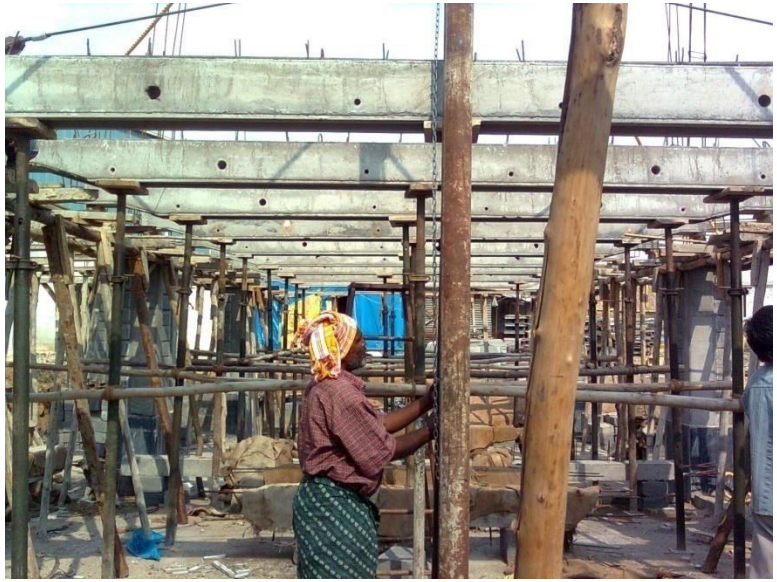
Construction sequence of our office

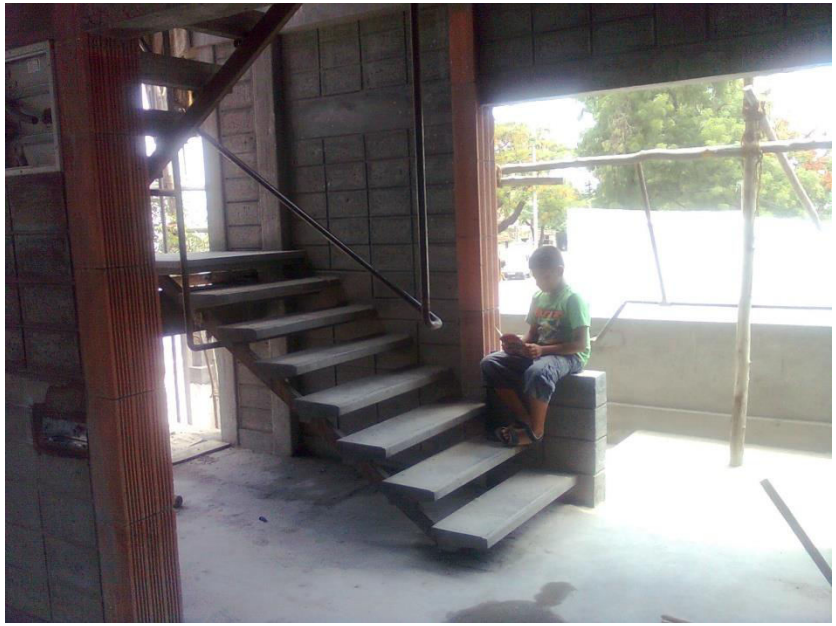
SHANKAR NARAYAN ARCHITECTS

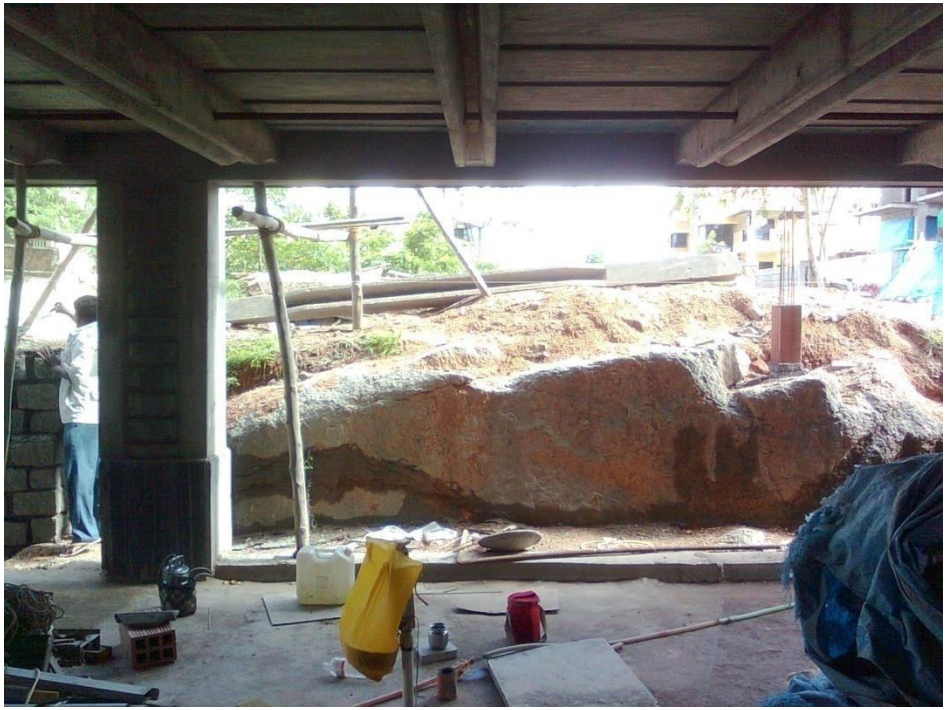
Secunderabad

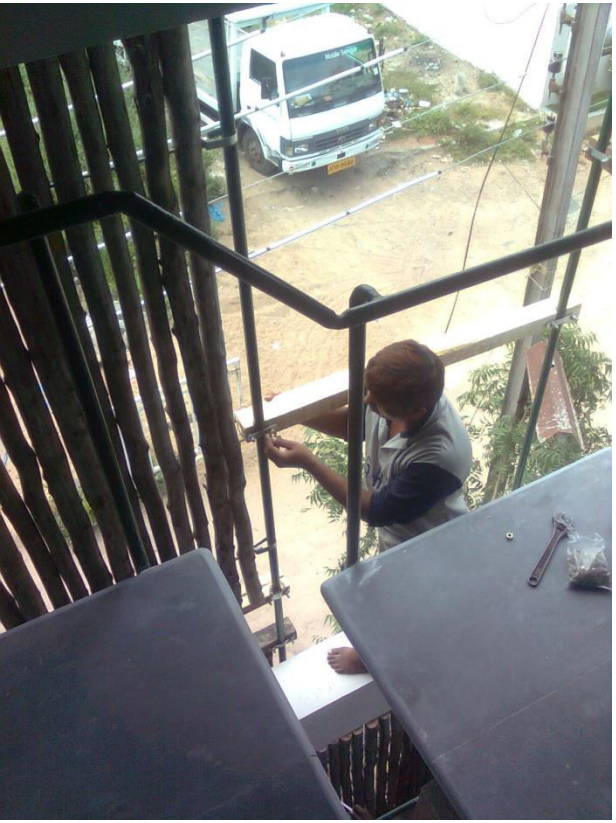
SHANKAR
NARAYAN
ARCHITECTS

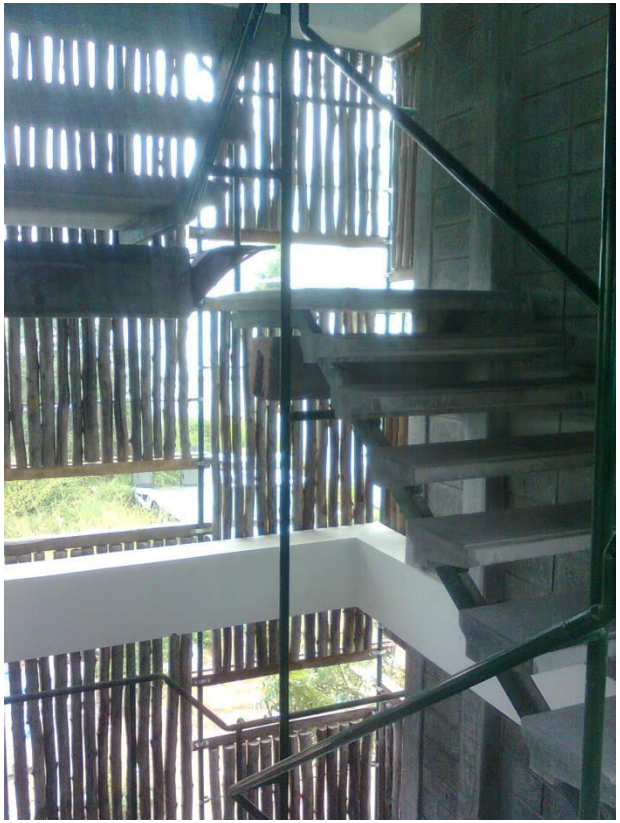
32 MOTI VALLEY, TIRUMALAGIRI, SECUNDERABAD, PIN: 500 015









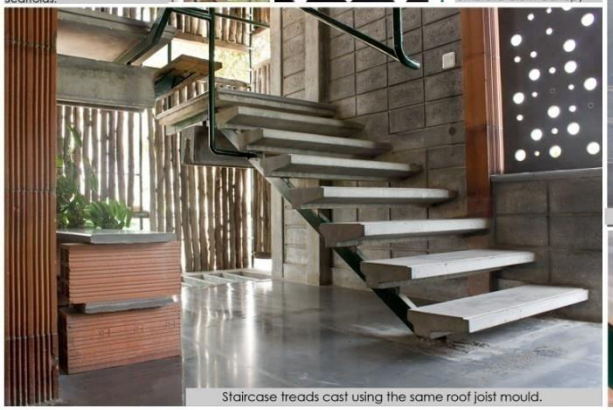



Ahlada

Office Reception Area with Tandur Stone Railing and Bench.

Trellis with re-used Casuarina Scaffolds.

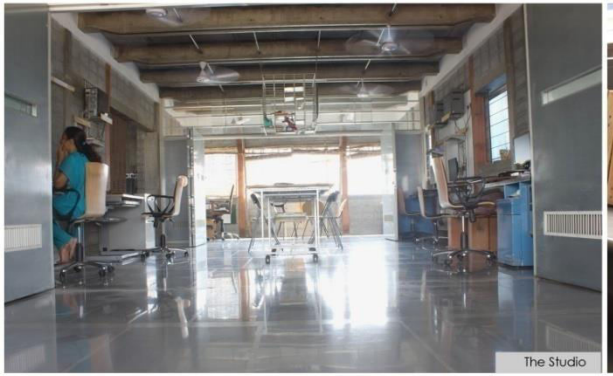
Perforated Stone Jalli and Umbrella Cloth Canopy



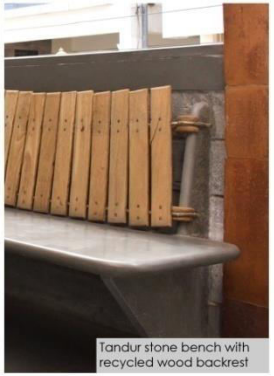
Staircase treads cast using the same roof joist mould.

Railing.

Detail of free end support of Pre-cast tread.



The Studio



Tandur stone bench with recycled wood backrest

PROJECT CREDITS:

OWNER : A.J.Gurushankar

ARCHITECT : G. Shankar Narayan

STRUCTURAL ENGINEER : V.V. Ranga Rao

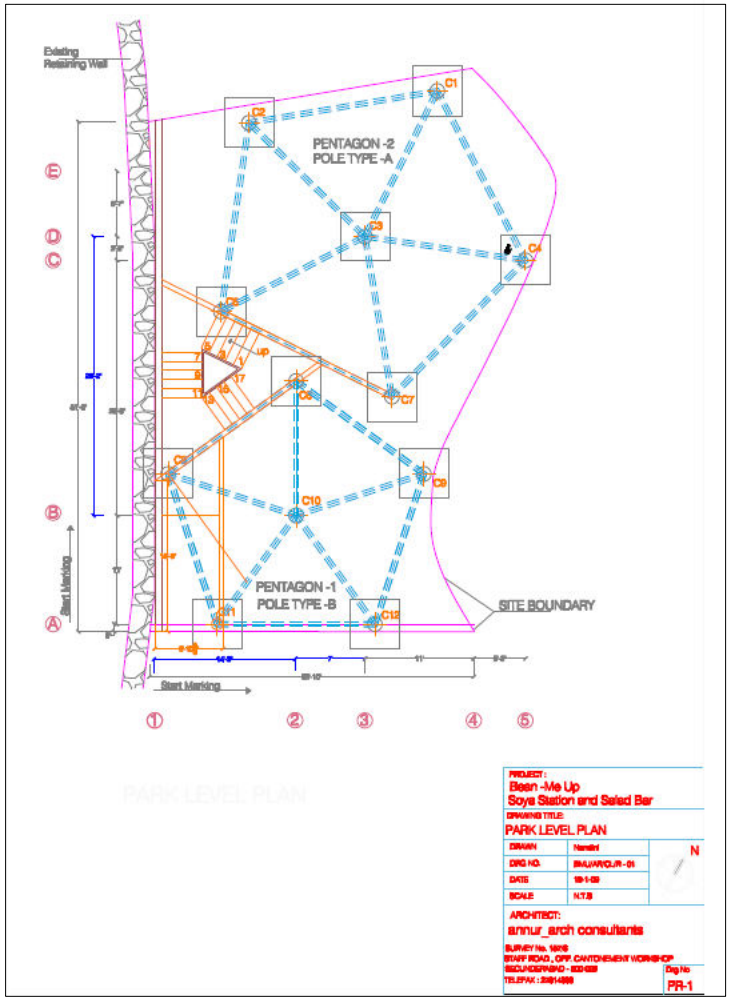
PROJECT MANAGEMENT : K. Andrew

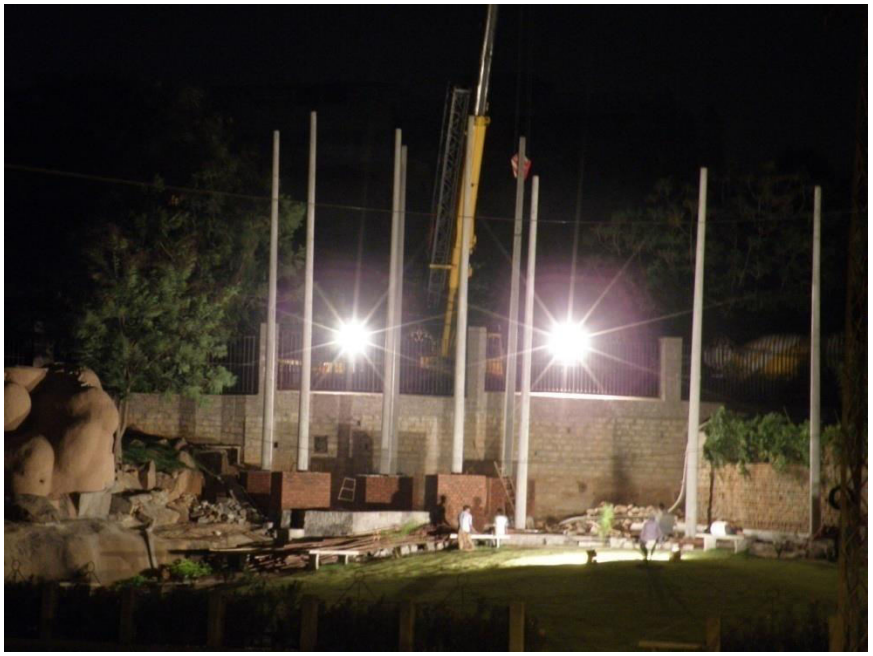
CHIEF MASON : Mathaiah

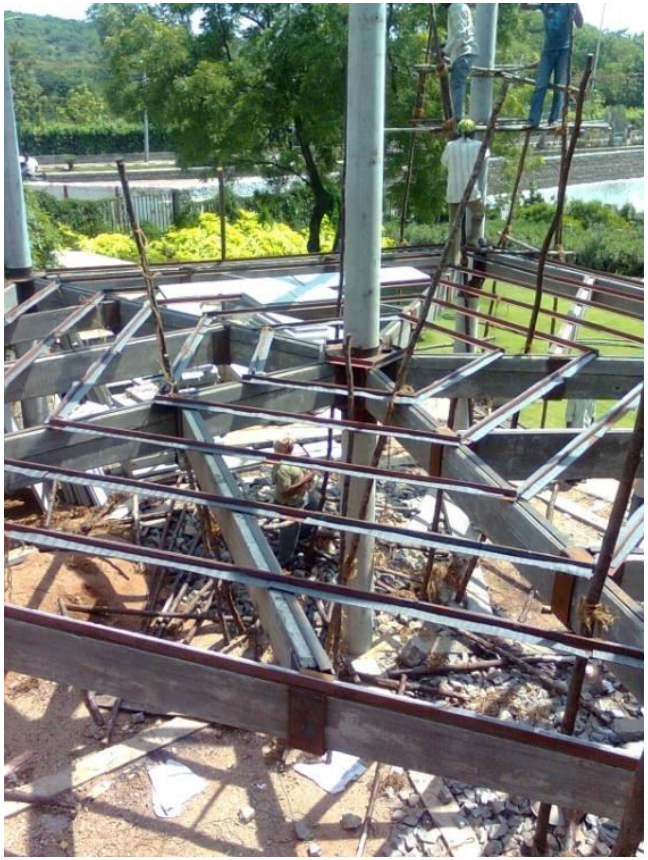
Bean Me UP!

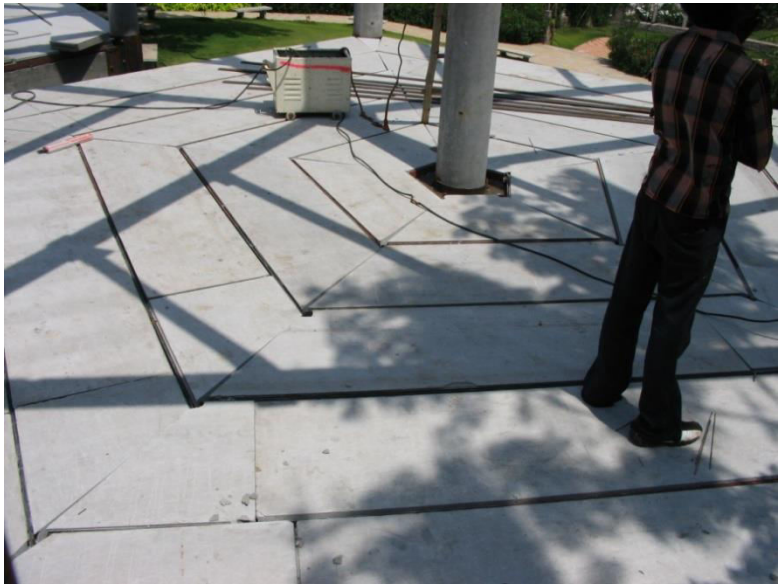
Ground + 2 Floors, Construction in progress.

Client : Vikas Passary
Architect : Shankar Narayan Architects
Structural : V.V Ranga Rao, S L Structural Consultants
Contractor : Global Constructions



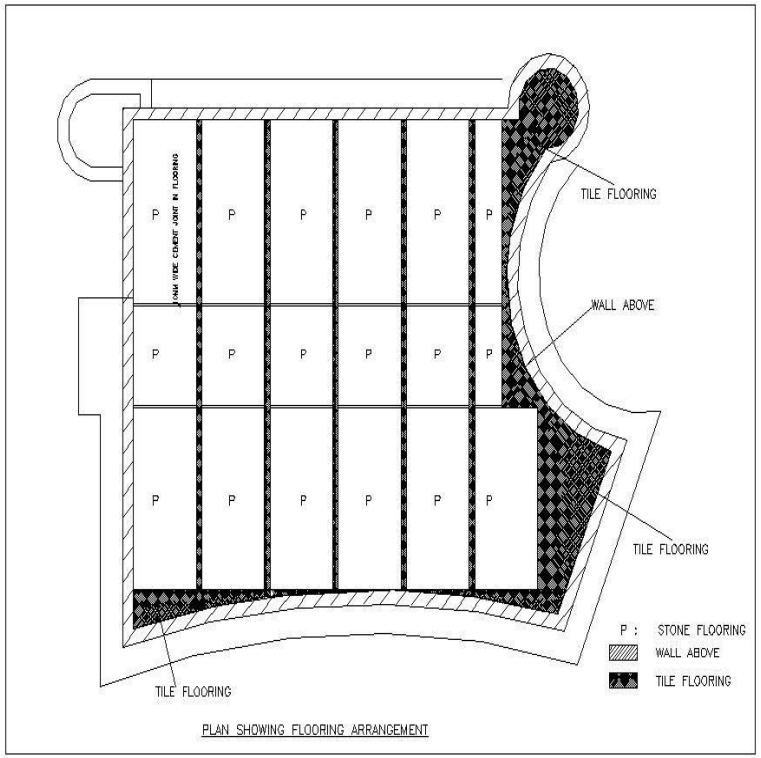


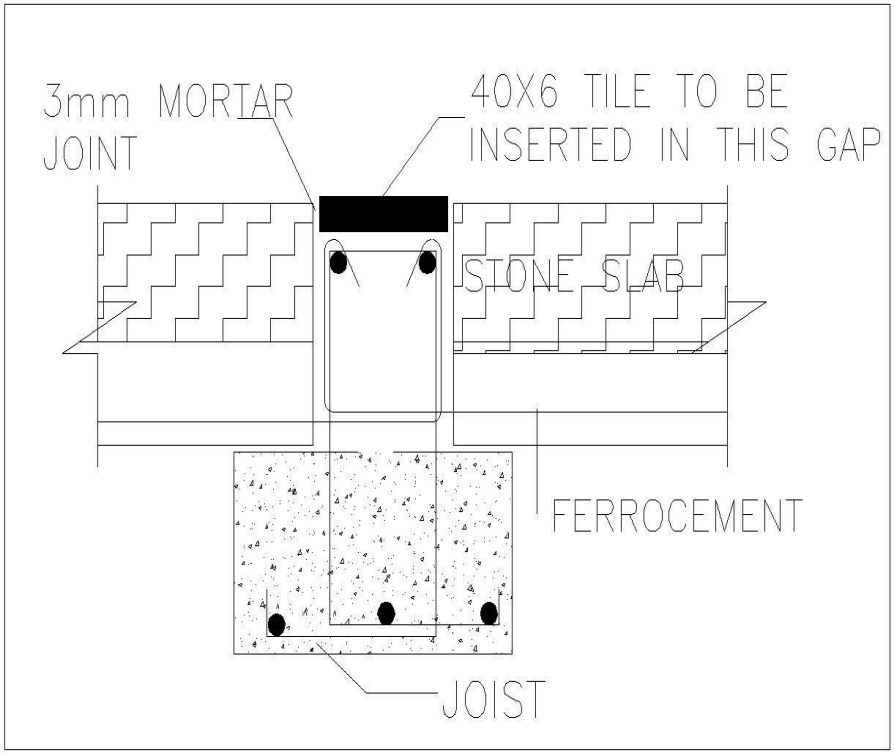


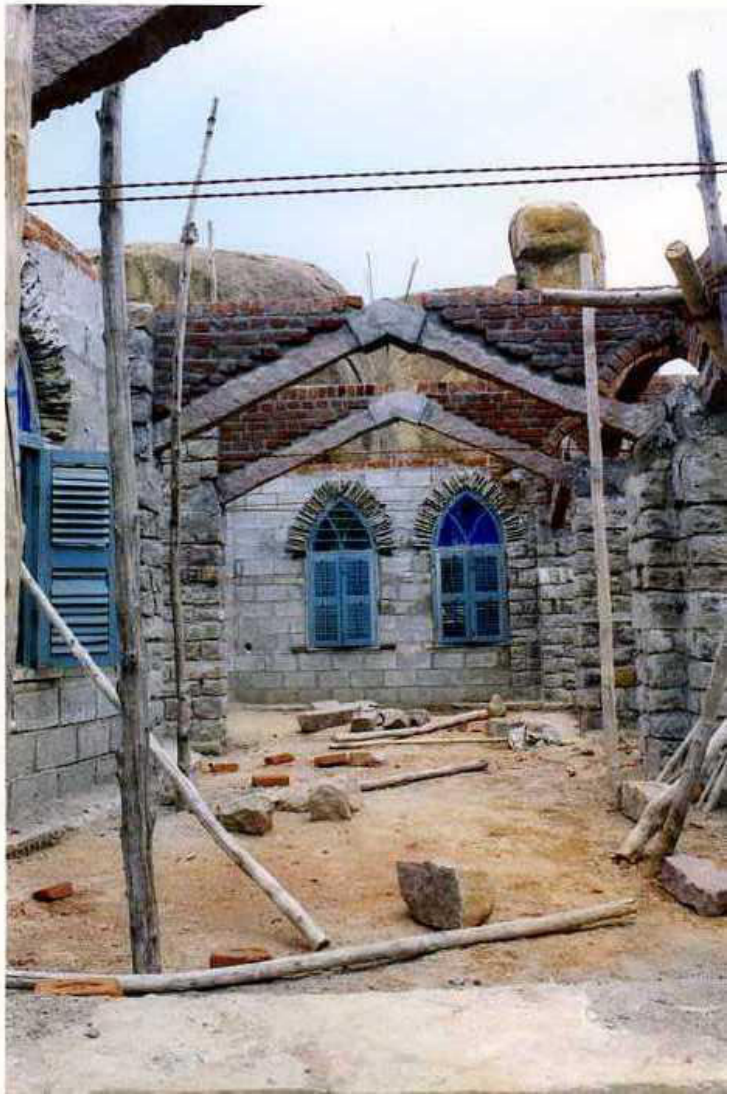


Blue Cross Clinic Building

Conceived and executed in 2000.







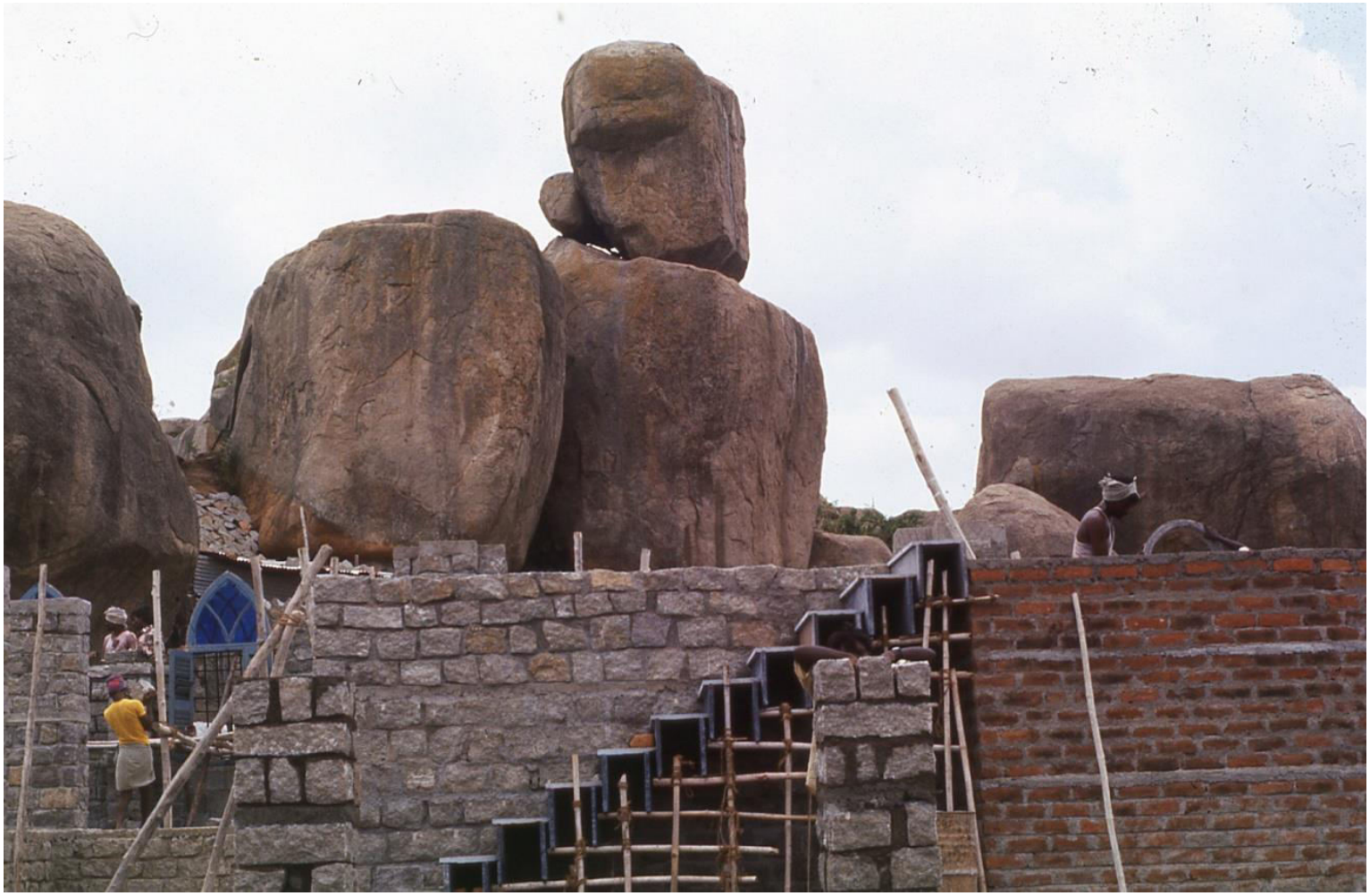
Challenges in the component building sector:

- To design for all human settlements from the Metro to the village.

- To invest in craftsmanship and enhance and adapt traditional skills.

- To develop simple low-cost mechanical systems for erection and installation.

- To use building and quarry waste in a big way.



Thank You