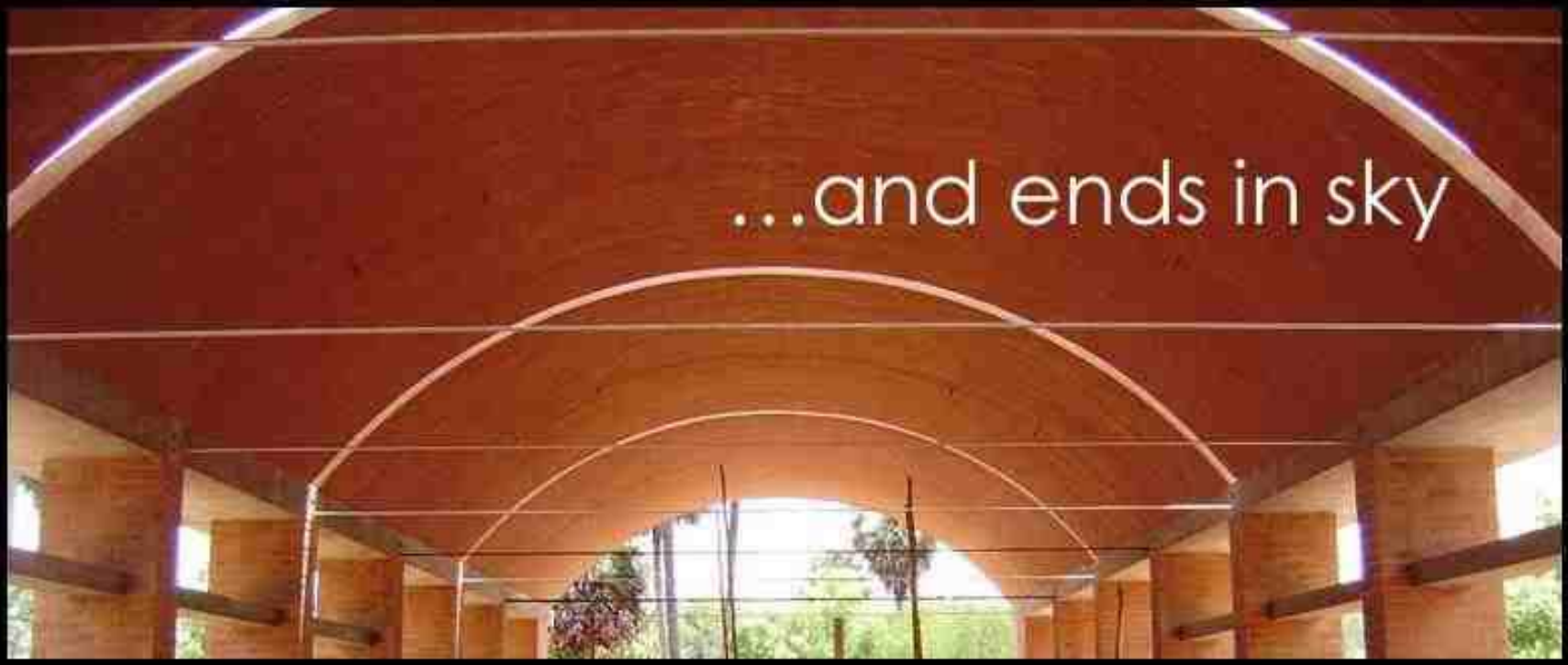
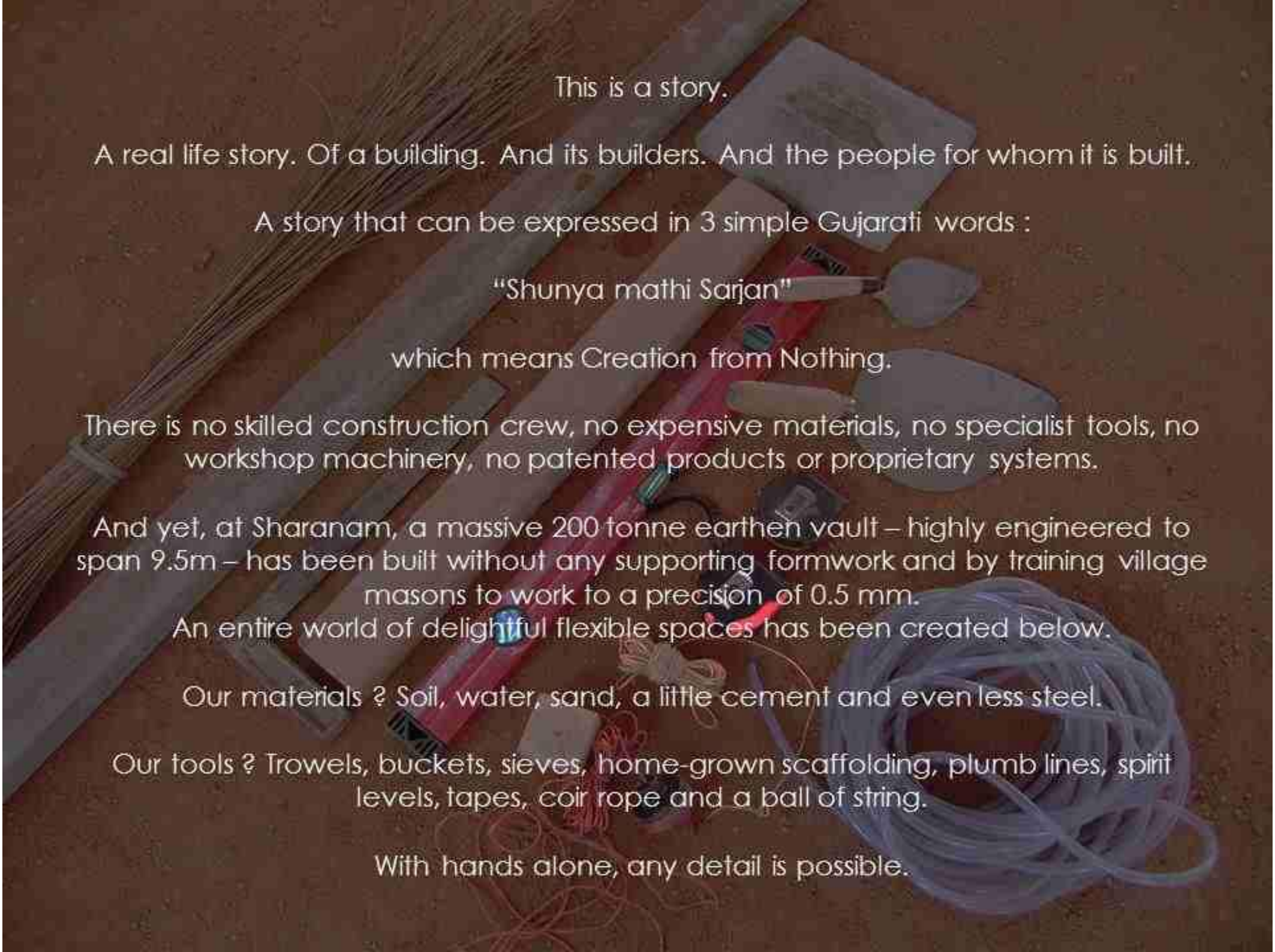
all our earth




CENTRE FOR RURAL DEVELOPMENT
Near PONDICHERRY
SHARANAM
Co – Architect :
Trupti Doshi, Mumbai



This is a story.

A real life story. Of a building. And its builders. And the people for whom it is built.

A story that can be expressed in 3 simple Gujarati words :

"Shunya mathi Sarjan"

which means Creation from Nothing.

There is no skilled construction crew, no expensive materials, no specialist tools, no workshop machinery, no patented products or proprietary systems.

And yet, at Sharanam, a massive 200 tonne earthen vault – highly engineered to span 9.5m – has been built without any supporting formwork and by training village masons to work to a precision of 0.5 mm.
An entire world of delightful flexible spaces has been created below.

Our materials ? Soil, water, sand, a little cement and even less steel.

Our tools ? Trowels, buckets, sieves, home-grown scaffolding, plumb lines, spirit levels, tapes, coir rope and a ball of string.

With hands alone, any detail is possible.

DISCLAIMER

This presentation is about 7 years of ceaseless hard work
Including 350 non stop Sundays
At 16 hours a day.

It will be rigorous.

SHARANAM

CENTRE FOR RURAL DEVELOPMENT

designed to act as a venue
for a variety of programmes
which include

rural health & sanitation,
Education & teacher training,
income generation,
self development
among women, youth, children
based on

psychological empowerment.

THE LARGER CONTEXT

Making Country fired Bricks

Top Soil used in making bricks

(most fertile for agriculture, nature takes 400 years to make 1 cm of top soil)

Turning fertile agricultural land into deserts

Don't ask about Carbon dioxide


Causing this

THE LARGER CONTEXT

Making Country fired Bricks

Surrounding trees chopped down
and used to burn the bricks

Turning forests into barren deforested land


FILL IT, SHUT IT, FORGET IT

Harmful quick fixes fast replacing traditional wisdom

THE CHALLENGE

DESIGN	Unique, Modern, Inspirational, Replicable Approach
ECOLOGY	Restore the ecological landscape of the site scarred due to illegal mud quarrying
CLIMATE	Thermally comfortable in an excessively hot & humid climate
TECHNOLOGY	Sustainable materials & techniques, Minimize use of steel & cement, Scalable
ECONOMICS	Cost effective, not low-cost
CULTURE	Drawing ingenuity from traditional wisdom Suited to the rural context
SOCIAL	Upgrade skills of local villagers Employ them in the meaningful creation of Sharanam For Them, With Them In the process, impart Confidence and Dignity.

INSPIRATION

The best Gathering Space in a Village :
The Shade of a Tree

What is it about a Tree ?

Shade from intense heat in the excessively hot climate of Tamil Nadu

Maximising Ventilation in the high humidity of the coastal area

Can we design a building like a tree ?

Study of Traditional Tamil Buildings demonstrates
a strikingly similar climatic response

Temples

Chettinad Houses

Local Vernaculars

THE SITE

5 acre plot in rural Tamil Nadu in the middle of 40 villages

Barren, used by local goons as an illegal mud quarry

THE IMMEDIATE CONTEXT

Illegal mud quarry across the road from Sharanam

Parts of Sharanam also looked like this

FIRST RESPONSE – SOIL HEALING

Plantation of over
3000 indigenous trees

Reducing water reqt by 75%
by using Pot Drip Irrigation

WATER CONSERVATION

Contour
Trenches

Contour Bunds
& Silt Traps

Ground Water
Recharge into
existing Open Well

WATER CONSERVATION

SEARCH FOR THE MOST APPROPRIATE BUILDING MATERIAL

Researched several sustainable materials and technologies including Bamboo, Filler Slabs & Unfired Earth

Research in Unfired Earth showed that it needs a very specific

Soil Composition

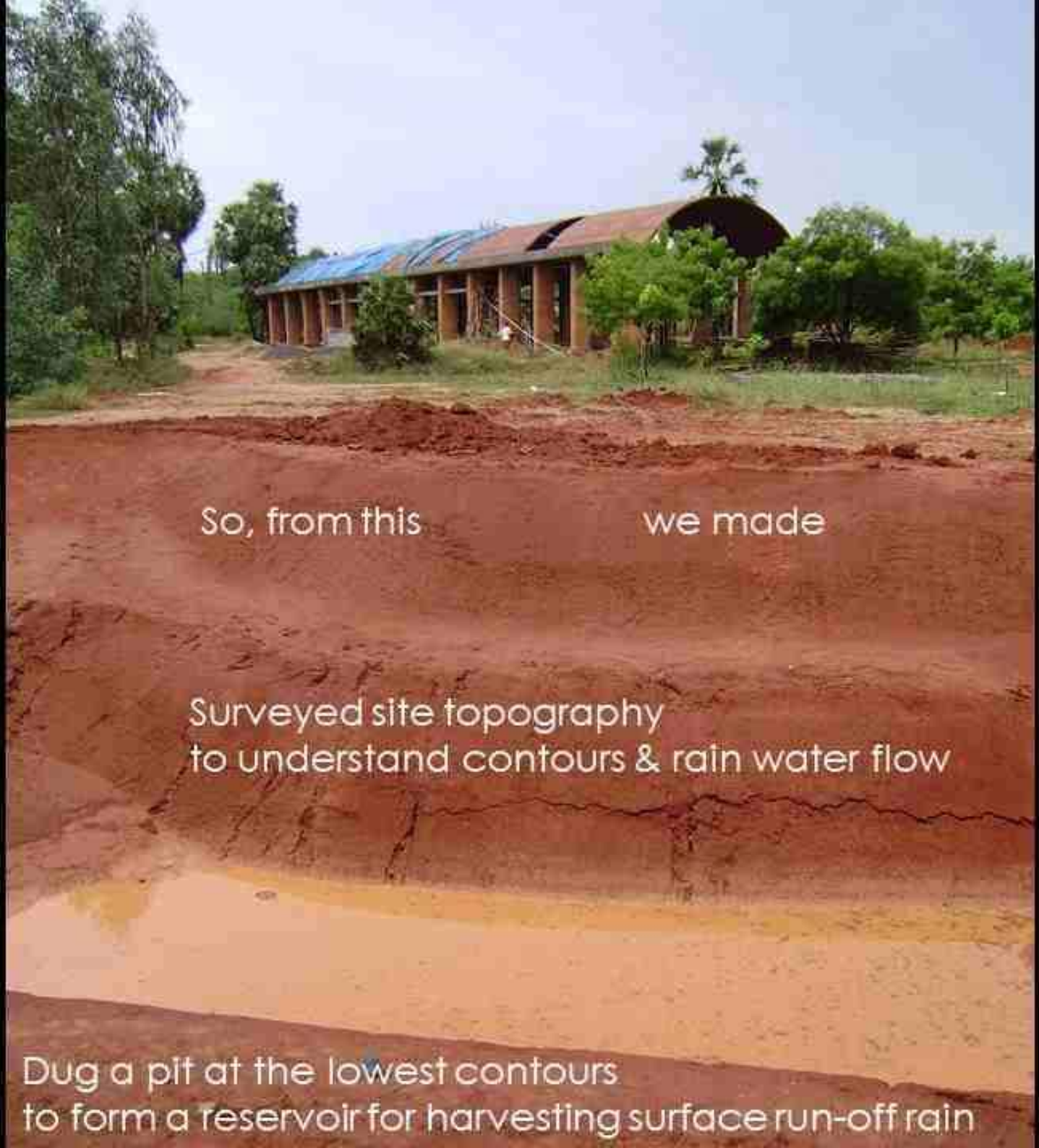
Sand	Clay	Gravel	Silt
50%	20%	15%	15%

Sent Sharanam Reservoir Soil for Testing

Received Soil Test Results the following week, as follows :

Sharanam Reservoir Soil Composition

Sand	Clay	Gravel	Silt
50%	20%	15%	15%


So, from this
we made
Surveyed site topography
to understand contours & rain water flow
Dug a pit at the lowest contours
to form a reservoir for harvesting surface run-off rain

UNFIRED COMPRESSED EARTH BLOCKS AT SHARANAM

100,000 blocks
of 9 different sizes

Made by training local villagers

Different blocks for Pillars, Walls & Roof

Advantages compared to
Wire cut factory made bricks

Far superior quality

1/4th financial cost

1/10th environmental cost

3 times stronger

Made to a precision of 0.5 mm


SOIL MIXING
With a pinch of cement
And some water
COMPRESSING

சரணம்

शरणम्

A COMPARISON OF BRICKS*

	COUNTRY FIRED BRICK	CSEB HB 245**	WIRE CUT BRICKS
Brick Size (L x W x H cm)	22 x 10 x 7	24.5 x 24.5 x 9	22 x 10.5 x 7.2
Volume of Brick	1540 cm3	5402 cm3	1663 cm3
Weight per Brick	1825 Kg/m3	1929 Kg/m3	1876 Kg/m3
Stabilisation	Fire	5% cement	Fire
Cost per unit on site (Nov. 2008)	Rs. 3.25	Rs. 6.15	Rs. 8
Units per cubic metre	649	193	601
Cost per cubic metre	Rs. 2109	Rs. 1187	Rs. 4808
Wet Crushing Strength	35 Kg/cm2	74 kg/cm2	75-100 Kg/cm2
CO2 Emissions	517 Kg/m3	49 Kg/m3***	286 Kg/m3
Embodied Energy	5278 MJ/m3	505 MJ/m3	2965 MJ/m3
Mortar used	1 cement: 5 sand	1 cement: 6 soil / 6 sand	1 cement: 5 sand
Mortar Quantity (per m2 wall)	72.5 litres	37.1 litres	72.4 litres

ENVIRONMENTAL COST	CSEB is 10.5 times less polluting than country fired brick CSEB is 5.8 times less polluting than wire cut brick
ENERGY CONSUMPTION	CSEB is 10.4 times less energyintensive than country fired brick CSEB is 5.9 times less energy intensive than wire cut brick
STRENGTH	CSEB is 2.1 times the strength of country fired brick CSEB is as strong as wire-cut brick
COST	CSEB is 43.8% cheaper than country fired brick CSEB is 75.3% cheaper than wire cut brick

* Data obtained from Auroville Earth Institute and structural tests conducted upon our site produced blocks at The Structural Testing Laboratory, Pondicherry Engineering College.

** Hollow Cement Stabilised Earth Block with earthquake resistant feature as produced on site and used in the exposed piers.

*** Energy values for CSEB integrate the energy for transporting materials: 150km for cement and 20Km for sand.


Local villagers learnt
the art and science of
earthen block making

RAMMED EARTH FOUNDATIONS

Foundations made from the earth dug out of the foundation pits itself

Soil was seived,
Mixed with a pinch of cement
And rammed back in

No soil brought from outside

No steel or concrete used in Foundations

Only 3 feet in depth

And are strong enough to carry a 7 storey building on it

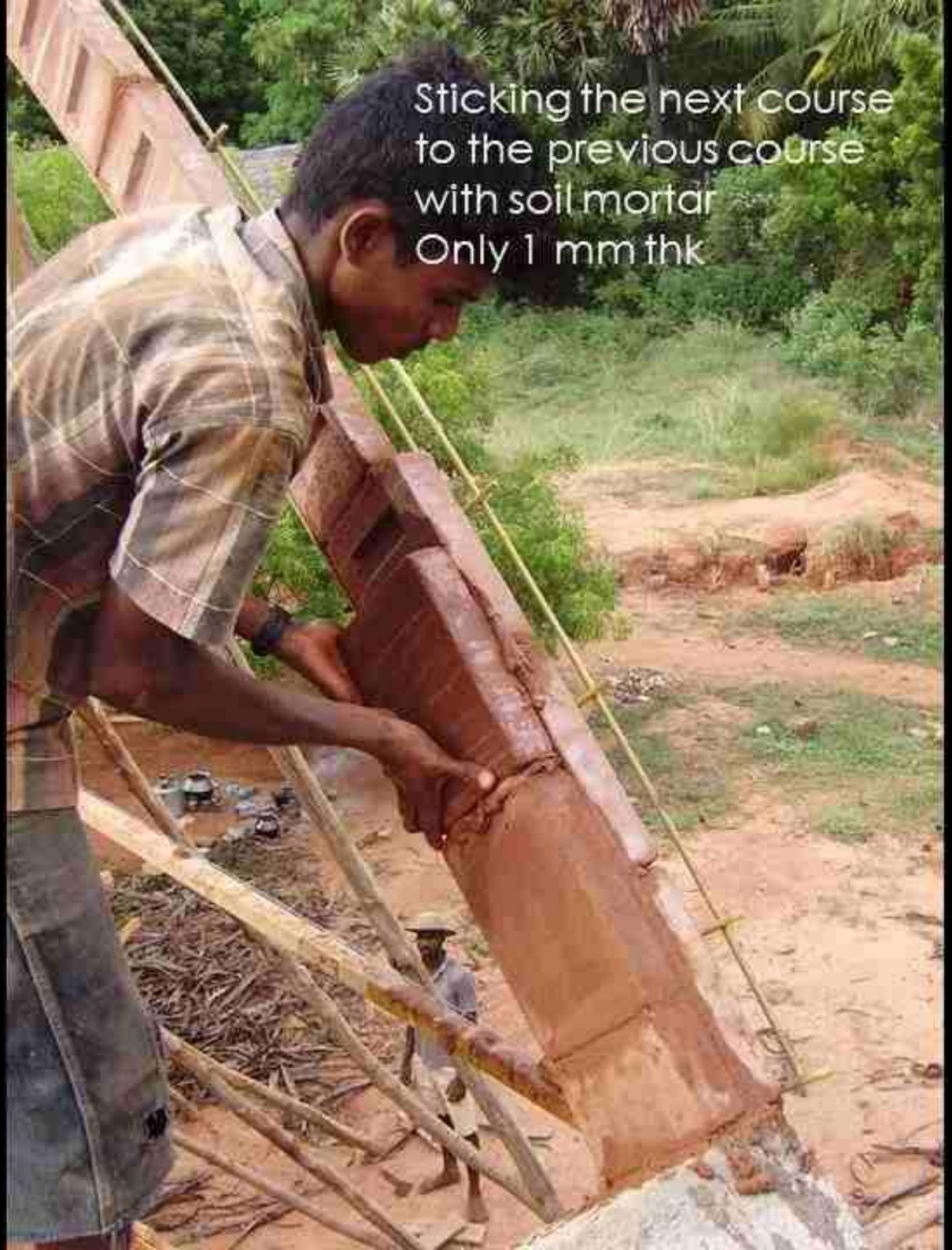
THE 'ROOFING' CHALLENGE

To build the strongest possible roof
with the least amount of material
With no steel or concrete

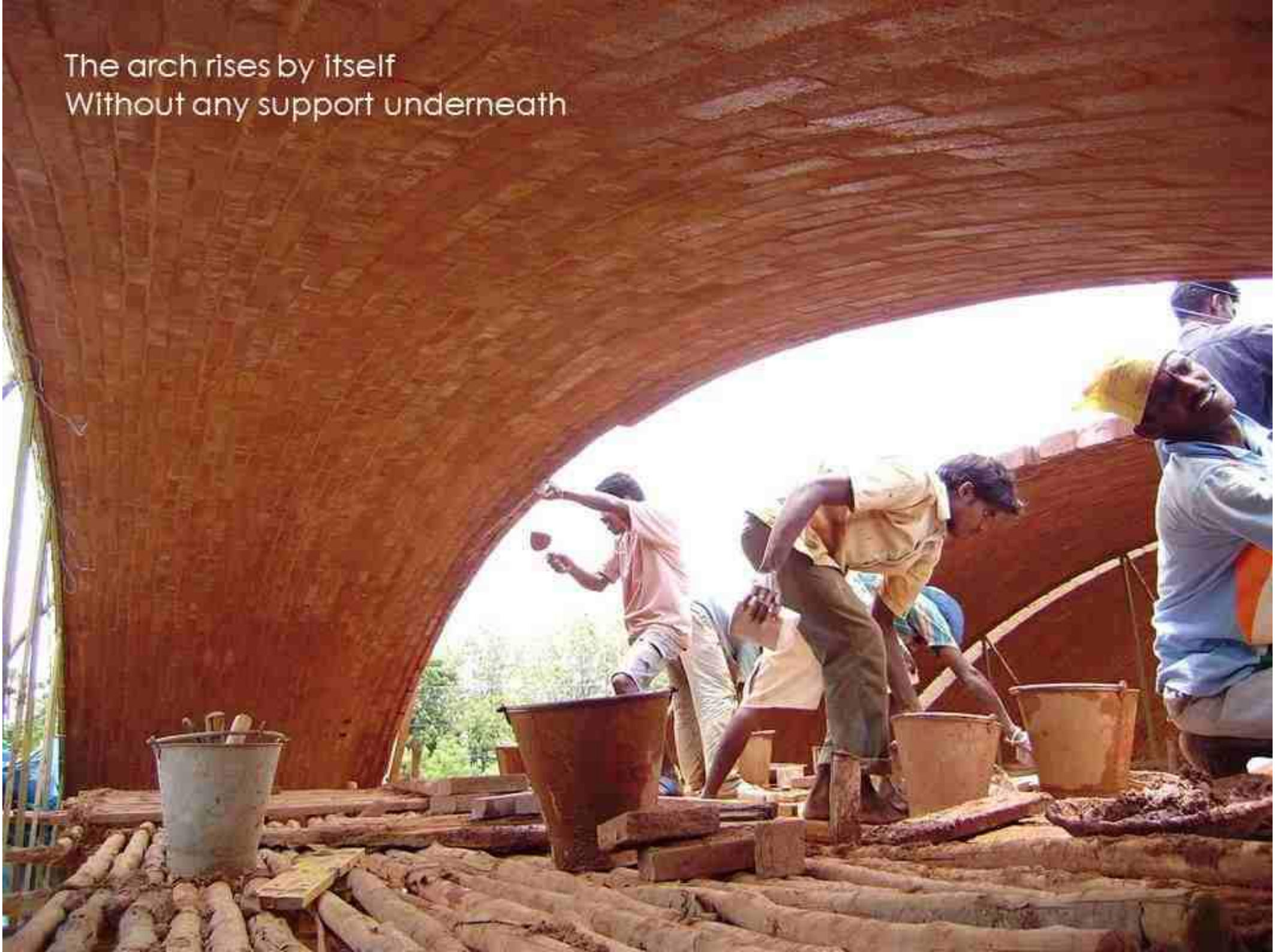
For a large column free space

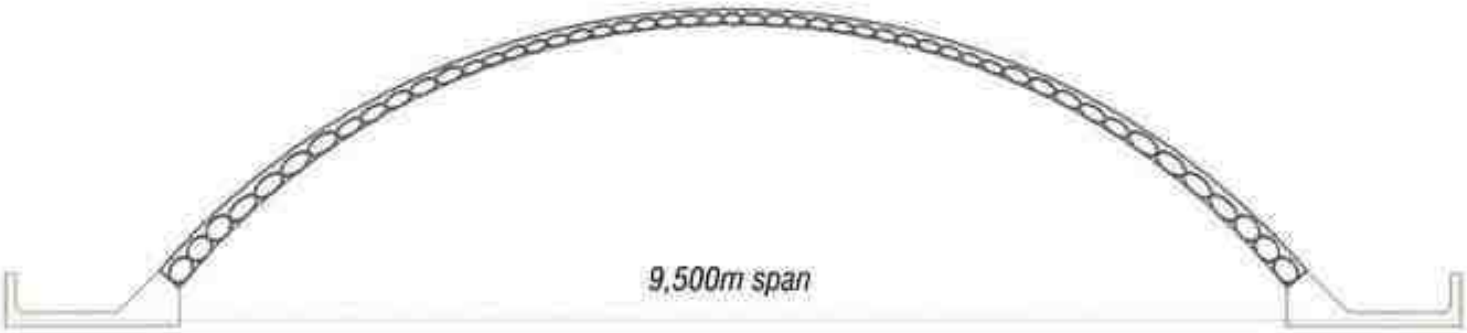

Two identical templates on either side
define the shape of the arch

First course of blocks,
precisely calculated
placed on the template


Sticking the next course
to the previous course
with soil mortar
Only 1 mm thk


Nylon strings
used as guidelines
for sticking blocks

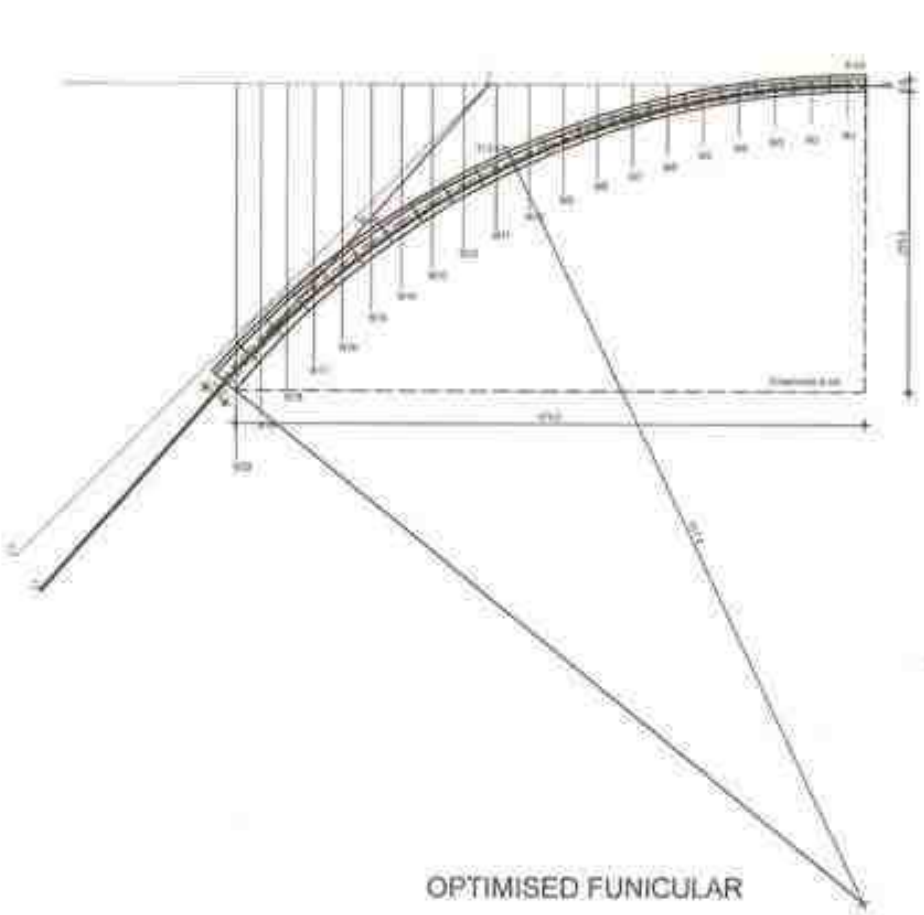

The arch rises by itself
Without any support underneath



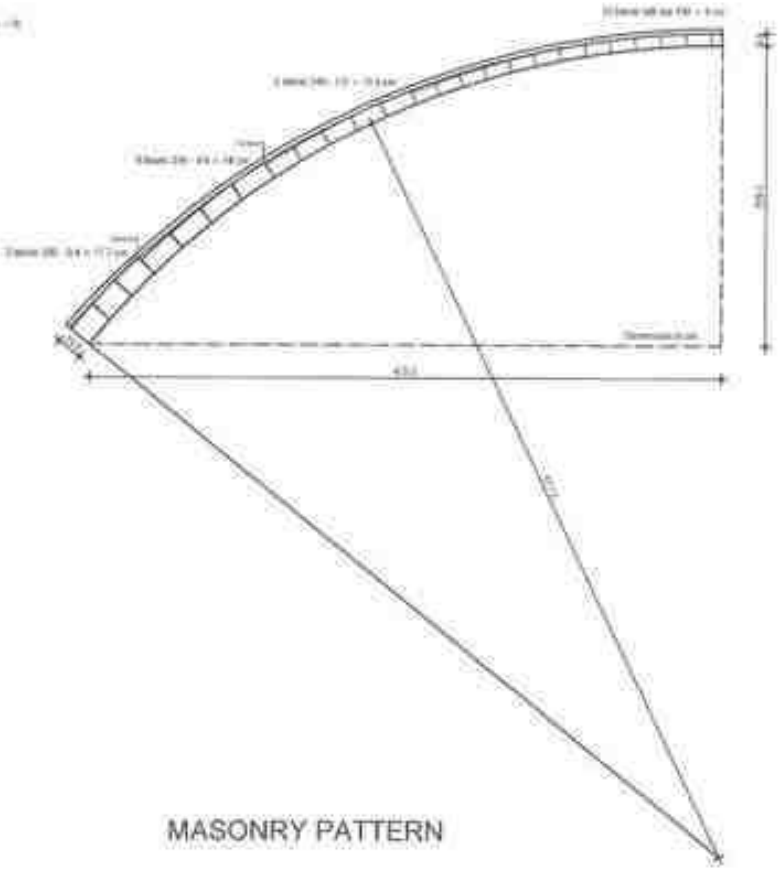
segmental arch optmised to behave like a catenary

OPTIMISATION STUDIES

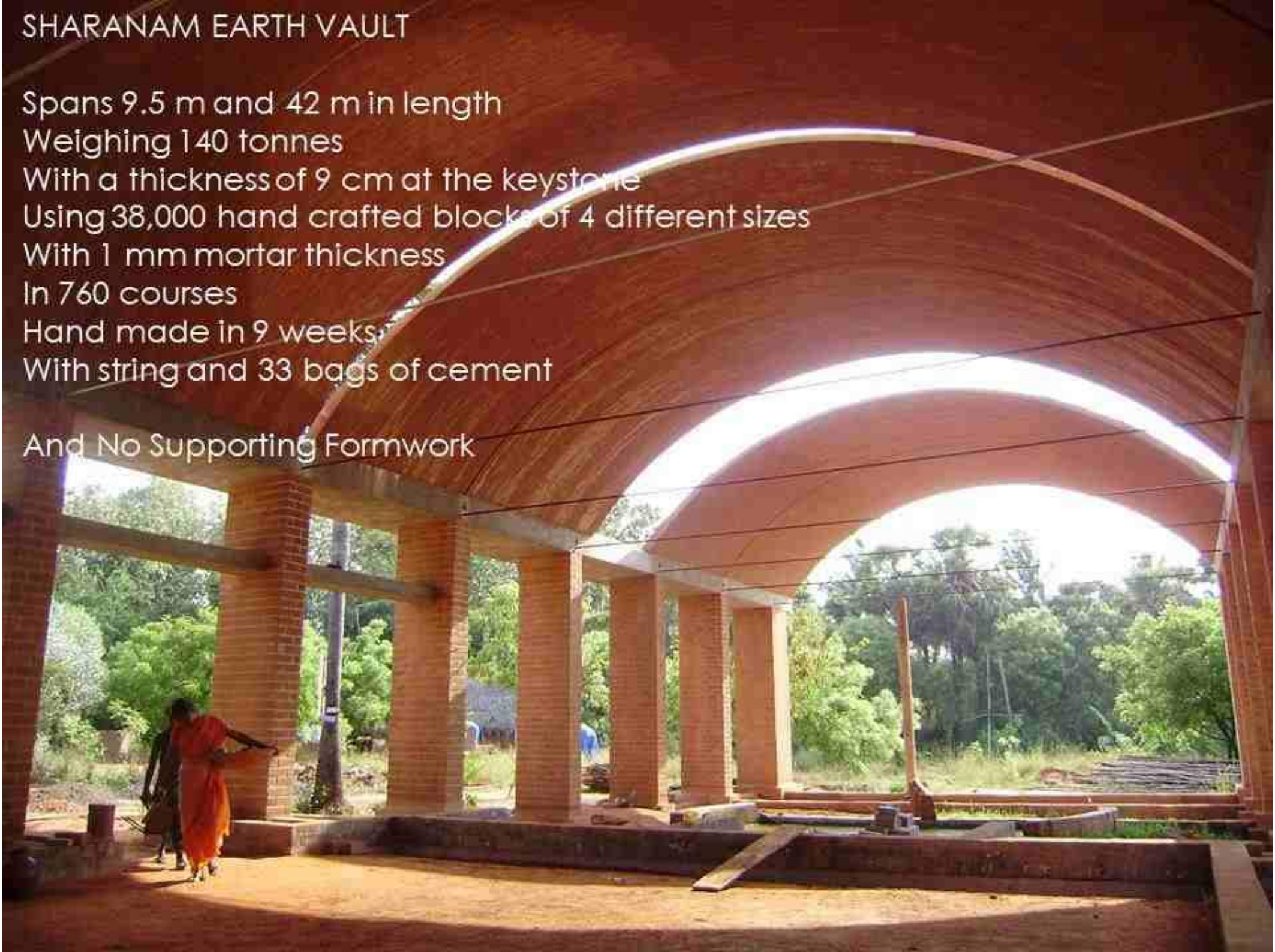
Thickness of Arch reduced from a normal 5 feet (in case of burnt brick)
To a mere 9 cm ~ 4 inches at the keystone



OPTIMISED FUNICULAR

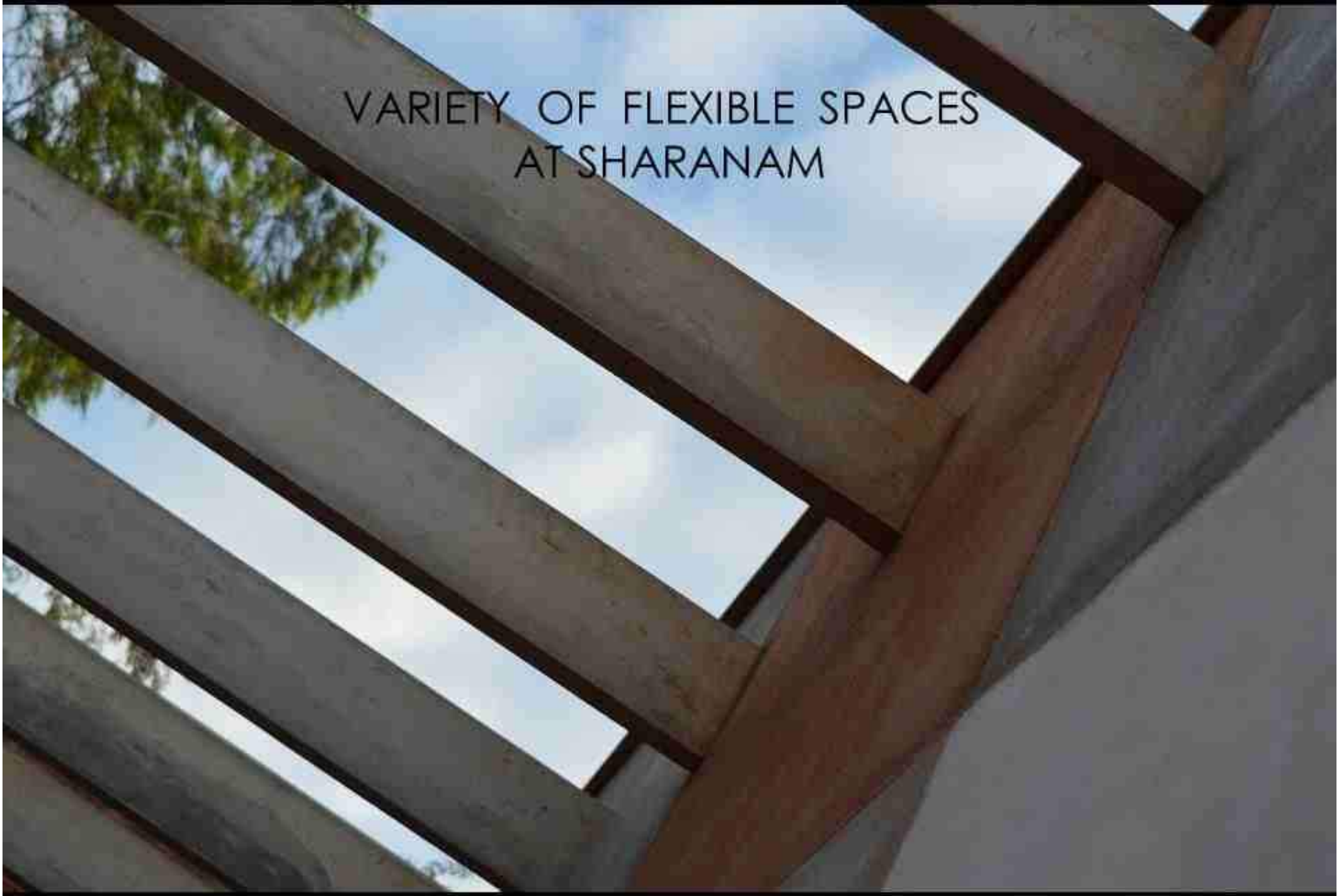


MASONRY PATTERN


SHARANAM EARTH VAULT
Spans 9.5 m and 42 m in length
Weighing 140 tonnes
With a thickness of 9 cm at the keystone
Using 38,000 hand crafted blocks of 4 different sizes
With 1 mm mortar thickness
In 760 courses
Hand made in 9 weeks
With string and 33 bags of cement
And No Supporting Formwork

FERROCEMENT TECHNOLOGY

Introducing the cost effective and high precision technology of ferrocement for constructing roofs as an alternative to Flat RCC slabs


VARIETY OF FLEXIBLE SPACES
AT SHARANAM


MULTIPURPOSE HALL
To seat 250


VILLAGE NEWSPAPER STUDIO


OFFICES


COMMUNITY RADIO STATION
&
MEDIA OFFICE


ADMINISTRATIVE BUILDING
- Director's Office
- Seminar Room
- Computer Room


ENTRANCE TO COURTYARD
Displaying all the finishes used throughout the Campus


ENTRANCE VESTIBULE


CIRCULAR CLASSROOM


'WASTE IS WEALTH'
Concertina Wall made with mini blocks
left over from the Vault
TOILET BLOCK


AMPHITHEATRE

ENVIRONMENTAL PRACTICES

A. WATER

Complete Rain Water Harvesting

1. Roof Top Rain water
2. Surface Run-Off
3. Minimum Dependence on Ground Water

B. SANITATION

Ecological sanitation practices

1. Use of Urine as fertiliser. No chemical fertilisers
2. Composting Night soil for use as manure

C. ZERO WASTE

1. Optimisation in Design
2. Building Methods ensure zero construction waste

ENVIRONMENTAL PRACTICES

D. ENERGY EFFICIENCY:

Bringing down energy requirement through
Intelligent Building Design

1. COOLING STRATEGIES

13 Passive Solar strategies for Thermal Comfort
Active ecological cooling technique

2. LIGHTING

Use of Daylight for all spaces

3. ACOUSTICS

Architectural Design of Main Hall
Allows a person to talk to 250 people at normal volume
Without using microphones

E. USE OF RENEWABLES

Balance requirement to be met by solar energy


13 PASSIVE SOLAR STRATEGIES FOR THERMAL COMFORT.

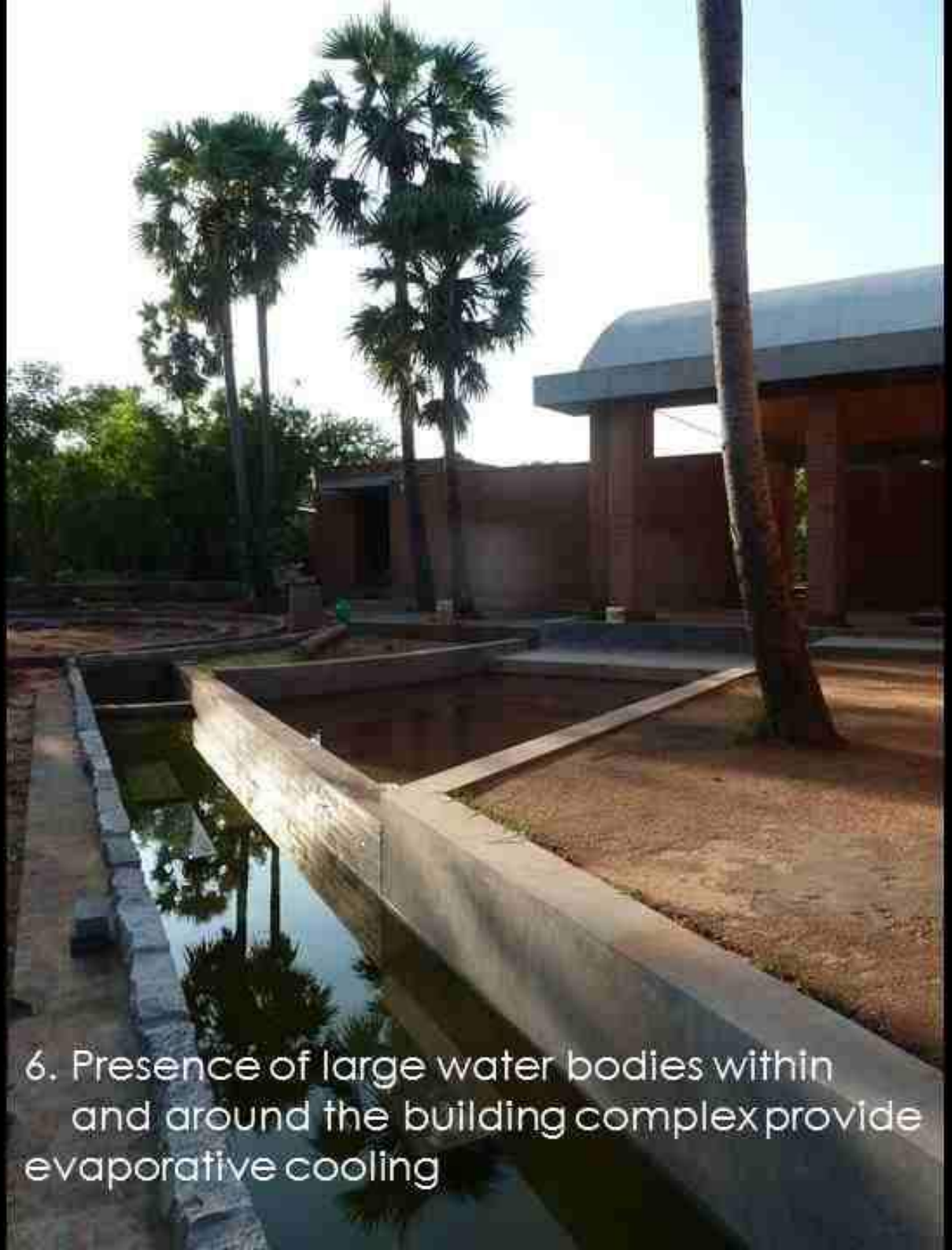

1. Building Design with longer sides facing North & South
Sun cuts across the path of the building
N

2. Building oriented exactly perpendicular to the summer breeze.
   Pillars designed to funnel the breeze in

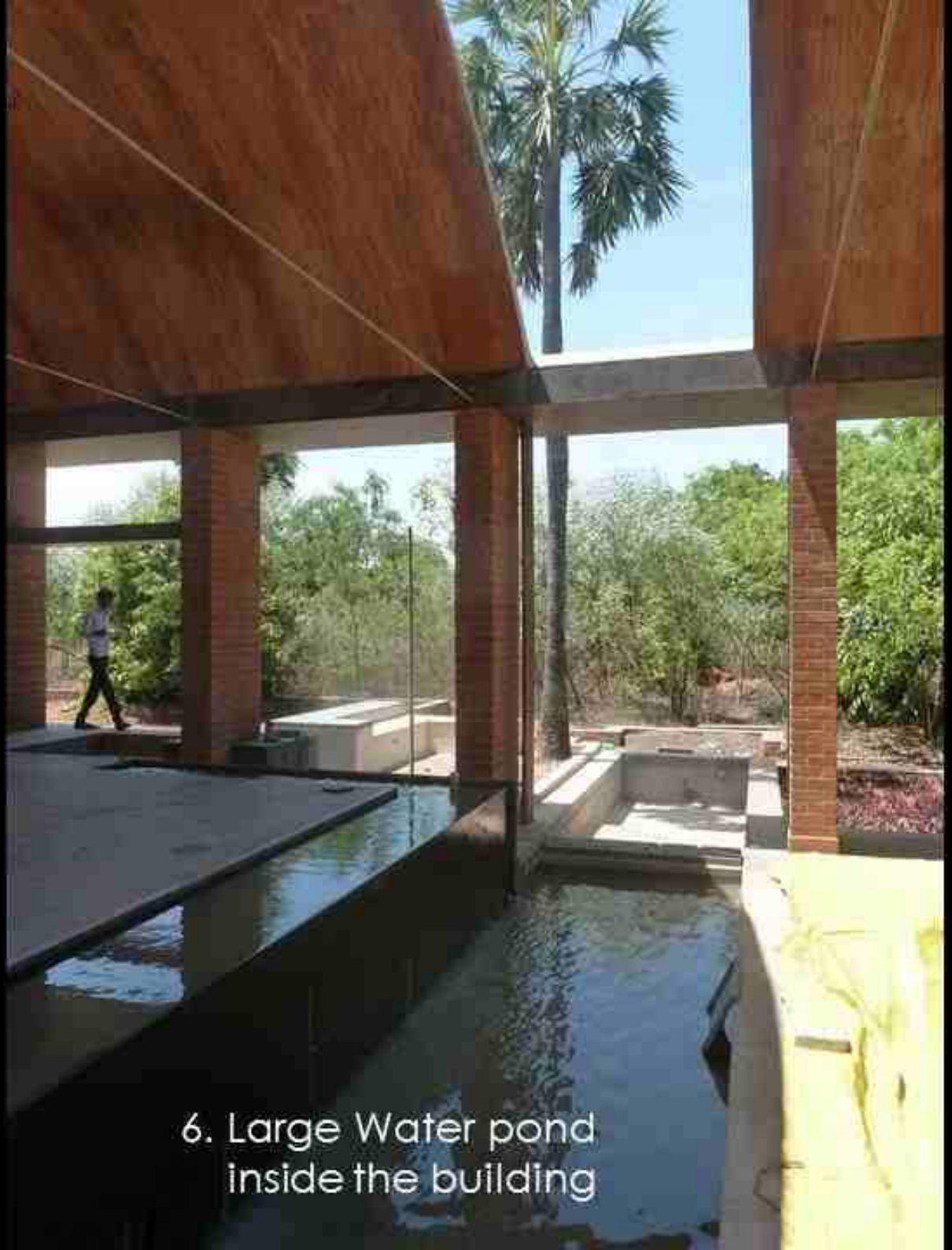

3. Stack effect :
Sky lights on the roof designed
to let out hot air
which rises to the top
allowing cooler air to enter from below

4. Green ground cover
all around the building so heavier air at lower level cools down before entering


5. Semi open nature of the main gathering space
prevents the heat from remaining trapped inside



6. Presence of large water bodies within and around the building complex provide evaporative cooling



6. Large Water pond
inside the building


7. Walls made of unfired earth
Building acts as an earthen pot

8. Cavity walls, ventilated,
with air as insulator
on sides that directly face the Sun


3. Vertical Gardens on the walls
prevent them from becoming hot


10. Shady crowning trees planted around
buildings prevent direct solar radiation
while allowing breeze in


11. Roof gardens provide excellent thermal insulation

12. Heat reflecting paint on the roof minimises solar heat gain

13. Cooling floors :
either in stone or a variant of the Kerala style traditional floors
which keep the surface of the floor very cool

ECOLOGICAL COOLING TECHNIQUE

Drains heat out of the building through the medium of water
Instead of pumping heat out of the building through air.


MINIMISING LIGHTING LOAD
Use of Daylight
for all spaces within the Campus

THE EARTHEN MAIN BUILDING AT SHARANAM IS

FINANCIAL COST

40 % cheaper than a conventional RCC frame

50 % cheaper than RCC vault

75% cheaper than a conventional brick vault

ENVIRONMENTAL COST

90% cheaper than a conventional building system in India today

WHY WE DID NOT ACCEPT 'GREEN RATING' ?

1. The Rating Agency in India gives 5 star green rating for a building that scores 80 out of 100.
   According to them, Sharanam was scoring 104 out of 100, with 4 additional points for Innovation.
   They did not have any category for this score.

2. They were charging a registration fee of Rs. 3 L for a village project.
   And in that money, we built another building.

3. As part of protocol, they needed us to pay Rs. 7 L to a 'consultant' who can tell us how to increase the green rating of the building.
   And they said that Sharanam had already done much more than what the 'consultant' can tell.
   However, the fee was mandatory.

4. Their understanding of thermal comfort was a standard 28 degrees C, irrespective of local climate, food habits, clothing and lifestyle.

THE INTEGRAL APPROACH

The goal is not to build the building,
The goal is to make the act of building a means of development.


More than
400 workers
have been
trained in upto
20 specialist
building skills
at Sharanam

THE INTEGRAL APPROACH

Redefining the role of a 'professional'
Architect here, is not a person in an AC office who gives out drawings,
But a hands-on professional engaging in the wider
interdisciplinary context of development

The entire building has been built without a 'Contractor'
This removes heavy % cuts taken by brokers
And workers receive due wages on time

Instead, the architects are leading the construction
By directly training local unskilled villagers from the surrounding bio-region

More than 400 local villagers have been trained in upto
20 specialist building skills
With them, Sharanam has been built to a precision of 1 mm
The drawings and actual construction will differ by no more than 1 mm

Skilled local workers had their skills upgraded
Introduced to new and scientific techniques
and higher standards of work

THE INTEGRAL APPROACH

At Sharanam, we believe that 'Green Building' is not just a finished product that can be quantitatively evaluated through carbon emissions and number crunching in energy audits

It is the qualitative expression of a process of building that makes it Sustainable

It is the Integral Approach towards building Sharanam which includes not only the cultural and climatic context of Tamil Nadu, the technological context of 'Sustainability', but also the wider human dimension and the social context of rural development which have contributed to the 'Green-ness' of Sharanam.

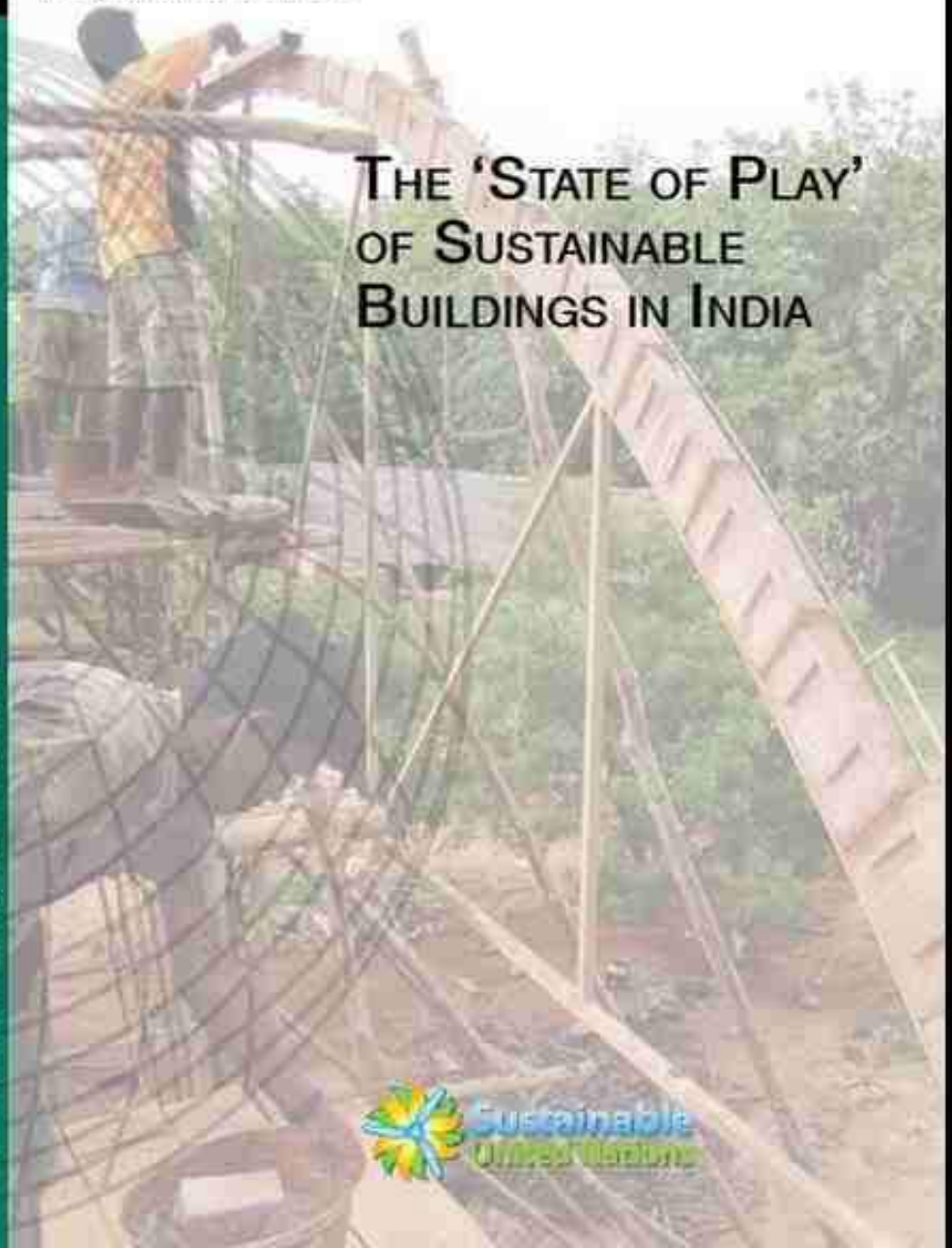
Here, the Act of building is seen as a means of Development *

UNEP

United Nations Environment Programme

UNEP Sustainable Buildings and Climate Initiative

Promoting Policies and Practices for Sustainability



THE 'STATE OF PLAY' OF SUSTAINABLE BUILDINGS IN INDIA

Sustainable United Nations

RECOGNITION

Sharanam

has been chosen by

UNEP

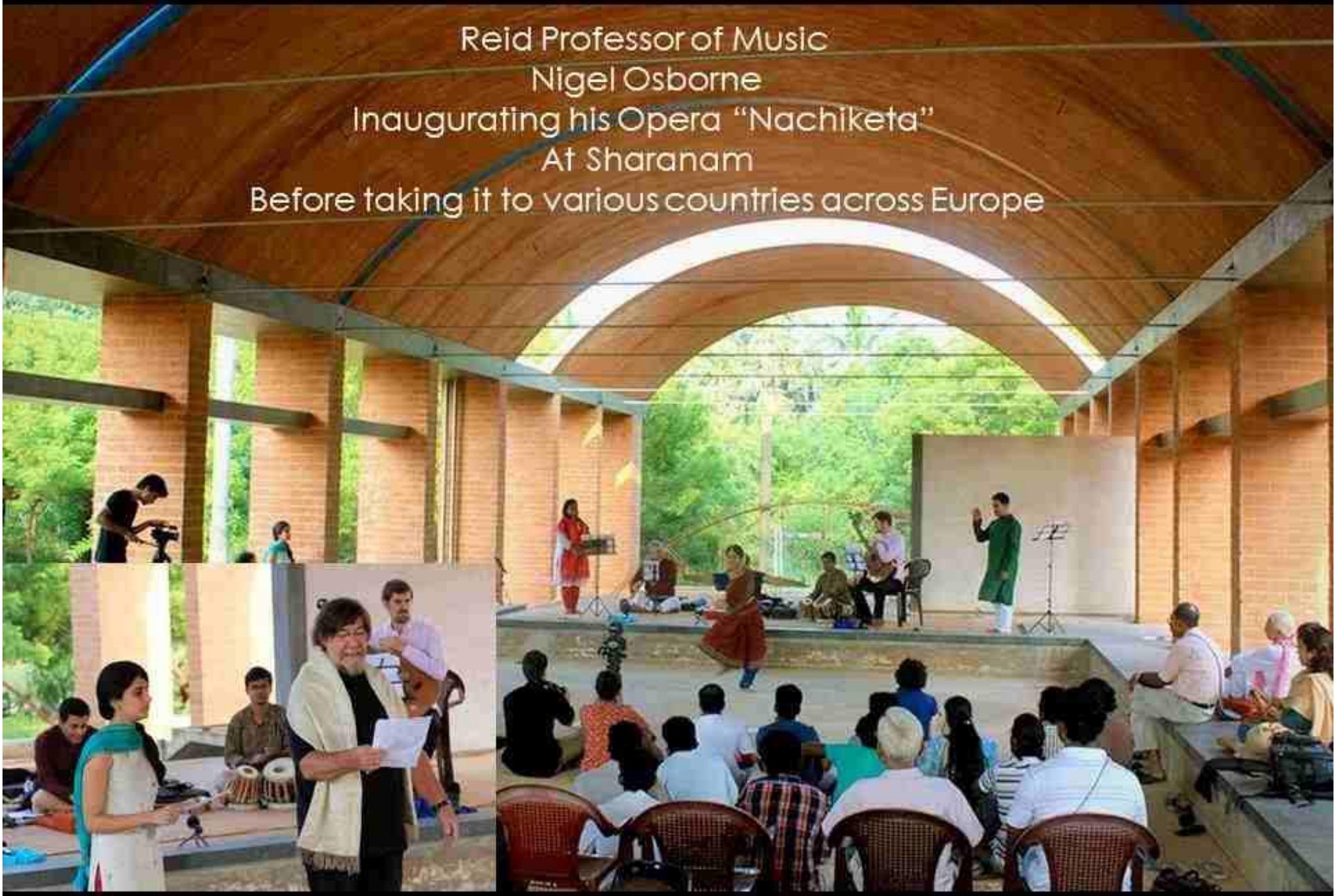
United Nations

Environmental Programme

As the model for

Sustainable Buildings in India

German Chamber of Commerce
Understanding Sharanam as a Case study for
'Ecological Economics in India'


Reid Professor of Music
Nigel Osborne
Inaugurating his Opera "Nachiketa"
At Sharanam
Before taking it to various countries across Europe

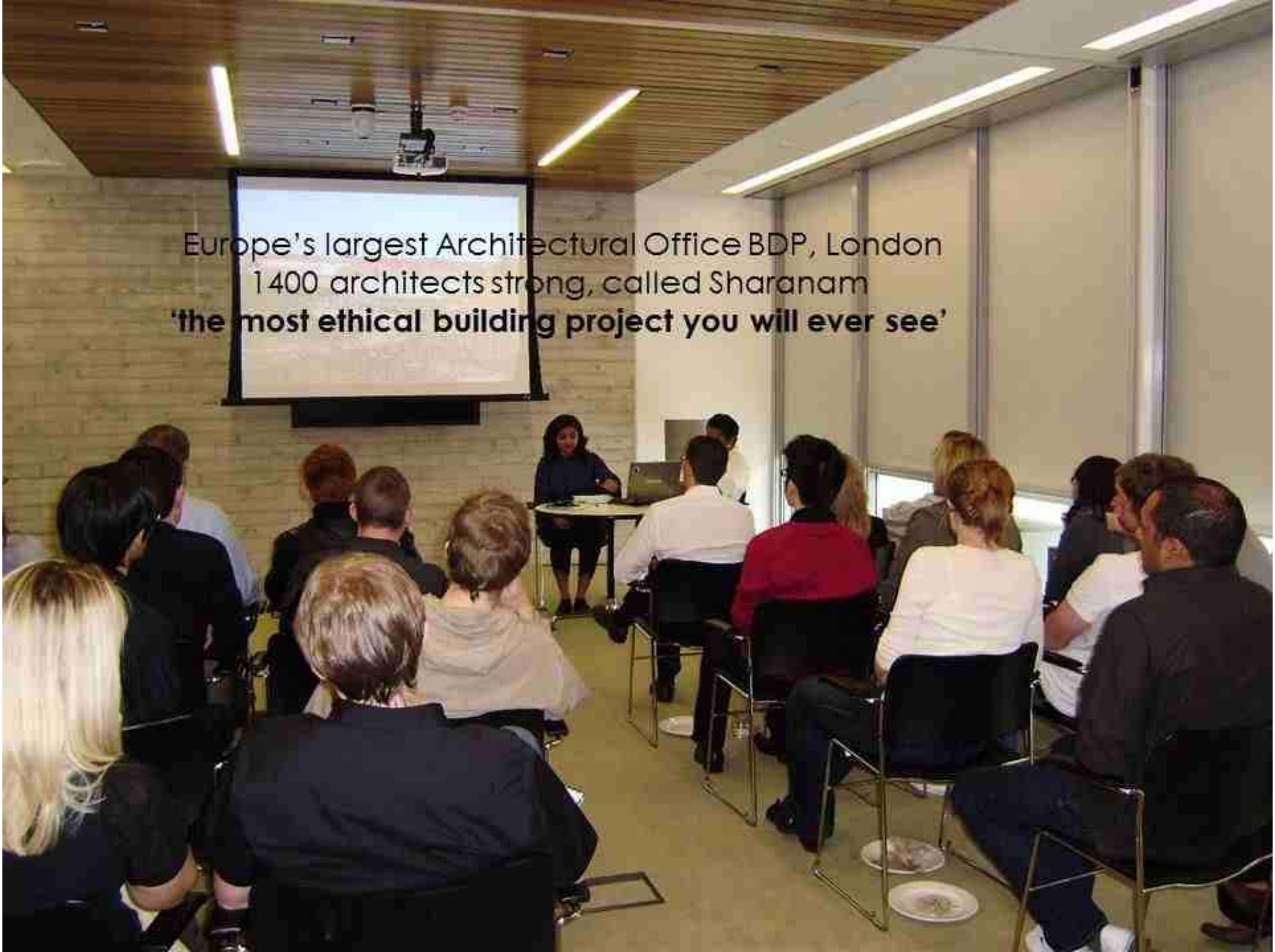

Violinist & Music composer of "Titanic" score
Paul Peabody
understanding Sharanam Acoustics

LETTER FROM
MR. SHRIKRISHNA BHAVE,
DIRECTOR, HUMAN RESOURCES, FORBES

"It is with a sense of nostalgia that I am writing this note. I and my colleagues at Forbes are back to our work and business life but in my mind & in the minds of many, the question still lingers - whether this is real or what we saw out there in auro society, Sharanam & Sarvam was real.

Getting a glimpse of the huge work being done on the human development index and personally experiencing the above, even if briefly, has made a profound impact on me and my colleagues. The deep, grass root level and transformational work that you and your team are doing is beyond praise - we can just gape at it in awe, wonder and admiration.

This is to thank you on behalf of Forbes Senior Team and also to extend my gratitude for enriching our lives, if only for a day."


Europe's largest Architectural Office BDP, London
1400 architects strong, called Sharanam
'the most ethical building project you will ever see'


ARCHITECTS
FROM EUROPE
COLLABORATE

PROF. DOUG KING, UK

Considered among the top 10 most influential people in UK
in the field of Sustainable Development

Excerpt from his website www.dougking.co.uk

"Last week I had the privilege of working with a couple of architects in India who have given up a substantial portion of their professional lives to work voluntarily for an NGO, the Sri Aurobindo Society, on a new centre for village development and education.

Jateen Lad and Trupti Doshi have constructed a building of great beauty and power which will act as a focus for education and enabling activities by the society, but they have done so much more than simply designing a building.

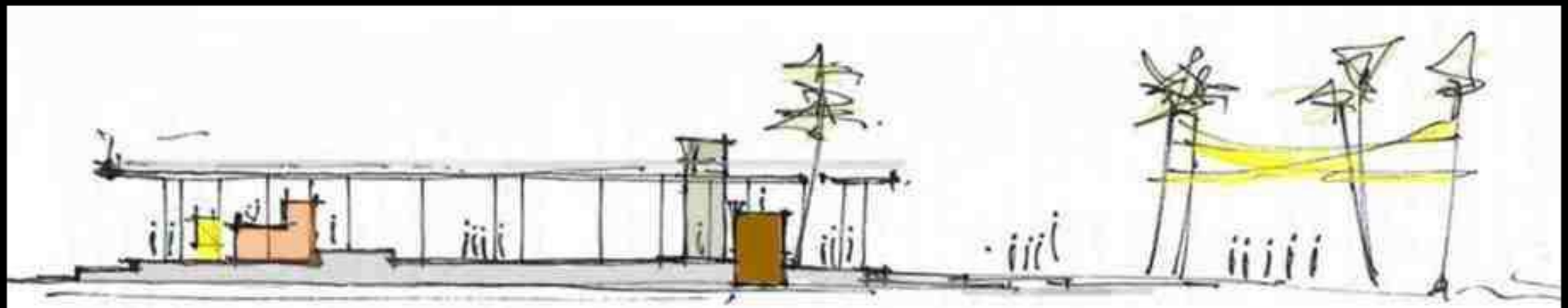
Sharanam, as the building is known, is a village development project in its own right. Over the last seven years Jateen and Trupti have used the construction project as a vehicle to train and empower local villagers."

Several students from Manchester University received hands-on professional training at Sharanam


THE REAL REWARD
coming an ac ve to the Development Process


This world was not built with
random bricks of Chance,


A blind god is not destiny's architect;



A conscious power has drawn the plan of life,


There is a meaning in each curve and line.


It is an architecture high and grand


By many named and nameless masons built

Lines from Sri Aurobindo's poem 'Savitri'

Sharanam