EARTHEN ARCHITECTURE IN AUROVILLE

Auroville Earth Institute
Satprem Mainí
Architect
Auroville attempts to link the ancestral tradition of raw earth building with the modern technologies of stabilised earth.

Earth, as a building material, can be used for creating a modern, progressive and eco-friendly habitat.

Compressed Stabilised Earth Blocks (CSEB) is today the technology used the most in Auroville.

Management of natural resources: respect and worship our Mother Earth!
No management of resources creates ecological disasters
Never do this !!!

Eroded land due to miss management of resources
Quarry not planned
It will become a garbage dump

Wastewater treatment
Wastewater treatment &percolation
Appropriate and sustainable development require first proper management of natural resources.

Underground rainwater
Basement floor
Half underground reservoir
Rainwater percolation system
Rainwater percolation system
MANAGEMENT OF HUMAN RESOURCES

Training people and giving them a livelihood insures sustainable development.

RESEARCH ON STABILISED EARTH TECHNOLOGIES
Compressed stabilised earth block technology

Auram press 3000 - Multi mould manual press with 17 moulds for doing ~ 75 blocks

Auram equipment for building with earth, sold worldwide

Single mould presses

Peripheral equipment

Rammed earth forms

Limited series production

Quality control devices
Compressed Stabilised Earth Blocks (CSEB) by the Auram press 3000
17 moulds for doing about 75 different blocks

ENVIRONMENTALLY FRIENDLY
➢ No firing is required for CSEB, but only curing (4 weeks with cement stabilisation)

<table>
<thead>
<tr>
<th>Little embodied energy per m³ material</th>
<th>Less pollution per m³ of material</th>
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<tbody>
<tr>
<td>➢ CSEB                   = 1,112 MJ per m³</td>
<td>➢ CSEB                   = 110 Kg of CO₂ /m³</td>
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<tr>
<td>➢ Wire cut bricks           = 2,247 MJ per m³</td>
<td>➢ Wire cut bricks           = 202 Kg of CO₂ /m³</td>
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<tr>
<td>➢ Country fired bricks      = 4,501 MJ per m³</td>
<td>➢ Country fired bricks      = 441 Kg of CO₂ /m³</td>
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<td>~4 times less than country fired bricks</td>
<td>~4 times less than country fired bricks</td>
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Country fired bricks

100 tons of wood burnt for 250 000 fired bricks !!!
COST EFFECTIVE

- CSEB are generally cheaper than fired bricks

<table>
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<th>Cost comparison of walls (Blocks produced on site)</th>
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<tr>
<td><strong>CSEB wall</strong></td>
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<tr>
<td>(24 cm thick)</td>
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<tr>
<td>➢ 3,045 Rs. per m³</td>
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<tr>
<td>➢ 731 Rs. per m²</td>
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(Value Auroville, 1st July 2010)

A finished m³ of CSEB wall costs in Auroville 6.9% cheaper than country fired bricks.
Stabilised rammed earth foundations

- Digging the trench and filling the frame
- Lifting the frame
- Checking penetrometre
- Ramming
- Adding 200 Litres of sand and 1 bag cement

Stabilised rammed earth walls
Composite techniques

Composite plinth beam

Composite columns

Composite staircase

Composite staircase

Composite techniques

Composite lintel single height

Composite beam double height

Composite beam triple height cantilevered

Composite beam triple height
Testing a triple height composite beam 240
2.50 m span, 1280 Kg/m, 4 mm deflection, no cracks
Testing hourdi blocks:
750 Kg on 8 hourdis = 3125 Kg /m²

DIVERSITY OF EARTHEN BUILDINGS
Projects by various architects

Cost effective houses at Kottakarai village

House at Dana community

House at Auromodele community

House at Dana community

House at New Creation Field community

House in the Green Belt

House at Samasti community

House in the Green Belt
Projects by various architects

Apartments at Prarthna Community
Row housing at Prayatna Community
Apartments at Aspiration area
Row housing at Prayatna Community

Kailash Youth Centre
Apartments at Djaima Community
Solar community kitchen for 1000 people
Electronic workshop at Auroshilpam community
Projects by various architects

Office of Aureka, producing the Auram
Multipurpose hall at Vérité community

Isaiambalam School
Kindergarten at Centre Field area

ARCHITECTURAL RESEARCH AND BUILDING METHODS
Deepanam School near Matrimandir
- Stabilised rammed earth walls and CSEB domes -

Building a cloister dome with the Nubian technique
Deepanam School near Matrimandir
- Stabilised rammed earth walls and CSEB domes -

Deepanam School near Matrimandir
- Stabilised rammed earth walls and CSEB vault 10.35 m span, 2.25 m rise
Deepanam School near Matrimandir
- Stabilised rammed earth walls and CSEB vault, 10.35 m span -

Segmental vault at Deepanam School, completed in 3 weeks with 4 masons
- 10.35 m span, 2.25 m rise, ± 30 tons, built with the Free Spanning technique -
Building an Egyptian shaped vault with the Nubian technique, 5 m span, 9 m long
Completed in 12 days with 4 masons

Building a bull eye, 80 cm dia
Catenary vault, 6 m span, 3 m rise with the Free Spanning technique
Building a lunette, 1.2m span with the Free Spanning technique.

Building a catenary vault, 6 m span, 3 m rise with the Free Spanning technique.
Kitchen of the boarding at the Auroville Earth Institute

Building a semicircular vault with the Free Spanning technique - 6 m span, 11 m long
Semicircular vault built Free Spanning
- 6 m span, 11 m long, ± 40 tons, built in 37 days with 4 masons -

Building a segmental vault with the Nubian technique
Building a groined dome with the Nubian technique

Groined dome completed in 6 days with 4 masons
PROJECTS' CASE STUDIES OF THE AUROVILLE EARTH INSTITUTE

Small projects by the Auroville Earth Institute

- Cost effective house at Suryanivas community
- House at Nalla Farm – Pondicherry
- House at Utility community
- Cost effective house at Vikas community
Small projects by the Auroville Earth Institute

Gayatri dome at Suryanivas community

School and community centre at Marakkanam

1st prize of a national competition
Tsunami house at Anumandhai

Community centre at Kilianur

Small projects by the Auroville Earth Institute

Disaster resistant built after the tsunami
Community centre at Bommarpalayam for UNDP

Disaster resistant built after the tsunami
Community centre at Annavali for UNDP

Community centre at Nadukuppam for UNDP

Community centre at Kadapakam for UNDP
Visitors Centre, 1200 m²
1992 Hassan Fathy International Award for Architecture for the Poor
Training Centre of the Auroville Earth Institute

Equilateral vault, the vault of the European cathedrals

House at the Auroville Earth Institute, built with the Free Spanning Technique
House at the Auroville Earth Institute

Chinnakalapet near Auroville – “Hermitage” for a priest
13 apartments on 4 floors at Vikas Community
Vikas Community was a finalist for the “2000 World Habitat Award”
Section of the third building

Section of rainwater harvesting system of the third building
Realization Housing project with 17 apartments
- CSEB and stabilised earth from foundations to roof
- Wind energy
- Rainwater harvesting
- Wastewater biological system
- Earth tunnel for natural air conditioning
  - Low emission for construction and use than conventional buildings and systems
  - 4 times less initial embodied energy
  - 3 times less operating energy

Realization - 5 Apartments completed
Shakti Vihara School at Pondicherry, for 700 children
Showroom in Shakti Vihara School at Pondicherry
Auroville, Realization community – Moveable house, earthquake resistant, built in 64 h.

Nepal – Jantanagar school, built in 20 days
Earthquake resistant, climate responsive – Built with community participation
Sri Karneshwar Nataraja Temple near Auroville
Pointed cloister dome 6 m span and pyramid, built in 6 months
Dome of the Dhyanalinga Temple near Coimbatore

Segmental elliptical dome - 22.16 m diameter, 7.90 m rise, ~ 570 tons, built in 9 weeks
Al Medy Mosque built in the heart of Riyadh, 420 m², 18.05 m high minaret
Built in 7 weeks with ~ 75 unskilled masons and ~ 150 workers
"Treat the Earth well. 
It was not given to you by your parents. 
It was loaned to you by your children." 
Kenyan Proverb

The Earth is Sacred, 
and any soil for building is a precious material. Don’t waste it! 
Building with earth has a great past, 
but also a promising future everywhere in the world. Don’t miss it!

I don't see the Earth as a formless material without consciousness, 
But as Spirit consciously disguised as matter. 
Satprem Maini
Satprem Maïni
Architect

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