



Vivekananda Kendra

Natural Resources Development Project

Work in the Field of
Eco-Friendly Construction Technologies

Milestones



Eco Friendly Construction



VK-NARDEP went in quest of locally available alternatives. The traditional knowledge bases dominated grand temples, which stand even today, sans mortar and steel rods, after centuries of ravages of time. Today that knowledge is being rediscovered in the Cost-effective Housing Technology movement that has sprouted throughout India started by organisations like that of Laurie Baker and Auroville etc.

The salient features of such houses are avoidance of excessive use of cement and steel and usage of locally available material. The innovative shapes of doors, windows and domes lend aesthetic appeal and beauty to these “Love-able, Live-able and Afford-able” homes. These are economical in terms of embodied energy and leave lesser eco-footprints.

Using the strength through shape principle, curved forms such as arches, vaults, domes and spheres are strong, more efficient and more economical than the equivalent rectilinear structure.



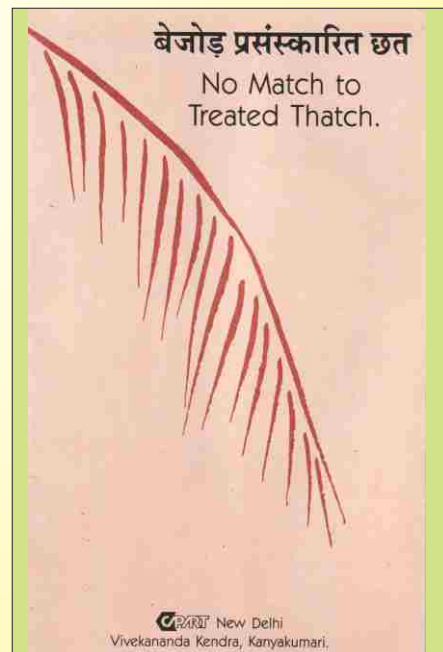
1987-92

- Chemically treated Thatches for economically weaker sections of the society
 - Trained local people
 - Thatches roofing done 150 house
- Constructed 20 houses with Chemically Thatched Roof

sponsored by CAPART, New Delhi



Tamil and English book
on Chemically
Treated thatches



Process

- ▲ Coconut leaves are plaited (thatch making) after soaking in water (making soft)
- ▲ Thatches are soaked in the copper sulphate solution to make it anti fungus
- ▲ Thatches are dried in the sunlight
- ▲ Cashew nut shell oil is sprayed on the thatches to make it water resistant
- ▲ Thatches are ready for use as a roofing material



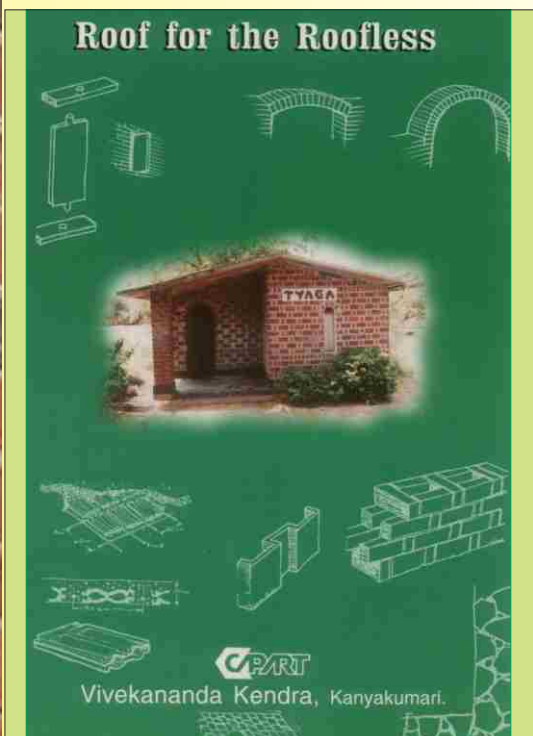
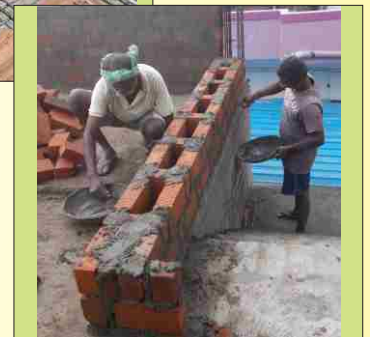
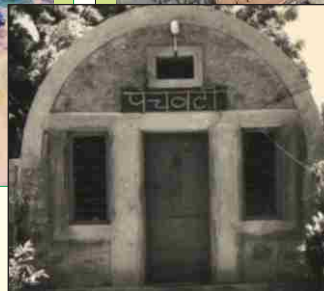
1988-89/93-96

- Using cost effective construction technologies in creating community infrastructure constructed houses for samathuvapuram, eco-houses in Kazhakadu mundanthurai using Rat trap bond for walling and Filler slab for roofing .

1991-93

- Inspired by Mahatma Gandhi and Laurie baker VK-nardep develops a host of cost effective building technologies.
 - Trained hundreds of mason on Cost -effective construction technologies particularly on Rat-trap bond wall , filler slab roof and different type of Arches
 - Roof for Roofless booklet published based on Low cost construction
- Support - CAPART, New Delhi & DRDA, Tamilnadu

Houses at Samatuvapuram



Constructed 6 eco centers at Kalakkad Mundanthurai -Tiger Project



1993-94

34 Group Houses constructed, Alwarthirunargari Panchayat, Tuticorin Dst

1994-95

22 Group Houses constructed, Tenkasi Panchat Union

under Jawahar Velai Vaippu Thittam

1995-96

40 Group Houses constructed Perukottar village, Kurivikulam block, Tirunelveli Dist.

1996-97

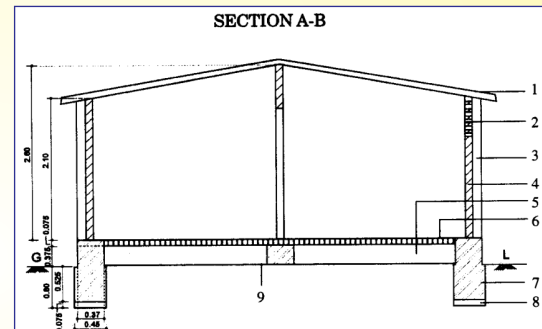
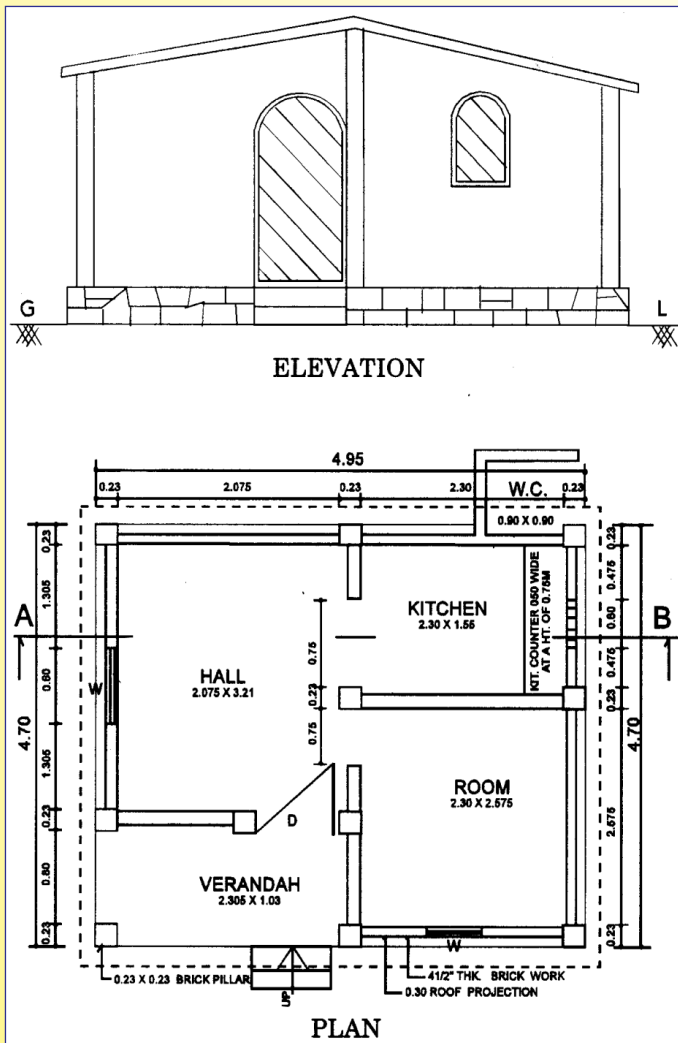
35 Group Houses constructed (Nattarkulam-5, Puliyanikulam-15 Karunkulam-15)

1995-98

15 Group Houses constructed Perunkottoor village, Sankarankovil Taluk,

under Jawahar Velai Vaippu Thittam

Guest House constructed at Sankarankovil, DRDA



1. R.C.C. Filler slab with Mangalore tiles infilling
2. Brick Jali
3. 0.23 x 0.23 Brick Pillar
4. 0.115m Thick Brick Wall in C.M. (1:6)
5. Sand Filling
6. Brick bat flooring with cement mortar finish
7. R.R. Masonry in mud mortar and pointing in C.M. (1:6)
8. Sand filling

NOTES

1. Do not scale drawings, follow only written dimensions.
2. All dimensions are in meters unless mentioned otherwise.
3. Plinth area 250 sq.ft. — 23.2 sq.m.

OPENINGS

1. DOOR - FRAMELESS
D - 0.75 x 2.00
2. WINDOW - PIVOT (2 Nos.)
W - 0.60 x 0.90

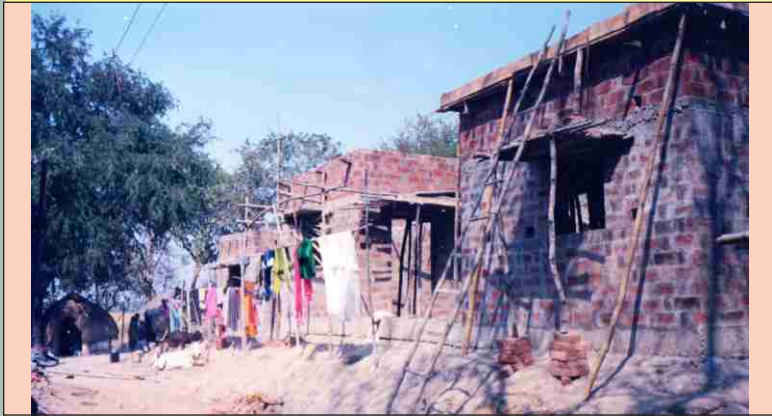


Model house -230 sq.ft





Orissa Cyclone



Constructed 67 houses at Sologaon in Balasore Dist of Odisha after the Super Cyclone named BOB -06 in the year 1999 - 2000

Speciality - Raised the plinth level by 10 feet height, Pile foundation as the soil was black cotton, Rat trap bond wall, and filler slab roofing

Installed Hand pumps - 8 nos.



1994-1999

Established "Technology Resource Center" at Anjaneyam
with the support of CAPART , NEW DELHI

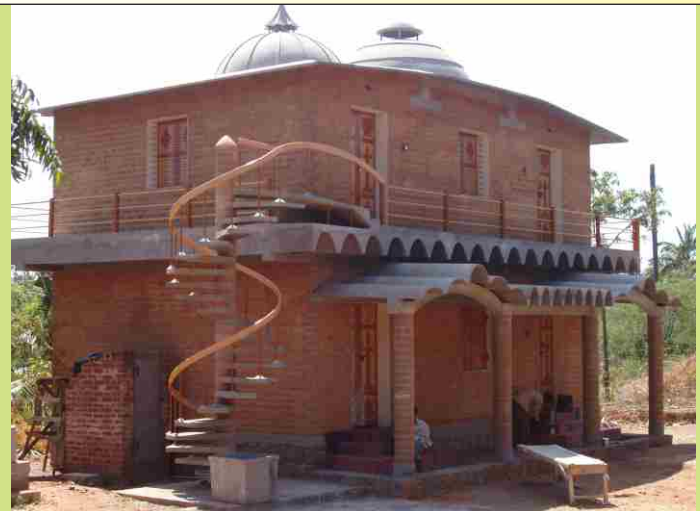
Construction of Training Hall , kitchen and dining Hall, Laboratory office building etc.,

Kitchen and Dining Hall



- ⇒ Novel Openings
- ⇒ Sunshade with corbelling
- ⇒ Catenary vault as a roofing made of bricks alone
- ⇒ No symmetry in the design
- ⇒ De-conditioning
- ⇒ Very less carbon footprint as less use cement and steel

Laboratory Building



- ⇒ Interlocking Mud blocks
- ⇒ Ferro cement vault for roofing and above additional floor constructed
 - ⇒ Domes for roofing
- ⇒ Spiral staircase with Ferro Crete steps etc.

Office Building



- ⇒ Rat trap bond walls
- ⇒ Filler slab for roofing
- ⇒ Dome structure made of bricks for 1st floor roofing.
 - ⇒ use of bottles for light
- ⇒ Brick Jalis for ventilation
- ⇒ Doors without frame etc.



Working yard for Hands on training



Micro Concrete roofing tiles technology as a substitute to Mangalore tiles



Technology Resource Center Entrance Arch

1998

Cost effective construction technologies for Architects and Mason -16 attended
Masons training for for 21 days - 22 attended

2000



- Exposure visit to Cost effective housing technologies -
 - 7 programmes sponsored by HUDCO

Bengal, Orissa, Bihar, Himachal, Jammu and Kashmir, Uttar Pradesh, Madhya Praesh, North East states - 123 participants





2000-2001

- Hudco recognised as Rural Building Center
- Pre-fabricated technologies developed
- 5000 sq.ft of Training center cum staying arrangement constructed
 - Working yard for practical demonstration constructed.

2001 -03

- Compressed Earth blocks – 21 days Programmes - 3 nos - 20 each
- Mason training and ferro-cement technologies – 2 programmes - 22 each
- Traditional techniques of floor making – 1 programme -12 participants
- Cost effective construction technologies - 3 nos - 21 days – CAPART 89 attended
 - 6 poor people houses constructed



Training Hall and staying arrangement

Technologies Adopted

- Compressed Earth Block
- Different type of filler material used for roof slab
- Varieties of ferro cement doors and windows
- Traditional oxides floorings
- Artificial Marble for flooring and walls
- Different type of Jalis
- Air circulation design at the Roof top
- Roof top water harvesting structure
- corbelling

Rural Building Center





2001 - 04

Established "Gramodaya park for Right living" with 35 Green construction technologies having panels and 8 live models of Green construction technologies



1. Dhara



Wall: Flemish bond with Decorative corners

Opening : Different types Semi Circular Arches

Roof: Different type of Filler Slabs

Flooring : Red and Black oxide Flooring

Different type of Brick Jali



2. Dhruva



Wall: Concrete Block, No plastering

Opening : Different type of Segmental Arches

Roof: Ferro Cement Roofing Channel

Flooring : Artificial Marble

3. Soma



Wall: Rat Trap bond Wall, No plastering

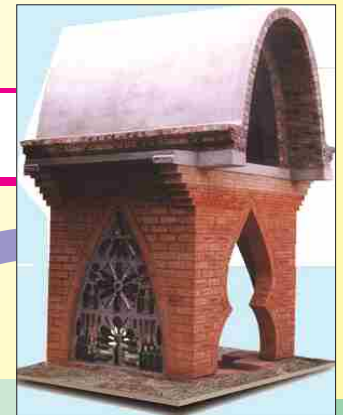
Opening : Different type of Corbeled Arches

Roof: Corbeled Arch Roof

Flooring : Kota Stone

Brick Jali

4. Apa



Wall: compressed Earth Block, No plastering

Opening : Different types of Corbeled Arch

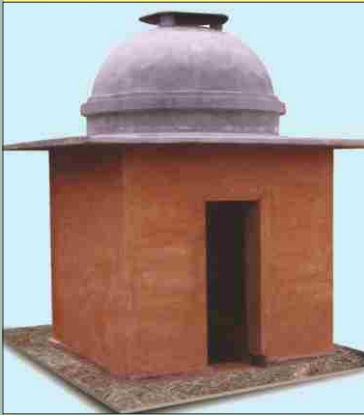
Roof: Catenary Vault (Brick)

Flooring : Kota Stone

Use of Bottles in making Brick Jali



2001 - 04



5. Anila

Wall: Rammed Earth Wall

Opening: Rectangular opening with beam

Roof: Dome (mud block)

Flooring: Mud Flooring

Roof top -Ferro cement Cap



6. Anala

Wall: Rubble Filler Block, No plastering

Opening: Semi circular & Corbelled Arches

Roof: Reinforced Brick Panel Slab

Flooring: Terracotta Tiles



7. Pratyusha



Wall: Laterite Stone

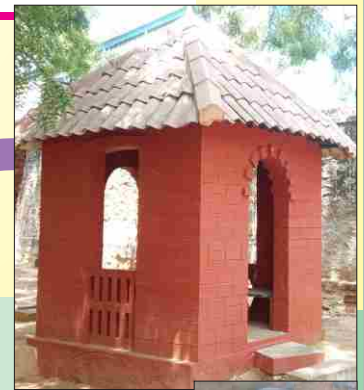
Opening: Different type of Arches

Roof: Funicular Shell

Flooring: Chettinad tiles



8. Prabhasa



Foundation: Arch

Wall: 7" Brick Wall

Opening: Different type of Arches

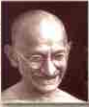
Roof: Micro Concrete Roofing tile

Different type of Brick Jalties



25 nos. of Educative exhibition panels on Eco Friendly construction Technologies

Wisdom from the wise



• Use material for construction available within a radius of 8 km. Don't spend more than what you can afford


• Architecture is for human beings and not vice versa
Hence, it should be responsive to their psycho-cultural and physical needs

• Livable, lovable yet affordable houses in tune with Nature
• SMALL is not only beautiful but is often essential and even more important than LARGE
• Cost reduction doesn't mean poor quality
• Most cost reduction methods give better quality and an Indian identity
• Stress on Indian vernacular architecture
• Free flowing lines and graceful curves create harmonious atmosphere for living
• A house should invite the dweller to be a part of it


Do / Use things differently
Do NOT
do / use different things!

But then... Unfortunately, there are other factors that come into play.

Global warming and Climate change



• Building Industry consumes 40% of energy produced and raises emission of CO₂ into atmosphere by 40%
• Indiscriminate use of natural resources - highly unsustainable, causes deforestation, and damages Eco-system.



• Result - climate change, drought and floods.

No wonder our elders and the learned advocated living in harmony with Nature!

Threat to our Eco-system



Bricks
• Manufacture 27% of energy required for house construction
• 5 clay bricks consume 1 litre of groundwater
• 1 lakh bricks emit 51 tonnes of CO₂

Fresh water
• A bag of cement mix needs 350 to 500 litres of water
• Thus, 60% volume of a building is made up of water!

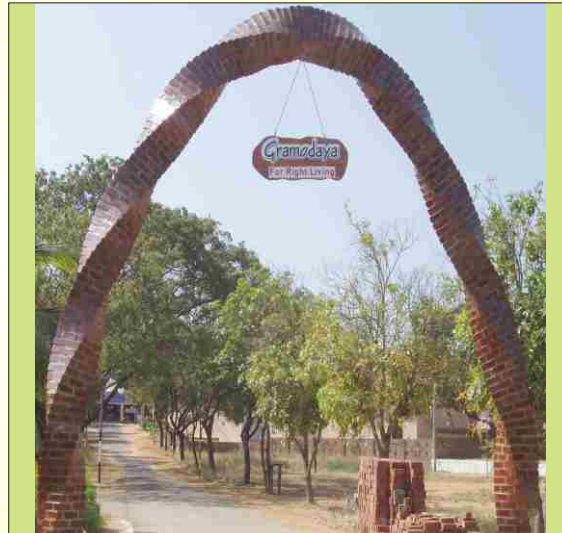
Cement
• Factories emit 90 kgs of CO₂ to produce a bag of cement

Sand
• 10 to 15 % of building material used in house construction, is precious river sand.

Steel
• Production of 1 tonne of steel emits 4.3 tonnes of CO₂

Today's building methods make an adverse impact on environment as they consume materials from non-renewable sources.

Where will this lead us ?



Different Arches is the speciality of VK-nardep - (i) Spiral Arch (ii) Compressed Earth block Arch (iii) Plastic bottle arch and (iv) Arch with Waste Mangalore tiles etc.,





2003

- Production of Compressed Earth blocks (HUDCO Rural building center) – 3 progs. - 29 masons
- Cost effective construction technologies (CAPART) 1 prog - 21 days - 29 NGO's attended

2004

- Construction technologies including Ferro-cement Rural Building Center – 5 progs. - 6 days - 54 attended
- Construction technologies for SHG Members Kanyakumari, Tirunelveli and Thoothukkudi – 3 progs. - 6 days - 83 attended

2005

- Construction technologies for SHG members (Tsunami programme) Thanjavur, Perambalare, Thiruvarur, Ramnad, Kanyakumari, Nellore, Madurai – 8 prog. – 185 womens
- Construction of Resource Center at State Institute of Rural Development – 900 sq ft.





2005 -06

- Construction of Resource Center at State Institute of Rural Development – 900 sq ft.
Construction technologies – 2 progs. -6 days - 54 attended

2007-09

- Construction of Core houses -8 nos during training - 230 sq.ft area
- Awareness programme on Disaster Resistant housing 12 prog -525 attended
 - Disaster Resistant Housing for Mason (UNDP)
 - 12 progms. - 6 days each - 191 attended
 - Disaster Resistant Housing for Engineers and Architects (UNDP)
 - 2 progms. - 2 days each - 76 attended
- Production of CEB and Ferro-cement technologies (BMPTC, New Delhi)
 - 2 progms 6 days each – 40 attended





2008-09

- Construction of Avvai Agam used FAL-G bricks (Flyash, Lime and Gypsum) and Ferro cement Vaults and Ferro cement curvature door technologies



2009 -10

Training programmes for Architects and Engineers (BMTPC, New Delhi supported)
– 2 Programmes – 3 days - 141 attended





2012-13

Training programmes for construction supervisors (BMTPC, New Delhi supported)
– 2 progs - 3days– 100 attended
Green construction technologies for college students - 3 days - 40 nos.

2012- 13

Training programmes for Engineers and Supervisors (BMTPC, New Delhi) - 3 days- 33

2012 -13

Carbon Foot Print of a building – DST, New Delhi - 3 days - 40 attended

2014 -15

- Vernacular architecture DST , New Delhi– 2 progs – 2 days - 84 attended
- Construction industry and carbon foot prints - 54 attended
- Helped Constructed 10 houses at Kanyakumari Dist



Joy of getting a good quality
compressed Earth Block



Showing the Rat trap bond



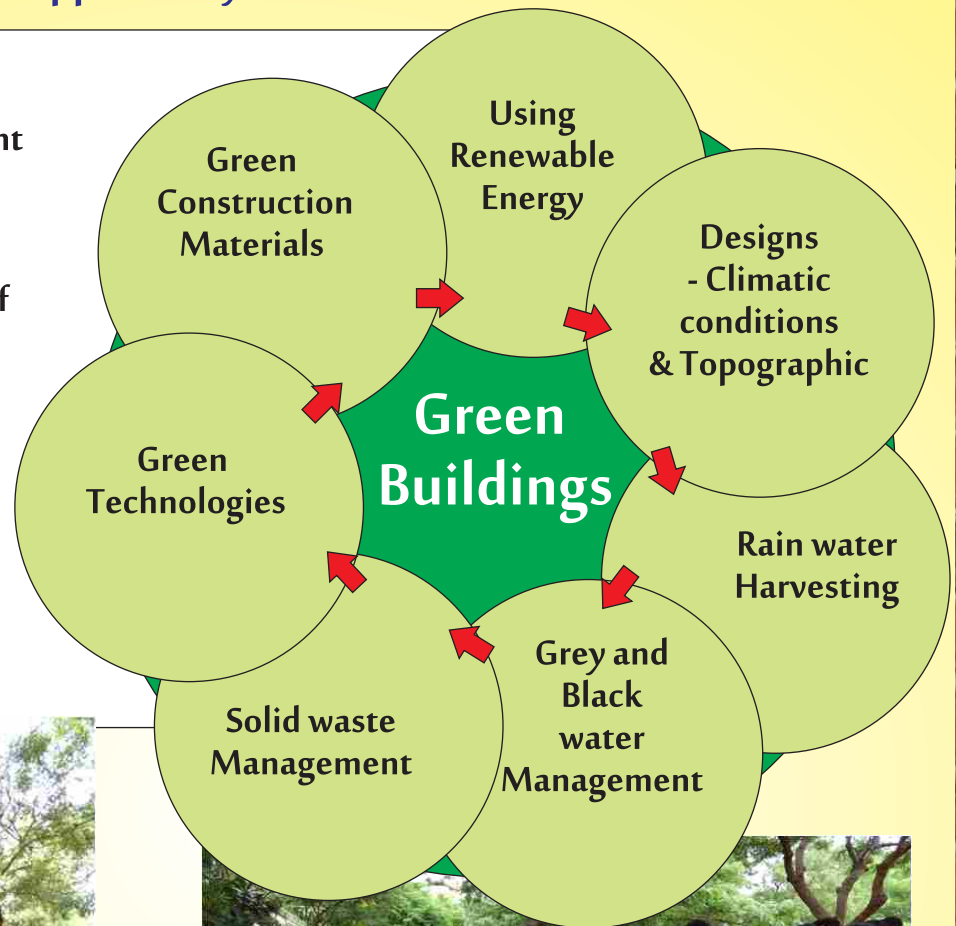
House of Stakeholders



2010-15

Dissemination of Eco-friendly cost-effective Construction technologies supported by DST , New Delhi

(I) In this project
tried to measure Eco Foot Print
Embodied energy,
Operational Energy
and Life cycle assessments of
(II) Eco-friendly
construction technologies
Trained Many
Engineering students
Research scholars,
Supervisors,
Engineers and Architects





2015-16 Avvaiyar Green Health Corner



Model design for Health corner



Rejected mangalore tile arch

2015-17 Renovation of Mohabeer Dharmashala (Heritage Building)

200 years old abandoned building reconstructed by using traditional techniques - Use of lime , Jaggery and Kaduka seeds

Madras Terrace Roofing , Old domes , Pre fabricated staircase steps and Amphitheater etc.,

Green Rameswaram Project is housed in this building





Before Renovation



After Renovation





Before Renovation

After Renovation





Mohabeer Dharmashala - Before Renovation



After Renovation - Green Rameswaram project Office





2017 -18

Compressed Earth Block – DST, New Delhi -4 days - 18 attended

Training on Ferro-cement technologies – DST, New Delhi - 7 days - 16 attended

Traditional flooring technology – DST, New Delhi - 6 days - 16 attended



2019-20

Mud pot arch Entrance of Varma center (used damaged mud pots, tiles and plastic bottles





2015-20

Dissemination of Eco-friendly cost effective construction technologies / integrated package for the replacement of wood in buildings with ferro-cement components -DST
New Delhi

- 35 programmes - 1380 participants



Ferro Cement Doors with Design



Ferro Cement water fountain



Multiple usages of Ferro Cement Technologies



Book shelf -cupboard



Display Shelf



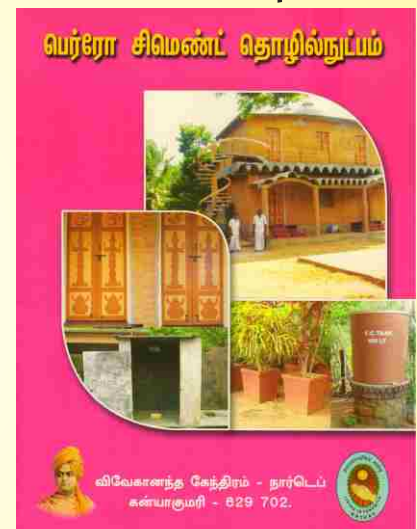
Vault for partician



Toilet



Beautiful Art piece



Book in Tamil

2019-20

Constructed a building at Rameshwaram using different Green building technologies

staying arrangement for
social workers which
includes kitchen and store

Technologies adopted

Wall - Rat trap bond
Roof - Filler slab rood
Joinery - Different type of Arches
Flooring - Traditional oxide flooring
Ferro cement doors and windows





Training Modules



Training on Green Architecture

Training Module : CT-01

Duration : 3 days Residential

Simple stay and vegetarian food

- ① Eco Details about Foundation, walling,
- ① Flooring, roofing and joinery etc.,
- ① Embodied Energy, Operational Energy
- ① and Life cycle assesment.
- ① Eco friendly construction practices.
- ① Renewable energy system for efficient home
- ① Roofwater harvesting
- ① Waste water management
- ① Solid waste manangement
- ① Practicals



Target group:

Engg. Students interested in Eco friendly construction technologies/Architects/ Masons/ Asst.masons/Engineering students.

Note:

Date will mentioned once 15 persons joined or
Join as a group of 15 persons



Training programme on "Ferro Cement Technology"

Training Module : CT-02

Duration : 6 days

(Residential - Simple stay and veg. food)

Subjects

- ★ Doors and Windows
(Platform making, Mesh laying , casting, curing, Handling, fittings etc)
- ★ Ferro Cement Roofing channels
(Different type of Moulds, casting, Transport, fittings etc.,)
- ★ Ferro Cement Water Tanks
(Different Sizes)
- ★ Ferro Cement Toilet & Bio gas Plants
- ★ Miscellaneous Items
(shelf, decorative items, name boards, partition walls, toilets etc.)
- ★ Precautions, Do 's & Don'ts & Repairing and Maintenance etc.,



Target group:

Engg. Students interested in Eco friendly construction technologies/Architects/ Masons/ Asst.masons/Engineering students.

Note:

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Training on "Production compressed Earth block"

Training Module : CT-03

(Residential -simple and vegetarian food)

Duration :6 days

Subjects

Soil Identification
Production of compressed Earth block
Block yard organisation
Mass production
Manufacturing of different type of block and usages
Mud block testing
Rammed Earth wall construction
Wall construction



Sieving the soil



Measuring the soil



Dry mixing sand, soil & cement



Humid mixing



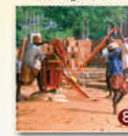
Filling up the hooper for making a block



Compressing the earth



Taking out CEB



Stocking the block for curing



Note:

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Target group:

Engg. Students interested in Eco friendly construction technologies/Architects/ Masons/ Asst.masons/Engineering students.



Training on Pre-cast Technologies

Training Module : CT-04

Duration :6 days

(Residential -simple and vegetarian food)

Subjects

- ★ Reinforced Brick Slab roofing
- ★ Funiculars Shell roof
- ★ Jack Arch Roof
- ★ Ferro Crete Technologies
- ★ Chettinad tiles
- ★ Door and Window frames
- ★ F.C.Wall



Note:

Date will mentioned once 15 persons joined or Join as a group of 15 persons

Target group:

Engg. Students interested in Eco friendly construction technologies/Architects/ Masons/ Asst.masons/Engineering students.



Training on "Arches Vaults and Dome"

(Residential -simple and vegetarian food)

Training Module : CT-05

Duration :6 days

- ✦ Appropriate Technologies
- ✦ Different type of Vaults
- ✦ Different type of Domes
- ✦ Different type of Vault
- ✦ Different type of Arches

Semi Circular

Segmental

Pointed

Corbel etc.,

Note:

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Join as a group of 15 persons



Target group:

Engg. Students interested in Eco friendly construction technologies/Architects/ Masons/ Asst.masons/Engineering students.



Training on Masonry Technologies

Training Module : CT-06

Duration :6 days

(Residential -simple and vegetarian food)

Subjects

- ★ Rat trap bond
- ★ Rammed Earth wall
- ★ Rubble filler block
- ★ Filler slab roofing
- ★ Different type of Arches
- ★ Polished oxide flooring
- ★ Artificial marble.

Note:

Date will mentioned once 15 persons joined or
Join as a group of 15 persons



Target group:

Engg. Students interested in Eco friendly construction technologies/Architects/ Masons/ Asst.masons/Engineering students.



Organic Architecture

Organic architecture is rooted in a passion of life; nature and natural forms, and is full of vitality of natural world with its logical forms and processes.

Emphasizing beauty and, its free flowing curves and expressive forms are sympathetic to the human body, mind and spirit. In a well designed “organic” building, we feel better and freer.



The Secretary
Vivekananda Kendra -nardep
Kanyakumari -629 702
Phone :04652 - 246296,298294
Email: vknardep@gmail.com



www.vknardep.org, www.greennameswaram.org