THE 10th GRIHA SUMMIT-2018

13th Dec., 2018, The Ashok, New Delhi

Sustainable Re-emerging Modified Cost Effective Building Technologies

PRAMOD ADLAKHA

Managing Director

- Adlakha Associates Pvt. Ltd
- Adlakha Affordable Homes LLP
- Aap Ka Awas LLP

Office :

F-70, Bhagat Singh Mkt, Near Gole Market,
Near Connaught Place, New Delhi - 110001
Phone No.: 011-23344471, 72
Email: adlakhaoffice@gmail.com

6 Principles applicable for affordable sustainable housing

1.	Siting, Form & Design:	Building orientation, massing, volume, building form, natural ventilation, day lighting & open spaces.
2.	External development & landscape	Hardscape & softscape, noise mitigation, vegetation w.r.t. shadows, heat island effect, parking, ecology, biodiversity, water conservation, pedestrian access, lighting & Signages
3.	Envelop Optimization	Performance oriented components of building - walls, roof, fenestration, floor & surface finishes.
4.	Materials	✓ Structural & finishing materials ✓ Locally available material ✓ Recycled, renewable & indigenous
5.	Building services optimization	✓ Climatic responsive design for reduction in heating, cooling & lighting loads ✓ Conservation practices ✓ Renewable energy utilization
6.	Construction practices	✓ Preconstruction requisites ✓ Construction management ✓ Monitoring & control of environment concerns ✓ Effective use of water ✓ Waste management ✓ Sustainable Construction Methodology ✓ Disaster risk mitigation during construction

Sustainability is part of our DNA

(3-M) Three attributes for Sustainable **Living** :

- **Minimum possession**
- **Minimum consumption**
- **Minimum wastage**

These attributes are also applicable for

Sustainable Building

Why Alternative Technologies ?

ISSUES

❖ The climate change	❖ The environment
❖ The carbon foot print	❖ National resources
❖ The energy conservation	❖ Cost effective & affordability
❖ Quality product	❖ Semi automatic & mechanisation

Become key factors demanding change

in:

(i) Methodologies of planning & construction

and

(ii) Exploration of New Innovative Green Materials & Technologies

"MADE IN INDIA"

Technologies for Sustainable Housing

Our Ancient Indus Civilization
is
The Learning Tool of Technology

Indian heritage technologies are temples of modern India.

Many Ancient Buildings and Monuments are classic examples of sustainable buildings

"MADE IN INDIA"

Technologies for Sustainable Housing

Based on ancient example of sustainable buildings "Made in India"

Innovative Alternative Technologies Used For Affordable Housing

Sustainable Affordable Housing

FOR ROOFING:

- R.C. Ribbed Slab
- Precast Channel Roofing
- Precast RC Plank Roofing
- Precast RC Ferrocement Panel Roofing
- Precast RC Hollow Slab Roofing
- Cast-in-Situ Hollow Slab Roofing
- R.B. Filler Slab Roofing
- R.B.C. Roofing
- Precast R.B. Panel Roofing
- Precast R.B. Arched Panel Roofing
- CRF Sections and Ferrocement Panel Roofing
- Precast Ferrocement Segmental Shells Roofing
- Precast RC panel roofing
- Funicular shell roofing

FOR WALLING:

- Rowlock bond (Rat – trap bond),
- Stretcher bond,
- Hollow concrete blocks,
- Interlocking mortar less block walking,
- Perforated mechanized modular bricks,
- FAL-G modular bricks,
- Stone block masonry.
- AAC blocks (in multistoried)
- Cement Flyash mortar

SHEAR WALL TECHNOLOGY

OTHER COMPONENTS:

- Precast Ferrocement Cupboard & Kitchen Shelves
- Precast Ferrocement Sunshades
- Precast R.C. Lintels
- R.B.C. Lintels
- Precast Ferrocement steps
- Precast concrete door & window frames
- Ferrocement water tanks
- RCC monolithic technology
- Precast elements such as
  - Lintels,
  - Sunshades,
  - Kitchen slabs,
  - Water tanks,
  - Stair case steps,
  - Drains and chambers,
- Under reamed piles (for load bearing walls)
- Interlocking pavers
- CRF beams

Re-emerging modified cost effective technologies

In Sixties & Seventies
(Stage 1 Prefabrication)

Based on principles of sustainability, Partial small prefab technologies with conventional materials were developed :

For Ease

➢ Ease in casting	➢ Ease in understanding by masons
➢ Ease of erection	➢ Ease in understanding by small contractors

"MADE IN INDIA"

Technologies for Sustainable Housing

Re-emerging modified cost effective technologies

Stage 2 : Prefabrication and Mechanization

(After 5 Decades of R&D and Implementation on ground)

- ❑ Technologies have been modified
- ❑ Mechanisation introduced
- ❑ Assured better quality control
- ❑ Systems are simplified for ease of construction
- ❑ Negligible Capital Investment
- ❑ D I Y (Do it yourself) methodologies
- ❑ Assured cost effectiveness
- ❑ Assured faster construction

But ,why are we afraid of New Materials & Technologies ?

Why we copy West ?

Recognise & motivate our own technocrats.

We have enough brain to develop "Made in India" and "Made for India" technologies.

Which are cost-effective-green-sustainable.

Save foreign exchange - motivate

Develop new entrepreneurs – Create jobs

The Development of Appropriate Technologies for

Quality - Affordable – Housing

have to pass through various stages of improvement

.

➢ Production process	➢ Durability
➢ Execution process	➢ Safety
➢ Quality control	➢ Ease in implementation
➢ Cost reduction	➢ Acceptance by community

Continuous R&D is the key factor for sustainability of technologies

"MADE IN INDIA"

Technologies for Sustainable Housing

However successful Promotion & Adoption of New Technologies require

Enough time to prove durability and advantages to existing one

Sometimes

It takes decades, before they are widely accepted

Although several examples of housing projects with new materials & technologies exist in few cities, however, they are not the "norms"

"MADE IN INDIA"

Technologies for Sustainable Housing

Why we don't see this

Because

Construction is a "System" with following parameters :

- ❑ Technologies
- ❑ Labour
- ❑ Contracting norms
- ❑ Financing
- ❑ Performance measures
- ❑ Standards

- ❑ Conventions
- ❑ Aesthetic
- ❑ Tastes
- ❑ Safety norms & related perceptions
- ❑ Longevity

"MADE IN INDIA"

Technologies for Sustainable Housing

Cost Effective On-site Modified Re-emerging Technologies

Stage 2 : Prefabrication and Mechanization

S.N.	Alternative Technologies
A. Foundation	
MRe - 1	Flyash-concrete-stone block masonry
B. Walls	
MRe - 2	(Modular 200mm) Load bearing flyash bricks system
MRe - 3	(Modular 200mm) Load bearing REB (mechanised) system
MRe - 4	Load bearing interlocking mortarless block system
MRe - 5	190mm load bearing stretcher bond system
MRe - 6	Load bearing modified RHCM system
MRe - 7	Row-lock bond walling system
MRe - 8	AAC/ CLC block wall system
C. Floor / Roofing	
MRe - 9	Mechanised RC ribbed slab system
MRe - 10	Mechanised RC planks & joists system
MRe - 11	Mechanised ferro-crete small panel system
MRe - 12	Mechanised precast hollow slab (kular) system
MRe - 13	Mechanised precast RB panel system

Cost Effective On-site Modified Re-emerging Technologies

Continued...

Stage 2 : Prefabrication and Mechanization

S.N.	Alternative Technologies
MRe - 14	Modified D.C. shell system
MRe - 15	Precast ferrocement shell system
MRe - 16	Precast ferrocrete channel system
D. Door / Window frames	
MRe - 17	Precast R.C.
E. Sunshades	
MRe - 18	Precast ferrocement
F. Staircase	
MRe - 19	Steps (Tread / Riser) precast ferrocement
G. Kitchen platform & Other shades	
MRe - 20	Precast ferrocement
H. External finishing	
MRe - 21	Exposed with water repellent silicon coat
I. Vernacular technologies	

Affordability In Technology

Savings in cost

Item	Savings in Cost
Foundations	10%
Walls	20%
Intermediate floors & roof	21%
Stair case	30%
Sunshades Cum Lintels	25%
Kitchen Platforms	30%
Water Tanks	20%
D/W Frames	30%

Sustainable Affordable Housing

Affordability In Technology
CAPITAL INVESTMENT of Mechanization

(For 20 lacs Sq ft built-up area for roofing) (Time period: 27 months)

(5500 Dwelling Units) G+3

Roofing System :-

RC planks casting machines 7 Nos @ 1,00,000	=	7.00 lacs
Twin moulds 14 Nos @ 20000	=	2.80 lacs
Pellets 700 Nos @ 1000	=	7.00 lacs
MS Channels for Joists 70 Nos. @ 2500	=	1.75 lacs
MS Angles for Steps, Sunshades, Shelves	=	0.50 lacs
Total		**20.05 lacs**
Open platform (20,000 sft) & Temporary shed (10,000 sft)	=	10.00 lacs
Total		**30.05 lacs**
Cost of mechanisation (Per Sft.)	**-**	**Rs. 1.50**

Walling System :-

Block Making Machines		
FOB Price	=	2,16,00,000
Insurance, Freight, duties 26%	=	25,92,000
CIF Price	=	3,04,81,920
Batching Plant (indigenous)	=	50,00,000
Total		**3,54,81,920**
Amortised Cost of Equipment (For 30 months project)	=	1,26,72,115
Residual value of equipment (For future use)	=	2,28,09,305
Cost of Mechanisation (Per Sft.)	**-**	**Rs. 11.50**

Ferrocement System :-

Staircase, Shelves, Platform, Sunshades, Water tanks, etc.		
Capital Investments	=	5.00 (Lacs)
Cost of Mechanisation (Per Sft.)	**-**	**Rs.0.25**

Total Cost of Mechanisation (1.50 + 11.50 + 0.25) = Rs.13.25 per sft

Affordability In Technology
Savings in time

S. No	Description	Conventional	Cost effective Proposal	Time period for block of 16 D.U.
1.	Foundation	6 days	6 days	6 days
2.	Superstructure: Casting of column, beams, slabs including shuttering, placing reinforcement, casting and removal of form work (each floor)	4 x16 = 64 days	5 days (each floor) (precast slab)	4 x 5 = 20 days
3.	Raising walls and Door / Window frames (each floor)	4 x 3 = 12 days	4 days (including lintel band)	4 x 4 = 16 days
4.	Internal plastering (each floor)	4 x 2 = 8 days	No ceiling & wall plaster	-
5.	External plastering (each floor)	4 x 3 = 12 days	No Ext. plaster (POP only)	-
6.	Flooring (each floor)	4 x 1 = 4 days	1 day	4 x 1 = 4 days
7.	Plumbing & Elec. (each floor)	4 x 5 = 20 days	5 days	4 x 5 = 20 days
8.	D/W shutters & Painting (each Floor)	4 x 1 = 4 days	1 day	4 x 1 = 4 days
	One Block of 16 Dwelling Units	**130 days**		**70 days**

Affordability In Technology
Savings in Energy

- ✓ **Reduction in consumption of resource materials**
  - *Bricks / Blocks*
  - *Concrete*
  - *Cement*
  - *Sand*
  - *Steel reinforcement*
- ✓ **Less consumption means saving of embodied energy**
- ✓ **Elimination of ceiling plaster**
- ✓ **Almost no external plaster / form work**
- ✓ **Reduction in internal wall plaster**
- ✓ **Provide better insulation**
- ✓ **On site production – Saves fuel on transportation**
- ✓ **Low maintenance**
- ✓ **Low energy light equipments required**
- ✓ **Elimination or reduction in form work**

Affordability In Technology

Savings in Water Consumption

- ✓ Reduced water consumption during construction – due to less volume of masonry, concrete, no ceiling plaster, no external plaster.
- ✓ The precast slab panels, stairs, sunshades, shelves (thin elements) are cured with spray of water.
- ✓ The mechanised & high strength blocks, have high compressive strength and low water absorption.
- ✓ Ferrocement elements being thin elements – consume less water.
- ✓ Hardy plants species which require less water (Acacia Arabica, Baryan, Pelpal, Ashok, Cedar etc.)

Onsite Prefab Elements Affordable - Machines

*** Doesn't require "Skilled" labour, But require "Training"**

Sustainable Affordable Housing

Alternate Station Hydraulic Brick Press

Bi-Directional Vibro Press

Stationary Block Machine

Concrete Block Machine

Solid/Hollow Concrete Block Machine (Egg laying Type)

Solid/Hollow Concrete Block Machine (Standing Type)

Cement mortar mixer spray plaster machine

Onsite Prefab Elements Affordable - Machines

* Doesn't require "Skilled" labour, But require "Training"

Continued…

Sustainable Affordable Housing

Solid/Hollow Concrete Block Machine (Handheld Type)

Ferrocement Roofing Channel Machine

Compressed Earth Block Machine

Compressed Earth Block Machine (Hydraform)

Ferrocement Wall Panel Machine

TNG Rural Housing Kit

Onsite Prefab Elements Affordable - Machines

* Doesn't require "Skilled" labour, But require "Training"

Continued…

Sustainable Affordable Housing

Precast RCC Plank Machine (Egg Laying Type)

RCC Joist Casting Machine (Egg laying Type)

C-Brick Machine

Micro Concrete Roofing Tile Machine

Ferrocement C-Beam Machine

Precast L-Panel Machine

Onsite Prefab Elements Affordable - Machines

* Doesn't require "Skilled" labour, But require "Training"

Continued…

Terrazo/ Chequered Tile Machine

Precast concrete Door/ Window Frame Machine

Combination Machine

Stone/Coal Disintegrator

Bar and Pipe Cutting Machine

Multipurpose Stone Processing Machine

Source : BMTPC & Other manufacturers

The Past & Present

Sustainable Affordable Housing

EWS HOUSING - YEAR 2006

RAJIV GANDHI HOUSING, BAWANA - 3164 HOUSES

TECHNOLOGIES

Roofing

Precast RC planks & joists roofing

Precast ferrocement elements

Walling

Perforated mechanized modular bricks

FAL-G modular bricks

Other Components

Single stack system of plumbing

Sustainable Affordable Housing

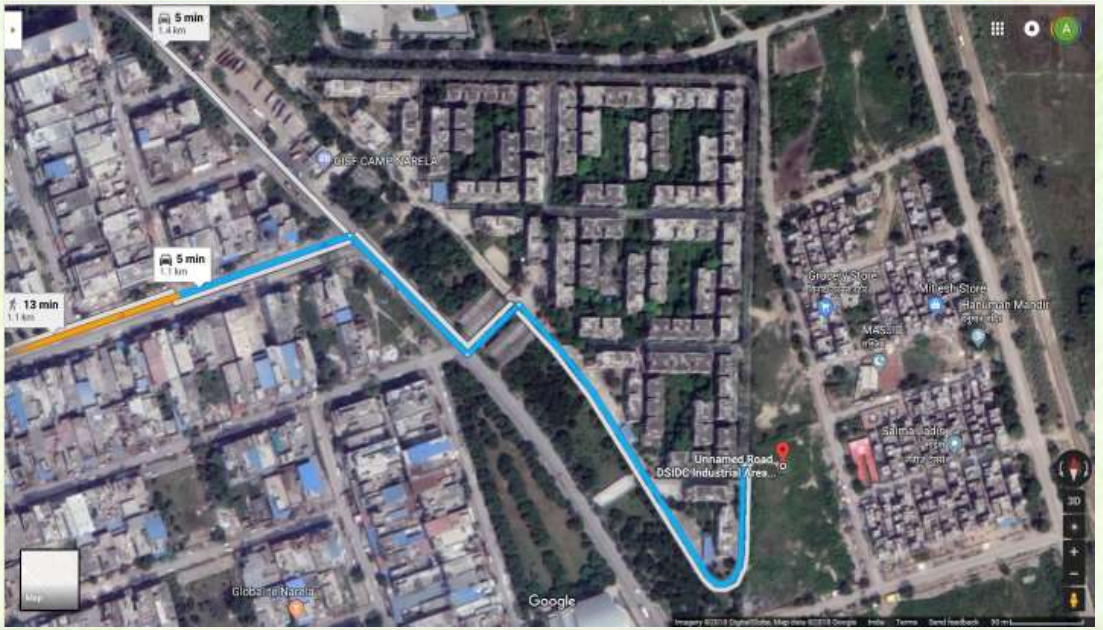
EWS HOUSING - YEAR 2008
BAWANA, DELHI -1184 HOUSES

TECHNOLOGIES

- Modular perforated Brick Walls
- Precast RC Planks & Joists Slab
- Precast Ferrocement Elements

Sustainable Affordable Housing

EWS HOUSING - YEAR 2006
NARELA, DELHI - 1892 HOUSES



TECHNOLOGIES

- Modular perforated Brick Walls
- Precast RC Planks & Joists Slab
- Precast Ferrocement Elements

Sustainable Affordable Housing

EWS HOUSING - YEAR 2009

NARELA (NEAR CETP), DELHI, 1652 HOUSES

TECHNOLOGIES

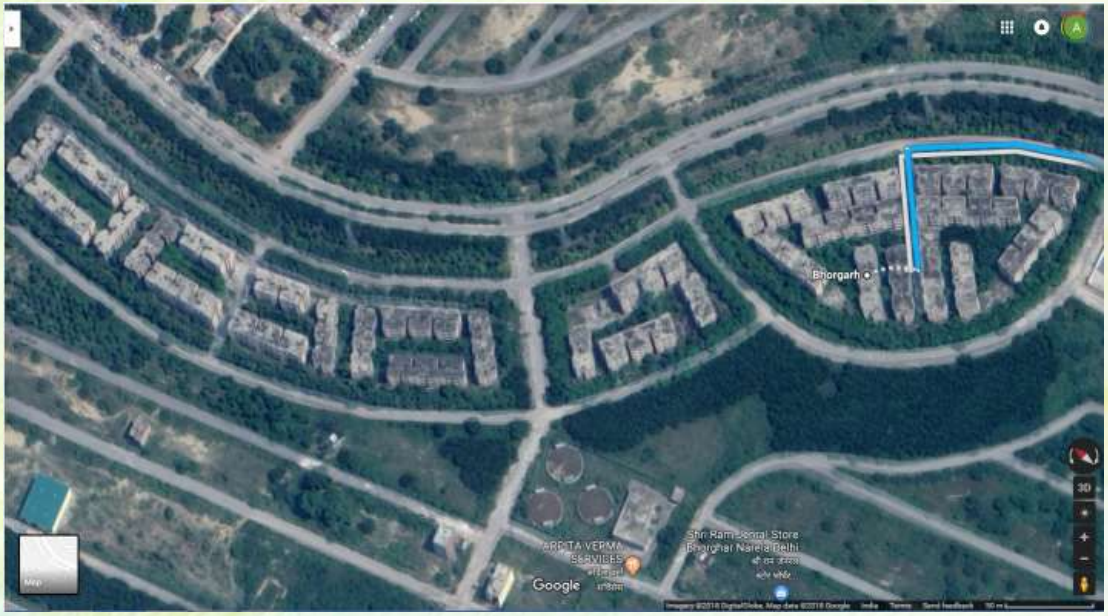
- Modular perforated Brick Walls
- Precast RC Planks & Joists Slab
- Precast Ferrocement Elements

Sustainable Affordable Housing

HOUSING FOR URBAN POOR – YEAR 2011
BHORGARH, DELHI, 1272 HOUSES

TECHNOLOGIES

- Modular perforated Brick Walls
- Precast RC Planks & Joists Slab
- Precast Ferrocement Elements



Sustainable Affordable Housing

EWS HOUSING - YEAR 2010
BAPROLA, DELHI, 5568 HOUSES

TECHNOLOGIES

- Modular perforated Brick Walls
- Precast RC Planks & Joists Slab
- Precast Ferrocement Elements

Sustainable Affordable Housing

EWS HOUSING - YEAR 2008
BAWANA, DELHI – 896 HOUSES

TECHNOLOGIES

Monolithic technology

Sustainable Affordable Housing

EWS HOUSING – YEAR 2016
BAKARWALA, DELHI – 240 HOUSES

TECHNOLOGIES

- Mechanized bricks
- Flyash bricks
- Precast R.C. Planks and Joists Roof

Sustainable Affordable Housing

EWS HOUSING

POOTHKHURD , DELHI - 10140 HOUSES

TECHNOLOGIES

- RC Planks & Joists Roof In framed structure
- Flyash brick walls

Sustainable Affordable Housing

EWS HOUSING

KALKAJI, DELHI - 3024 HOUSES

TECHNOLOGIES

- Waling - CLC Blocks

Google View

Sustainable Affordable Housing

EWS HOUSING

FARIDABAD & PALWAL (ERA GROUP) - 578 HOUSES

TECHNOLOGIES

- Modular perforated bricks
- Precast RC Planks & Joists Roof

Era Adel Divine, Era Divine Court, Era Redwood Residency

Sustainable Affordable Housing

EWS HOUSING

SUSHANT GOLF CITY, LUCKNOW

2750 HOUSES

TECHNOLOGY :- Monolithic RCC

Sustainable Affordable Housing

EWS HOUSING

ASHRRAY, SULABH AWSAS YOJANA, LUCKNOW

4500 HOUSES

Sustainable Affordable Housing

EWS HOUSING - YEAR 2009
GHOGHA, DELHI – 3680 HOUSES

TECHNOLOGY :- Monolithic RCC

Sustainable Affordable Housing

EWS HOUSING - ONGOING
TIKRI KALA, DELHI – 4560 HOUSES

TECHNOLOGIES

- RC Planks & Joists Roof In framed structure
- Flyash brick walls

Sustainable Affordable Housing

EWS HOUSING - YEAR 2013
BAWANA, DELHI – 704 HOUSES

TECHNOLOGY

Monolithic Technology

Sustainable Affordable Housing

EWS HOUSING - YEAR 2010
OMICRON, GREATER NOIDA, 1848 HOUSES

TECHNOLOGIES

- Modular perforated Brick Walls
- Precast RC Planks & Joists Slab
- Precast Ferrocement Elements

Sustainable Affordable Housing

LIG AFFORDABLE HOUSING

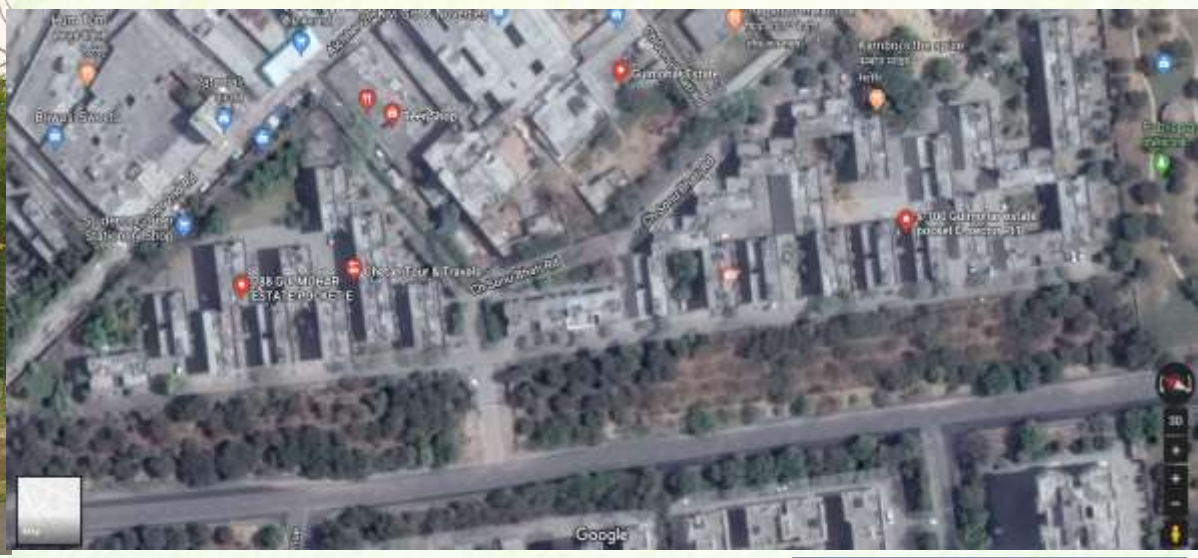
GREATER NOIDA - 800 HOUSES

Cassia Estate

TECHNOLOGIES

Walls :- Rat Trap Bond

Gulmohar Estate



Sustainable Affordable Housing

AFFORDABLE HOUSING - ONGOING

DELHI POLICE HOUSING, DHEERPUR, DELHI - 5202

TECHNOLOGY

Projects using Monolithic Technology

Sustainable Affordable Housing

AFFORDABLE HOUSING - YEAR 2013

INNO GEOCITY, CHENNAI - 500 HOUSES

TECHNOLOGIES

- Hydraform interlocking block walls
- Precast RC Planks & Joists Roof
- Stone Block masonry in foundation
- Precast Boundary wall

Sustainable Affordable Housing

WORKER'S HOUSING

ANJAR & VAPI, GUJRAT – 669 Houses

TECHNOLOGIES

- Hydraform interlocking block walls
- Precast RC Planks & Joists Roof
- Precast sunshade, Ferrocement staircase
- Concrete Block masonry in foundation
- Precast Boundary wall

Sustainable Affordable Housing

AFFORDABLE CORPORATE STAFF HOUSING - YEAR 1992

TECHNOLOGIES

•Filler slab

DAURALA ORGANICS LTD. U.P.

TECHNOLOGIES

•190 mm wall stretcher bond
•Precast ferrocement panel slabs

DAURALA SUGAR LTD. U.P.

Sustainable Affordable Housing

AFFORDABLE CORPORATE STAFF HOUSING - YEAR 1992

MAWANA SUGAR WORKS

TECHNOLOGIES

ROOFING:

- Precast RB Panel
- RC Panel
- RC Ribbed slab

WALLING:

- Stretcher bond
- Rat trap bond

Sustainable Affordable Housing

AFFORDABLE CORPORATE STAFF HOUSING – YEAR 1983 FOR VAM ORGANIC CHEMICALS LTD. AT GAJRAULA, DISTT. MORADABAD, U.P. – 144 HOUSES

TECHNOLOGIES

- **ROOFING: FILLER SLAB**
- **WALLING – LOAD BEARING WALLS (Exposed)**

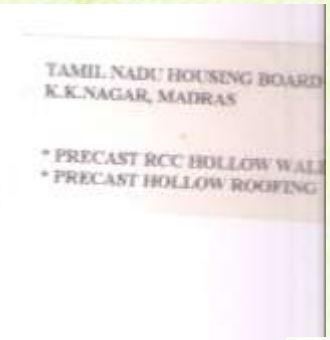
AFFORDABLE CORPORATE STAFF HOUSING - YEAR 1984
MODI XEROX, RAMPUR, U.P.

TECHNOLOGIES

- **ROOFING: FILLER SLAB**
- **WALLING – LOAD BEARING WALLS (Exposed)**

Sustainable Affordable Housing

DEMONSTRATION HOUSE - YEAR 1976
K.K. NAGAR, CHENNAI



TECHNOLOGIES

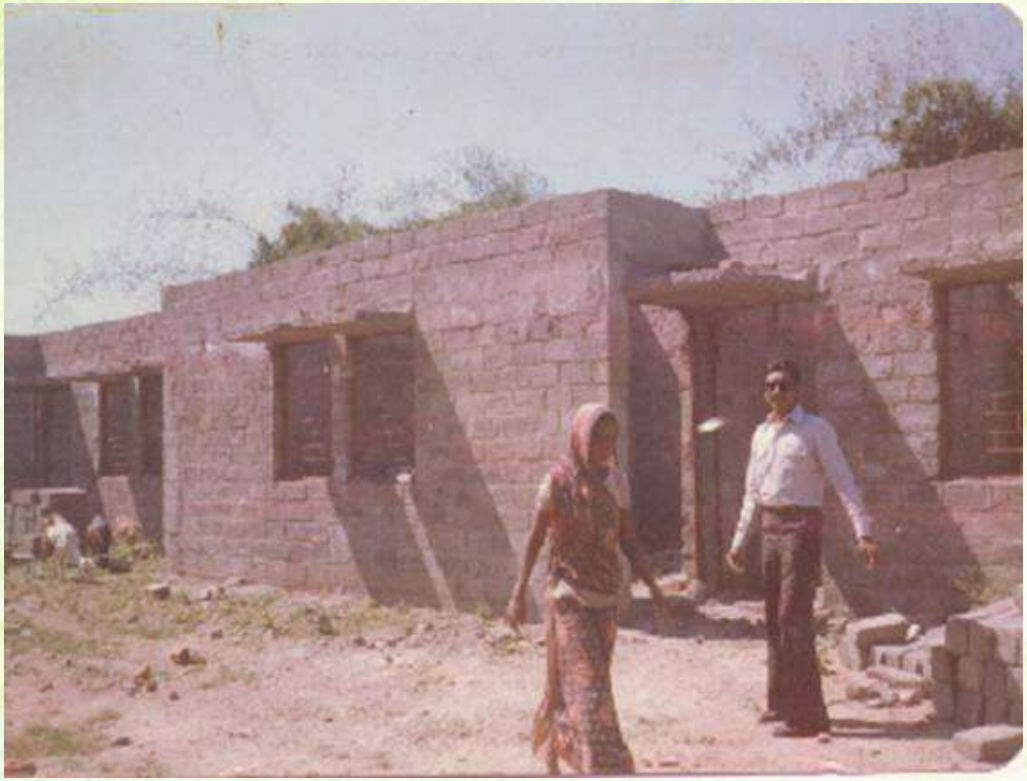
ROOFING
- **Precast hollow roofing**

WALLING
- **Precast RCC hollow wall**

EWS HOUSING BHOPAL DEVELOPMENT AUTHORITY - YEAR 1978

TECHNOLOGIES

- Under Reamed Piles
- Stone Block Masonry
- Walls
- Precast Cast-in-situ Hollow 'Kular' RCC Slab



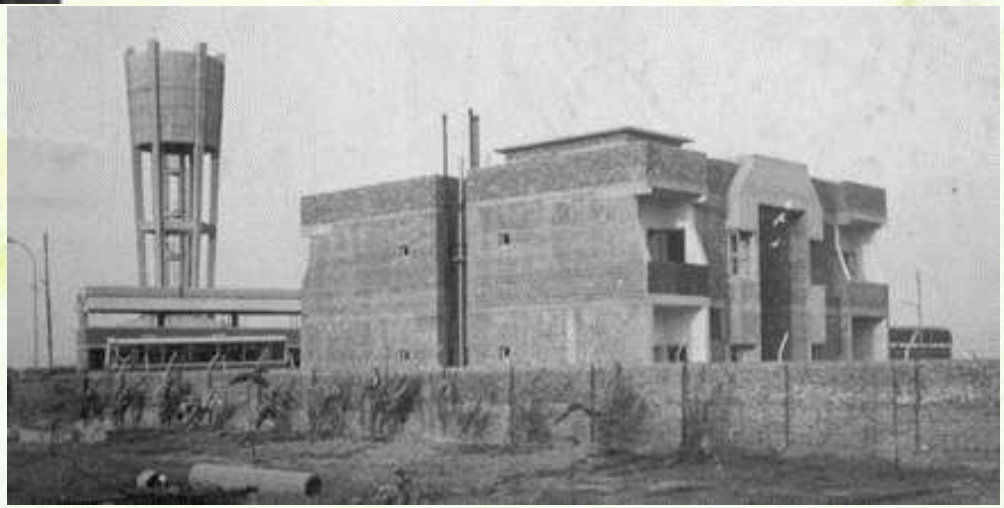
Sustainable Affordable Housing

AFFORDABLE CORPORATE HOUSING - YEAR 1993

DCM TOYOTA LTD, GREATER NOIDA, U.P.

TECHNOLOGIES

- Filler slab roofing
- Stretcher bond 190mm wall



Sustainable Affordable Housing

CORPORATE STAFF HOUSING

MODI FIBER CO. LTD. MODI NAGAR

TECHNOLOGIES

- **Filler slab roofing**

Sustainable Affordable Housing

WORKER'S HOUSING FOR PUNJAB KHAND UDYOG LTD. - YEAR 1982
(PUNJAB GOVT. UNDER TAKING)
AT GURDASPUR & ZIRA – 120 HOUSES

ROOFING
- Precast RC Plank & Joists

WALLING
- Stretcher bond
- Cement – Lime Plaster

Sustainable Affordable Housing

DEMONSTRATION HOUSES - YEAR 2010 AMETHI, U.P.

ROOFING

- **Filler slab roofing**

WALLING

- **Rat trap bond**

Sustainable Affordable Housing

POETRY IN BRICKS - YEAR 2009
MANESAR, GURGAON

VERNACULAR TECHNOLOGY

THE THREE MANTRAS OF SUCCESS IN TECHNOLOGIES

"MANTRA 1"

We are all players in the game of "Technology"

It is not the skill.

It is the game spirit that wins the game.

We are the "trustee" of knowledge;

But to sustain ourselves
We have to win the "Trust" of the people
and the society to whom we intend to serve

"MADE IN INDIA"

Technologies for Sustainable Housing

Sustainable Affordable Housing

THE THREE MANTRAS OF SUCCESS IN TECHNOLOGIES

"MANTRA^2"

The Government alone can't succeed in Technology Mission,

Only By Making Laws

It requires an overhauling of our mind set

If we can change "**MOBILE**" set

Why can't we change our **"MIND"** set

"MADE IN INDIA"

Technologies for Sustainable Housing

Sustainable Affordable Housing

THE THREE MANTRAS OF SUCCESS IN TECHNOLOGIES

"MANTRA^3"

Ultimately Users Voice Is Consumers Voice

(With a Caveat)

"मकान ऐसे मत बनाओ कि लोग फरियाद करें

मकान ऐसे बनाओ कि लोग फिर याद करें"

Sustainable Affordable Housing

WRONG NOTION

Who says the alternative innovative technologies are meant only for "Poor Man's Housing.

The Green & Cost effective technologies can be used for all types of Affordable Buildings.

- ✓ Educational
- ✓ Commercial
- ✓ Hospitals
- ✓ Hotels
- ✓ Industrial
- ✓ High-end Housing

Sustainable Affordable Housing

Confidence – Acceptability – Performance (Bldgs. Other than Housing)

KNGD Engineering College, Modinagar

Technology:
- Flyash Bricks
- Filler Slabs
- Concrete D/W Frames

Jagriti Hostel, Modi Nagar

Technology:
- Flyash Bricks
- Filler Slabs
- Concrete D/W Frames
- Ferrocement Furniture
- R.B.C. basement walls

Mahendra Hostel, Modi Nagar

Technology:
- Filler Slabs

N.C. College of Engineering, Panipat (Hostel)

Technology:
- Filler Slabs
- Load bearing wall

Promilla College, Modi Nagar

Technology:
- Filler Slabs

Training Hostel, Daurala Organics Ltd.

Technology:
- Filler Slabs

Sustainable Affordable Housing

Confidence – Acceptability – Performance (Bldgs. Other than Housing)

Community Hall, Ambala

Technology: ➢ 34 Different Alternative Technologies for walls & roofing's

Modi Bhawan, Goverdhan

Technology: ➢ Filler Slabs

CORPORATE OFFICE, GREATER NOIDA INDUSTRIAL DEVELOPMENT AUTHORITY

Technology: ➢ 20 Different Alternative Technologies for walls & roofing's

Shops cum Flats, Modi Nagar

Technology: ➢ Filler Slabs

Zenetronics, Ashok Vihar, Delhi

Technology: ➢ Precast ferrocement panel
➢ RAT Trap bond

Tala Hydro Project Authority, Gedu, Bhutan

Technology: ➢ Stone block masonry

Sustainable Affordable Housing

Confidence – Acceptability – Performance (Bldgs. Other than Housing)

Animal Welfare Board of India, Office & Hospital at Ballabhgarh

Technology:

- Hydraform Interlocking Blocks
- Ferrocement Roofing Systems
- Concrete D/W frames

Ginni Modi Hospital, Modinagar

Technology:

- Filler Slabs

Rimal Hospital,Ludhiana

Technology:

- Filler Slabs

Krishna Medical Centre, Lucknow

Technology:

- Filler Slabs

300 Bedded Super Specialty Hospital, Janakpuri, Delhi

Technology:

- AAC Blocks Walls

Sustainable Affordable Housing

Confidence – Acceptability – Performance (Bldgs. Other than Housing)

Technology:

- Composite steel Concrete structure

SAMRAT AT CHARBAGH, LUCKNOW

Technology: ➢ Filler Slabs

HOTEL AT MOSCOW

- ✓ Hotel Mayur, Lucknow
- ✓ Hotel Amber, Lucknow
- ✓ Hotel Avadh Deep, Lucknow

Technology: ➢ Filler Slabs

HOTEL KOHINOOR, LUCKNOW

Technology:

- ➢ Basement walls in RBC
- ➢ Slabs Precast RCC hollow slabs with kulars
- ➢ Filler slabs

Cost Effective Alternative Technologies

Confidence – Acceptability – Performance (Bldgs. Other than Housing)

MADAN TRADING CO.
MOHAN COOP. INDTL AREA, NEW DELHI

Technology:
- RC Plank System Intermediate Floor

UNIK SURFACTANTS (P) LTD. PARTAPUR, MEERUT

Technology:
- RAT Trap bond walls
- Precast RC Panel roofing

WELCURE DRUGS & PHARMACEUTICALS, LTD. BHIWADI, RAJASTHAN

Technology:
- RAT Trap bond walls
- Precast RC Panel roofing

GEETA FLEXCO GRAVURE P. LTD., NOIDA

Technology:
- RAT Trap bond walls
- Precast RC Panel roofing

DAWAT RICE FACTORY, SONEPAT

Technology:
- RAT Trap Bond

BHARTI AGRITECH, P. LTD. GURGAON

Technology:
- RAT Trap bond walls
- Precast RC Panel roofing

Sustainable Affordable Housing

Confidence – Acceptability – Performance (Bldgs. Other than Housing)

RITA ROOFING LTD.
MALANPUR, INDUST. AREA, GWALIOR

TECHNOLOGY : RMP Roofing Sheets

ADITYA GEARS LTD. BHIWADI

TECHNOLOGY : RAT Trap Bond Walls
Precast Ferrocement Roofing

SKJ BEARING (P) LTD. BHIWADI

Technology: Precast Ferrocement Roofing

TILDA RICELAND LTD. KURUKSHETRE

Technology: RAT Trap Bond, Arch.
Foundation & Precast Channel roofing

Sustainable Affordable Housing

HIGH-END HOUSING

FARM HOUSE OF SMT INDIRA GANDHI, DELHI

Technology: - Vautan light weight concrete block walls

YEAR 2009 - POETRY IN BRICKS, MANESWAR

Technology: - Vernacular Technology

Sustainable Affordable Housing

Thanking You