“Adequate & Appropriate Engineering”

That will save the environment & help us build the living environments of the future, which can cope with and extensively reduce risks from disaster.

Mr. Sumit K. Agarwal: Ferroconcrete specialist, Social Entrepreneur.
sumit@tanjun.asia
Prefabricated Livelihood Skill Training & Research Centre (LSTR)

Prefabricated Ferroconcrete Technology

Ferroconcrete/Ferroconcrete has been recognised as a Separate Construction Technology by the American Science Congress in 1972.

It is on the approved technology list of HUDCO, BMTPC, CBRI, PCERF, Concrete Institute of India, IE(I) etc.

Extensive works done in India for:
- RDSO & Indian Railways
- UPSRTC
- UP Jal Nigam
- UK Forest Department
- UK Organic board
- UK Dairy Development Board
- Dehradun Municipal Corporation
- Gas Authority of India Ltd. (GAIL)
- Maharashtra Water Works
Ferroconcrete has been used extensively in housing, roofing, water tanks and storage construction for over 65 years globally.

What is ferro-concrete?

- Dense concrete impregnated wire-mesh structure
- Very high strength & very low weight (in some cases over 8 times stronger than RCC)
- Strength through shape and NOT by mass
- Highly water and earthquake resistant
- Affordable, Quick and extremely durable (Life-span is same as RCC)
Ferroconcrete was certified in 1991 by IIT Kanpur as one of the most suitable and durable materials of our times.

August 10, 1991

Mr. Ashok Jain
Director
M/s Ashok & Associates
Lucknow

Dear Ashok,

Subject: Ferroconcrete Prefabricated Housing Panels

I am glad to inform you that the prefab panel 2850x900x150 has been tested under all possible loadings expected on the element for its use as wall, roof and floor. The element is safe for a live load of 4.5 kpa (450 kg/m² approx) when used as a roof panel; a wind load of 6.0 kpa (600 kg/m² approx) for a wall panel.

The structure made of the panels as per Chunar Project will be in a position to withstand the codal forces (live, wind, seismic etc.) safely. As the margin is more than 100%, economy may further be done. The structure can withstand an earthquake of intensity 9.0 on the Richter scale. This is the speciality of this type of element assembly. The number of bolts may be altered for different situations.

Besides, the structure is blast proof. Only mortar falls off which in turn can be repaired easily, in situ.

I would like to add that custom made panels can be designed for different levels of loads/thermal/acoustic comfort using the filler materials.

If you have any queries, please call me.

Yours Sincerely,

ASR Sai

1. LIVE LOAD (450kg/m²) & WIND LOAD (650kg/m²)
2. Can withstand earthquake of intensity 9.0 on the richter
3. Blast Proof
The government of Maharashtra has already included ferroconcrete into their SOR.

Tanjun advisor Dr. A.K. Jain at the Global Ferroconcrete application seminar during “CONSTRO” at Pune, Maharashtra.
The Gas Authority of India Ltd has already included Ferroconcrete as a SOR item in its tender documents.

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**ANNEXURE- III TO SECTION-VI**

**DESCRIPTION OF ITEMS AND SPECIFICATIONS (INDEEDIVE) FOR FERRO-CEMENT/FERROCONCRETE BIODIVERSITY IN SCHOOLS**

[ALTERNATIVE TO CONVENTIONAL BRICK & MORTAR CONSTRUCTION AS MENTIONED IN THE TENDER]

<table>
<thead>
<tr>
<th>No.</th>
<th>ITEM NO.</th>
<th>DESCRIPTION OF ITEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>FLOOR, ROOF &amp; WALLS</td>
<td></td>
</tr>
<tr>
<td>1.1.1</td>
<td>PRE-FABRICATION</td>
<td>Providing, fixing, erecting, welding Tray shaped floor component reinforcement cage with height of 100mm on all sides and reinforcing ridges of height 25mm at 100mm maximum c/c where applicable, with 3.2mm m.s. bar as per IS 100mm C/C both ways for ferro-cement flooring and roofing and walling and chicken mesh 2 layers of 24 gauge including binding with wire etc. complete.</td>
</tr>
<tr>
<td>1.1.2</td>
<td>FREEDOM &amp; WALLS</td>
<td>Providing, fixing, erecting, welding Tray shaped component reinforcement cage with height of 100mm on all sides and reinforcing ridges of 25mm thickness at 100mm maximum c/c where applicable, with 3.2mm m.s. bar as per IS 100mm C/C both ways for ferro-cement flooring and roofing and walling and chicken mesh 2 layers of 24 gauge including binding with wire etc. complete.</td>
</tr>
<tr>
<td>1.1.3</td>
<td>PLASTERING &amp; FINISHING</td>
<td>On-site erection and installation of prefabricated components using MS nuts and bolts of not less than 8mm x 75mm size and finishing with cement slurry @ 3.3 Kg/smt and approved bar reinforcement/chicken mesh.</td>
</tr>
<tr>
<td>1.1.4</td>
<td>SUNSHADES</td>
<td>Including placing curing etc. complete.</td>
</tr>
<tr>
<td>1.1.5</td>
<td>JAALIS AND CHHAJAS</td>
<td>Providing, fixing, erecting, welding Tray shaped component reinforcement cage with height of 100mm on all sides and reinforcing ridges of 25mm thickness at 100mm maximum c/c where applicable, with 3.2mm m.s. bar as per IS 100mm C/C both ways for ferro-cement flooring and roofing and walling and chicken mesh 2 layers of 24 gauge including binding with wire etc. complete.</td>
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The Gas Authority of India Ltd has already included Ferroconcrete as a SOR item in its tender documents.

Tanjun Founder Shri: Sumit Kumar Agarwal at the India Prefab-2014 conference delivering the inaugural address on Ferrocement.
Er. P.L. Nervi first used Ferroconcrete in 1948 in Italy to construct buildings and continued to build the Turin exhibition hall as well as the Pirelli tower. The American Navy today makes their large high-speed boat hulls using Ferroconcrete.

**Some Global Examples**

- The Turin exhibition hall: 1000 feet unsupported structure
- CNIT-France: 2.5" Thin section curved span roof
FERROCONCRETE

RESIDENTIAL & COMMERCIAL STRUCTURES

Sahara Arts & Management Academy

LUCKNOW-UP (INDIA)

15000 sft : 80 days
6000 sft school library built entirely above ground

NASHIK: (INDIA)
Foundation above-ground reduces earthquake intensity to nearly half and allows passage of water during floods without damaging the structure.

Residences for forest department officers

ASAN DAM-UK (INDIA)
Double story prefab construction

LUCKNOW-UP (INDIA)
15 Meter span temple roof in 1.5 inch thick section

KHAJURAHO-MP(INDIA)
This a component based completely nut bolted structure and holds water perfectly well since 1998.

70 Thousand Litre water tank at 12 meter height

KANPUR-UP (INDIA)
These are component based completely nut bolted structures and can be erected extremely quickly.

Extremely durable boundary walls

Various: (INDIA)
Check dams built for the Maharashtra government

Maharashtra: (INDIA)

Retaining wall components are tested on site once again using the coin deflection method.
One room Home installation process – 36 hours from start to finish

Uttarakhand: (INDIA)
One room Home installation process – 36 hours from start to finish

Uttarakhand: (INDIA)
One room Home installation process – 36 hours from start to finish

Step-5: Securing & sealing of roof

Step-6: Painting, Electrification & finishing

Uttarakhand: (INDIA)
Exhibition of rehab solutions at India Prefab 2014

Uttarakhand: (INDIA)
Site installations at Vikasnagar

Uttarakhand: (INDIA)
COMMUNITY & SCHOOL TOILETS

FERROCONCRETE

Kalsi

Siyat

Uttarakhand: (INDIA)
SO WHAT MAKES FC THE BEST REHABILITATION OPTION??
Skill building of Bhil Tribal youth at Jhabua in Madhya Pradesh.

Skill building at PUNE, Maharashtra.

Convocation of Master Trainers at our Training Centre with the faculty.

Training of trainers at haridwar

Skill building of a team from Bihar at our training centre.
No foundation & monolithic structure means very low transfer of ground vibrations. **(EARTHQUAKE RESISTANT)**

Hollow plinth allows nearly 6 feet of water to flow under without damage to structure. **(FLOOD RESISTANT)**
Option showing two separate houses made from the same number of components on the same size of 5mx8m plot. This gives every person the dignity to individually design their homes and add or expand at their own free will. Readymade designs from a given number of components provide for quick and easy choice of homes for the disaster affected people while keeping the social fabric intact as before and not burdening the govt/funder with multiple costsings.

**FRIENDLY FUTURISTIC SUSTAINABLE AFFORDABLE**

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**STANDARD PREFAB HOUSING COMPONENTS**

- Door
- Window
- Wardrobe
- Wall
- Ventilator
- Jaali
- Floor

Total no. of vertical components: 35
Use the trolley to carry raw material

Use trolley to transport finished components to erection site

Use hydraulic lifts to take component to roof height

Carry personnel and tools to and from site

Attach belt driven vibrator on trolley to manufacture components

Use tilting function to neatly place finished pieces in a straight row on both sides of the tiller

Use belt driven sprayer to continuously water the components while driving through

Attach alternator to create up to 7.5 KvA output of power

Use belt driven concrete mixer

Use standard tilling apparatus to draw sand

ashok jain <akjferrocement@yahoo.com>
Sumit Kumar Agarwal <sumit@tanjun.asia>
Quick look at present (2014) Uttarakhand
The difference between quick-response Disaster Shelters & long-term Rehabilitation

Quick response Tin & steel shelters at Govindghat where wind speeds can reach up to 125 kmph and outside temp in the sun can be 38 degrees celsius.

Bricks cost Rs.13 at Augustamuni. 90% death & damage during earthquakes happens from falling debris.
Please also read the annexed article on Blood-Bricks.

Lamgordi shelters. Eventually, we must build for humans just like you and me.
UNDERSTANDING & ADDRESSING PORTABILITY

Structures for difficult terrain

- Maximum component load 80 KG.
- Carrying by mule in the hills is the option.
- Roof component 150mm thick as against the balance, which are 100mm thick.

FERROCONCRETE STRUCTURES AS OLD AS 25 YEARS EXIST IN DISASTER PRONE UTTARAKHAND

Design: Ar. Jayant Patankar
**CONCLUSION: SO WHAT MAKES FC THE BEST REHABILITATION OPTION??**

**TECHNO COMMERCIAL ANALYSIS**

<table>
<thead>
<tr>
<th>Proven technology for over 35 years under Indian conditions and over 65 years globally.</th>
<th>The structure is blast-proof.</th>
<th>It can be constructed from many locally available materials.</th>
<th>Portability allows for remote area construction with ease.</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is the only prefab option made from a traditionally proven structural material: Concrete.</td>
<td>It withstands earthquakes up to 9.0 on the richter scale.</td>
<td>Extremely cost effective.</td>
<td>Extremely speedy construction</td>
</tr>
<tr>
<td></td>
<td>It withstands wind loads of upto 650Kg/m².</td>
<td>Standardized quality and pricing across locations and terrains.</td>
<td>Simple Technology allows transfer &amp; development of skills to the community for sustainability.</td>
</tr>
<tr>
<td></td>
<td>Both prefab &amp; in-situ options allow for exceptional versatility.</td>
<td>Modular design for expansion.</td>
<td></td>
</tr>
</tbody>
</table>
WHERE COULD WE BEGIN?
One modular expandable dwelling. One hygienic toilet with septic tank. Skill development & technology transfer to the community

The Tanjun Model. Quick, cost-effective, local, long-lasting & sustainable

THANK YOU