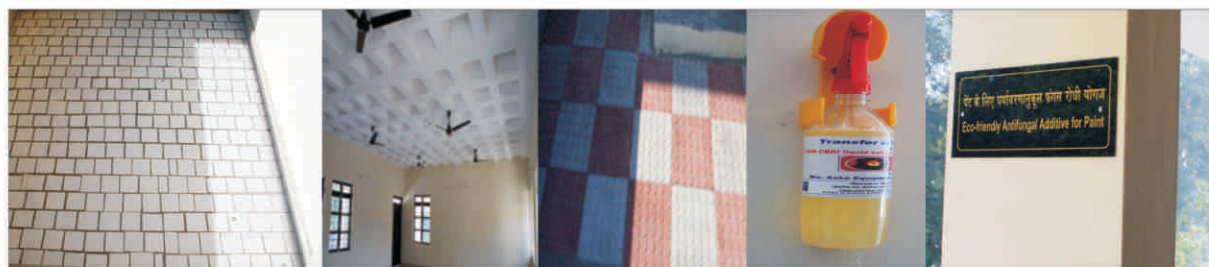


CSIR-CBRI Technology Demonstration-Cum-Class Room



सीएसआईआर-केन्द्रीय भवन अनुसंधान संस्थान
CSIR-CENTRAL BUILDING RESEARCH INSTITUTE

रुड़की 247 667 (उत्तराखण्ड) भारत
ROORKEE 247 667 (Uttarakhand) India



The Institute has developed several technologies, used in the construction of buildings, in the past. For wider dissemination of these technologies and its performance evaluation when exposed to different geo-climatic environment, most of the CSIR-CBRI developed technologies were used in the construction of an additional room over the existing single storeyed class rooms of Bal Vidya Mandir (school building) at CBRI Campus, Roorkee. The objective was firstly, to provide practical and visual information about the technologies that support sustainable human settlements and evaluate its serviceability performance; secondly, expressing the concern towards the societal benefits.

A comprehensive range of building technologies and products were implemented in the construction, including systems that could be regarded as conventional, as well as some alternative approaches. The exhibits are grouped into three distinct categories viz. Masonry work, Materials & Technology and Roofing Systems.

The highlights of technologies are:

MASONRY WORK

The construction of walls was carried out using Fly-ash Bricks, C-Bricks, Concrete-Stone Blocks, all developed by CSIR-CBRI and locally available Burnt Solid Clay Brick units.

CLAY FLY ASH BRICKS

About the Technology

This is an environment friendly technology, which uses flyash, water and medium plastic soil as raw materials for casting the bricks. Their properties like less breakage, better shape, use of waste material, fuel saving etc. makes them useful for masonry construction.

Technical Specifications

- Flyash addition : 35 to 60%(w/w) to the soil mass depending upon the type of soil
- Firing of bricks done at 950 to 1000 °C
- Brick shaping done by extrusion or manually
- Power requirement : 100 KW
- Plant & machinery : Indigenous
- Space required : 4 Hec. (approx)

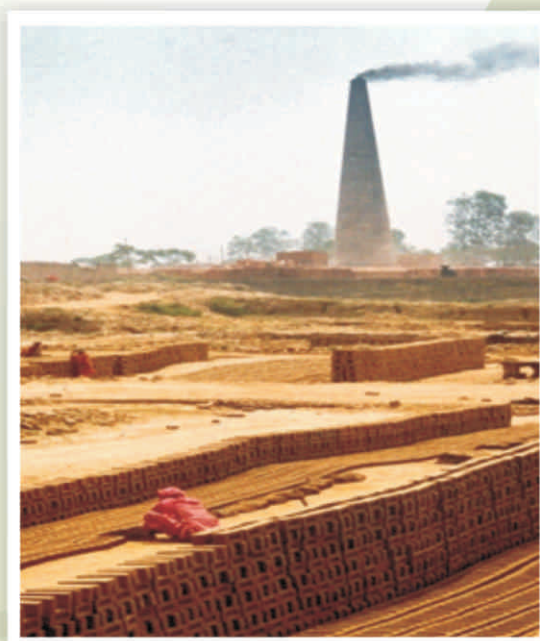
Salient Features

- Better product quality
- Saves upto 20-25% fuel
- Reduced drying and firing losses
- Environment friendly

Economic Aspects

- Plant capacity : 90 lakh bricks per year
- Total capacity cost : Rs. 1.00-1.20 crore

For details, refer CBRI BRN: 7



Clay Fly Ash Bricks

C-BRICK

About the Technology

The technology comprises a simple process for manufacturing bricks at low cost based on vibro-compaction technique. The equipment used here is portable C-Brick machine. The raw materials used for this process are Sand, Flyash and Cement. Produced bricks are strong, stable and have a good finishing.

Technical Specifications

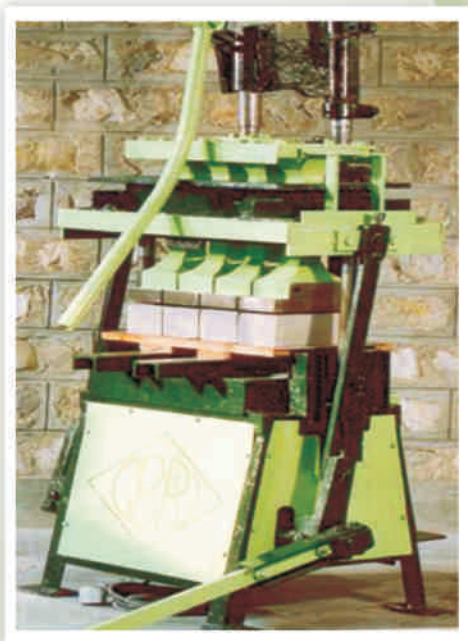
- Production capacity : 3000 bricks per shift
- Power requirement : 1.5 kW
- Net weight : 500 Kg (approx)
- Unit cost : Rs. 1,50,000.00

Salient Features

- C-BRICK size 230 x 110 x 75 mm
- Frog on the C-BRICK machine is possible
- Good dimensional stability
- Wet Compressive strength upto 7 to 12 MPa depending upon mix design
- Water absorption below 20 %
- Ease in operation and maintenance

Economic Aspects

- Capital Investment : Rs. 10,00,000.00
- Manpower : 5
- Land : 700 m²
- Installed Power : 10 KW (C-BRICK Machine and Mixer)
- Estimated Production Cost: Rs 6.00 per brick (approx.) at Thermal Power Station site



C- Brick Making Machine

CONCRETE MASONRY BLOCKS

About the Technology

Concrete Masonry Blocks are used as a substitute for bricks in hills and stone abundant areas which make the building process economical. Manual and machine techniques are used for casting the blocks. In machine technique, an egg laying type portable machine capable of casting six blocks at a time is used.

Technical Specifications

- Pressure vibration technique used
- Power required is 3.0 KW

Salient Features

- Economic substitute of bricks
- Capable of casting 1000 blocks of size 290 x 190 x 140 in one shift of 8 hours
- Included in BIS codes, MES, CPWD and some State PWD Schedules
- Adopted in mass scale in Rajasthan, Orissa, Andhra Pradesh, North East, H.P., Uttarakhand and M.P.



Concrete Masonry Blocks



MATERIALS & TECHNOLOGY

WOOD WITHOUT TREE RICE HUSK PLASTIC WOOD

About the Technology

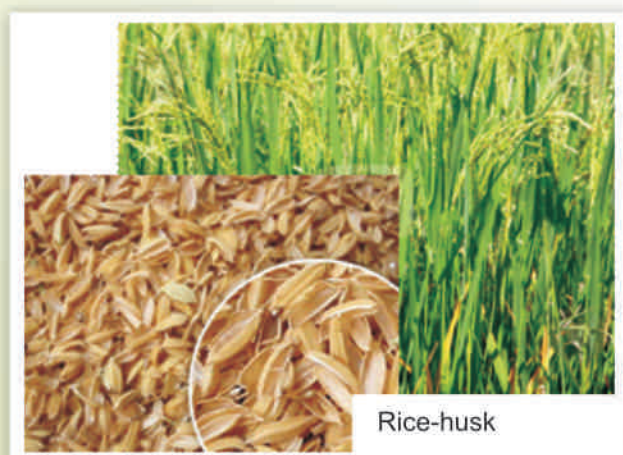
Natural wood is replaced by manufacturing rice husk plastic wood which can be shaped by conventional wood working tools. The door/window frames were manufactured using this technology, developed by CSIR-CBRI. The material has wood like surface appearance, having features of replacement to natural wood, meeting requirements of National Building Code (NBC 2005, Section 3, Timber). The door frames provided in the Demonstration Building were manufactured using rice husk plastic wood.

Technical Specifications

- Meets safe permissible stress of structural wood as per NBC 2005, Sec 3, Timber

Salient Features

- Replaces the use of natural wood
- Termite resistant
- Carpenter friendly



Rice-husk



Rice Husk used to make Plastic Wood

FLUOROGYPSUM PLASTER

About the Technology

Fluorogypsum Plaster is a building material used for plastering (external & internal), masonry work, bricks/blocks, building boards and tiles. It is manufactured as a dry powder from waste of Hydrofluoric acid plant. This material can also be used for making wall panels, tiles etc. Some parts of walls of Demonstration Building were plastered using Fluorogypsum Plaster.



Fluorogypsum Plaster

Salient Features

- Low water absorption
- Possess fire resistance
- High compressive strength
- Good acoustic properties

Economic Aspects

- Waste utilisation
- Energy saving

HEAT REFLECTIVE TREATMENT USING WHITE GLAZED TILE PIECES

About the Technology

It is a solar heat reflective treatment made of white glazed tile pieces used in roofs and walls of houses, industrial buildings, cold storage buildings, schools etc. for keeping the buildings cooler and provide good water-proofing layer on roofs.

Salient Features

- Durable and cost effective when applied as per CSIR-CBRI process
- Reflects about 80% solar radiation
- Suitable for air-conditioned buildings for reducing power cost
- Provides a good water-proofing layer on roofs

Economic Aspects

- Low cost
- Almost maintenance free design of roofs



Solar Heat Reflective System

CONFINED MASONRY

About the Technology

Confined Masonry comprises lightly reinforced concrete elements embracing masonry panels at periphery and having thickness same as that of walls. The seismic performance of this technology was tested on a full-scale model at CSIR-CBRI. All the load bearing walls of the Demonstration Building were constructed using this technique.

Salient Features

- Superior seismic performance with higher strength, initial stiffness, ductility and energy dissipation capacity as compared to unreinforced and reinforced masonry
- Uses locally available material and skills
- Economically viable for low-to-medium rise construction

Economic Aspects

- About 30% cost reduction as compared to the construction cost of RC framed structure



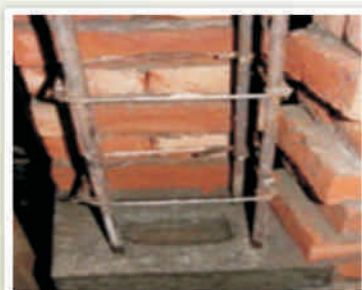
(a)



(b)



(c)



(d)



(e)



(f)

Stages of Construction of a Confined Masonry Building

(a) Construction of masonry wall with provision of reinforcement in tie-column (b) providing shuttering on two faces of tie-column (c) casting of tie-column followed by subsequent masonry (d) provision of keys in masonry and concrete for better bonding at interface (e) subsequent shuttering of tie column (f) completed confined masonry model.

LIQUID EXTINGUISHANT FIRE EXTINGUISHER

About the Technology

Liquid Extinguishant Fire Extinguisher has been developed in public fire safety interest for common persons to any user's personal, house-hold, office as well as house-lady's kitchen fire safety with a functional fire extinguishment time of 8-10s on 100 cm² size Class A & B Fires and 25-30s on 1000 cm² Fire. This would cost only Rs. 100/- to 200/- for a half litre to one-litre plastic spray-bottle versions. This fire extinguisher is capable of extinguishing Class A fires involving ordinary combustible materials like paper, wood, grass, leather, plastic goods etc as well as Class B fires involving Flammable liquids such as petrol, diesel, kerosene, lubricating oils, etc. with better fire efficiency.

Technical Specifications

- It works on the principles/methodologies of oxygen depletion, flame chain-reaction inhibition and flame-zone cooling by lowering flame temperature.

Salient Features

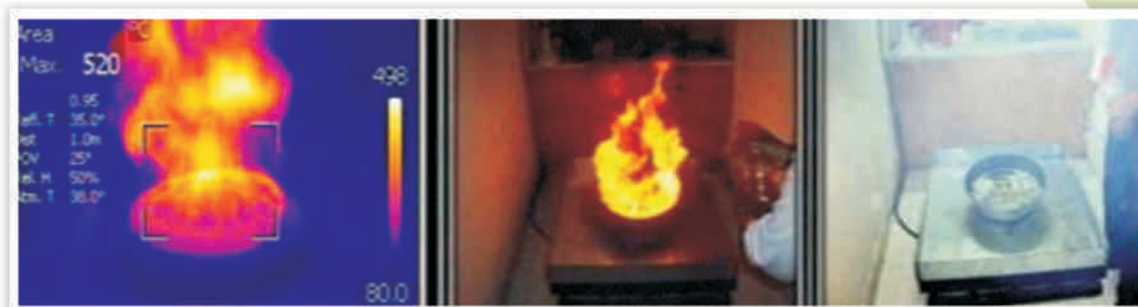
- Fire Suppression Time: 8-10s on 100 cm² size Class A & B Fires and 25-30s on 1000 cm² Fire
- Extinguishant App. Rate: 1-5 g/s for different Classes of fires

Economic Aspects

- Product has an affordable price.



Fire Extinguisher



Using Liquid Extinguishant Fire Extinguisher for Kitchen Fires

ECO-FRIENDLY ANTIFUNGAL ADDITIVES FOR PAINT

About the Technology

These additives comprise essential oils from Eucalyptus and Peppermint plants. The product is eco-friendly and do not pose health hazard to occupants at lower concentration. 1% volume fraction of additives is recommended to be mixed with commercially available paints. The product was used in exterior painting of the Demonstration Building.

Technical Specifications

- Material : Oily Liquid
- Colour : Clear to pale yellow
- Eucalyptol : 90 %
- Menthol : 40%
- Soluble in ether, ethanol and chloroform

Salient Features

- Controls fungal growth in walls
- Can be applied in interior and exterior surface of the building
- Have a shelf life up to 4 years

Economic Aspects

- Cost effective
- Plant leaves are locally available
- Isolated by steam distillation (A pilot plant)



Eco Friendly Additives for Paints

ROOFING SYSTEM

PRECAST RC WAFFLE UNITS

About the Technology

Waffle units are open box type precast RC units, upto 1.2 m in size. Casting of units is done in steel/timber moulds with steel weld mesh reinforcement. After curing, they are assembled over the shuttering in a grid pattern leaving a space of 10 to 17 cm between the units.

Technical Specifications

- Cement requirement : 41.5kg/m²
- Steel requirement : 7.7kg/m²

Salient Features

- Uses green technology with lower carbon foot-print and lower embodied energy.
- Can be cast and assembled manually or by using machines for larger housing projects.
- Preferred in construction of two-way slabs of large span (above 90 m).
- Saves construction cost and time.
- Incorporated in BIS Codes, CPWD and several State Schedules.
- Implemented in U.P., M.P., Uttarakhand, A.P., Haryana etc for the construction of several halls.
- Offers aesthetically pleasing ceiling.



Precast Waffle Units

Economic Aspects

- Cost effective, saves upto 30% construction cost with respect to RCC slabs

For details refer CBRI BRN: 6

NEW THERMAL INSULATION TILE USING EXFOLIATED VERMICULITE WASTE

About the Technology

Vermiculite belongs to a group of hydrated aluminium-iron-magnesium silicates, which occurs as golden-brown to greenish flakes. It is a hydrous mineral whose waste product is used to manufacture thermal insulation tiles, which are useful for thermal insulation, partitioning, false ceilings, panelled doors and shutters.

Technical Specifications

- Substantial amount of exfoliated vermiculite waste is available in India.
- This waste is used for making roofing tile for thermal insulation purpose incorporating cement, water dispersible polymer, additives and pigment.
- The properties meet the requirement of IS: 3346.

Salient Features

- Utilizes vermiculite waste
- Adaptable technology for large, medium and small level industries
- Aesthetic appearance
- Environment friendly

Economic Aspects

- Cost effective



Thermal Insulation Tile using Vermiculite Waste



For details please contact:

Director

CSIR-Central Building Research Institute

Roorkee-247667, Uttarakhand, India

Phone: +911332 272243; Fax: +911332 272272

Email: director@cbri.res.in; Website: www.cbri.res.in

