## Bored Compaction Piles

Used for foundation of structures of various types such as residential and industrial buildings, overhead tanks, towers, substations, gantry foundations, underground tanks, over bridges etc.

### Salient Features
Combines the advantages of both bored and driven piles by compacting freshly laid concrete and soil around obtaining increased load carrying capacity over normal piles. Suitable for loose to medium silty/sandy soils specially with high water table.

### Technology Package
Complete design and construction package

### Techno-Economics
Initial cost of equipment is Rs.4 lakh

### Scale of Development
Licenced, Technology is in production

### Status of Commercialization
Commercialized

### Raw Materials
Cement, aggregate and reinforcing steel

### Plant, Equipment and Machinery required
Equipment for boring, augers, under reamer, steel pipes for concreting and driving, low weight driving equipment

### Environmental Aspects
No adverse effect on the environment

### IPR Status
Indian Patent No.126179
# Gravitational Settling Chamber for Pollution Control in Brick Kilns

The Government of India, through a gazette notification, has restricted the maximum permissible SPM concentration in the effluent gases to 750 mg/l and provision of a Gravitational Settling Chamber (GSC) has been made mandatory. A multiplied strategy was adopted to meet the following objectives without which the implementation of the developed device was not a possibility:

1. Sustainable development of the brick kiln industry.
2. Assumed continued employment for thousand of labours involved.
3. Local intervention in the kiln.
4. No moving parts and no use of water and electricity.

Taking the socio-economic parameters of the brick kiln owners into consideration, we are able to evolve a simple and rugged design of GSC for pollution control in brick kiln.

<table>
<thead>
<tr>
<th>Applications</th>
<th>Pollution control in Brick Kilns &amp; other low stack furnaces/kiln.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salient Features</td>
<td>The Government of India, through a gazette notification, has restricted the maximum permissible SPM concentration in the effluent gases to 750 mg/l and provision of a Gravitational Settling Chamber (GSC) has been made mandatory. A multiplied strategy was adopted to meet the following objectives without which the implementation of the developed device was not a possibility: 1. Sustainable development of the brick kiln industry. 2. Assumed continued employment for thousand of labours involved. 3. Local intervention in the kiln. 4. No moving parts and no use of water and electricity. Taking the socio-economic parameters of the brick kiln owners into consideration, we are able to evolve a simple and rugged design of GSC for pollution control in brick kiln.</td>
</tr>
<tr>
<td>Technology Package</td>
<td>Design drawings, process know-how, demonstration, assistance in construction.</td>
</tr>
<tr>
<td>Techno-Economics</td>
<td>Rs. 20,000 for construction of two settling chambers in one kiln</td>
</tr>
<tr>
<td>Scale of Development</td>
<td>Commercial scale</td>
</tr>
<tr>
<td>Status of Commercialization</td>
<td>Licensed, implemented in over 5000 brick kilns</td>
</tr>
<tr>
<td>Raw Materials</td>
<td>Bricks, cement &amp; steel</td>
</tr>
<tr>
<td>Plant, Equipment and Machinery required</td>
<td>Civil Construction</td>
</tr>
<tr>
<td>Environmental Aspects</td>
<td>No special measures are required</td>
</tr>
<tr>
<td>IPR Status</td>
<td>Indian Patent No. 232333</td>
</tr>
</tbody>
</table>
Water Based Epoxy System for Concrete

Applications
For the preparation of polymer modified mortars, polymer modified cementitious coating and bonding material for concrete.

Salient Features
The epoxy latex has been operated by emulsifying epoxy resin based on epichlorohydrine and bisphenol and its hardener in the presence of non-ionic surfactant (HLB value > 15). After emulsification, fillers, deforming and wetting agents were added. It was used for preparing polymer modified mortars, cementitious coating and bonding material for bonding old/new concrete. Formulations have been finalized on the basis of test results. Polymer modified mortar base on epoxy showed better performance as compared to those based on acrylic emulsion with respect to strength, water absorption and impermeability. Bond strength of the bonding agent based on epoxy latex is higher (L>1250 psi) than those based on acrylic and other emulsions (>450 psi). The developed bonding agent conforms to Type-II ASTM C 1059, while others conform to only Type-I. It is therefore suitable for use in structure exposed to high humid conditions or immersed in water.

Technology Package
Process know-how document, demonstration, assistance in production

Techno-Economics
Investment of Rs. 80 lakh for a plant of capacity 100 ltrs per day

Scale of Development
Commercial scale

Status of Commercialization
Commercialized

Raw Materials
Epoxy resin base and hardener, surfactant, additives like defoaming and wetting agents

Plant, Equipment and Machinery required
Reaction kettle, stirrer, mixer and other lab equipment

Environmental Aspects
Normal measures adopted by the paint industry

IPR Status
Not applied for Patent
# Roof Cooling Device

## Applications
Provides a cool roof in buildings for thermal comfort of occupants. Saves electrical energy in air-conditioned buildings.

## Salient Features
The device is meant for small individual houses. It eliminates heat radiation from hot ceiling and cools indoor air by a few degrees. It contains all components like pump, electronic controller, sensors etc in a single unit. It can be easily installed at site by local craftsmen. Provides thermal comfort by using less energy. Keeps inside cool even during short power cuts with inverter operated ceiling fans. Reduces power consumption of AC units by up to 30%. A 1/2 to 1 HP water pump works for a total of about 15 min in 24 hrs. Consumes less energy as compared to desert cooler, not adds humidity to indoor air. Highly environment friendly and cost effective. Reduces thermal stress on humans by reducing heat gain in a natural manner.

## Technology Package
Know-how for commercial production of domestic unit.

## Techno-Economics
Installation cost is Rs.300/sq.m. of roof area. Water consumption is 6 to 9 litres/sq.m./day.

## Scale of Development
Commercial Scale

## Status of Commercialization
Licenced

## Raw Materials
Electric water pump, electronic components, sensors, steel hardware for chassis and housing, HDPE water tank, miscellaneous hardware

## Plant, Equipment and Machinery required
A general mechanical workshop with steel cutting, bending, drilling and welding facility. Small printed circuit board electronic assembly unit.

## Environmental Aspects
Does not use green house gases and not adds humidity to indoor air. Creates less humid healthy indoor living environment compared to desert coolers, Requires less energy than desert coolers, Highly environment friendly.

## IPR Status
Not applied for Patent
Natural Fibre Composite Door/Panel

<table>
<thead>
<tr>
<th>Applications</th>
<th>Door shutters, Panels, Laminates and Corrugated sheets.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salient Features</td>
<td>The increasing demand for wood has created an alarming pressure on dwindling forests with adverse consequences on ecology. In view of this, a systematic R&amp;D programme was initiated to develop wood substitutes utilizing natural fibres. The salient features of the developed products are: light weight, dimensionally stable, shape stability against operational load, adequate screw holding and nailing property similar to wood, carpenter friendly, durable against moisture, termite resistant and conforming IS: 2202.</td>
</tr>
<tr>
<td>Technology Package</td>
<td>Technical know-how produced on pilot plant scale, right to use patent. Product hand book and data sheet. Guidelines of setting of testing lab for Q.C. and other intellectual knowledge base related to project</td>
</tr>
<tr>
<td>Techno-Economics</td>
<td>The developed know-how includes: surface treatment of fibers, production of laminates and core materials and fabrication of products such composite door shutters, panels etc. It can be manufactured by using existing plants, equipments and machinery. The cost of developed panels and door shutters is comparable with wooden shutters.</td>
</tr>
<tr>
<td>Scale of Development</td>
<td>Pilot plant scale development</td>
</tr>
<tr>
<td>Status of Commercialization</td>
<td>Commercialized</td>
</tr>
<tr>
<td>Raw Materials</td>
<td>Natural fibers, resins, fillers and additives</td>
</tr>
<tr>
<td>Plant, Equipment and Machinery required</td>
<td>Hydraulic press, curing chamber, engineering moulds etc.</td>
</tr>
<tr>
<td>Environmental Aspects</td>
<td>To save deforestation caused by cutting of trees. ii) Utilization of local renewable resources (natural fibers).</td>
</tr>
<tr>
<td>IPR Status</td>
<td>Indian Patent No. 195175</td>
</tr>
</tbody>
</table>
# Urethanized Bitumen System for Waterproofing Roof

<table>
<thead>
<tr>
<th>Applications</th>
<th>Sealing, coating, adhesives and foam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salient Features</td>
<td>Urethanized bitumen has been prepared with variable viscosity, adequate elastic resiliency and a reduced thermal susceptibility. These behaviour are confirmed by the thermal (DSC), rheological and IS: 1208-78. Its waterproofing functions is further assessed by IS: 1580 and IS: 1834-84 &amp; ASTM D-3409-95 respectively. After assessing the materials suitability, compositional variables in products and parameters related to blend preparation are optimized. The urethane bituminous system has been prepared as per the requirement of end use applications.</td>
</tr>
<tr>
<td>Technology Package</td>
<td>Technical know-how produced on lab scale products with all details</td>
</tr>
<tr>
<td></td>
<td>• Standardization of manufactured products</td>
</tr>
<tr>
<td></td>
<td>• Preparation of product hand book/data sheet</td>
</tr>
<tr>
<td></td>
<td>• Guidelines of setting of testing lab for Q.C. and documents</td>
</tr>
<tr>
<td></td>
<td>• Intellectual knowledge base related to project and other users support strategy</td>
</tr>
<tr>
<td>Techno-Economics</td>
<td>Rs. 35/- kg.</td>
</tr>
<tr>
<td>Scale of Development</td>
<td>Lab level.</td>
</tr>
<tr>
<td>Status of Commercialization</td>
<td>Commercialized.</td>
</tr>
<tr>
<td>Raw Materials</td>
<td>Bitumen, polymer, stabilizer, adhesion promoter, filler etc.</td>
</tr>
<tr>
<td>Plant, Equipment and Machinery required</td>
<td>Blender &amp; Mixers.</td>
</tr>
<tr>
<td>Environmental Aspects</td>
<td>No adverse affect on the Environment.</td>
</tr>
<tr>
<td>IPR Status</td>
<td>Not applied for Patent</td>
</tr>
</tbody>
</table>
Cable Penetration Seal System (Cable Fire Stop)

Applications
To restrict the spread of fire through openings around the cables.

Salient Features
It is an assembly consisting of penetrating cables, penetration seal materials and devices, together with any supporting construction, designed to maintain the integrity and insulation performance of separating element for the duration of specified fire resistance rating.
- Materials used are available indigenously.
- Easy to install at locations with difficult approach such as under control panels.
- Removable without damage to existing cable where space permits future extension to be made.
- Having F and T rating of two hours
- Resist relevant external influences to the same degree as the wiring system with which it is used.

Technology Package
Know-how, formulation, mixing technique and installation

Techno-Economics
Viable

Scale of Development
Commercial Scale

Status of Commercialization
Commercialized

Raw Materials
Indigenously available fire extinguishing foam concentrates (3% or 6%) and Water

Plant, Equipment and Machinery required
Equipments required mainly for mixing and pouring of compound

Environmental Aspects
Eco-friendly- No adverse effects on the environment

IPR Status
Not applied for Patent
# Silicate Based Waterproofing Formulation

<table>
<thead>
<tr>
<th>Applications</th>
<th>Water proofing in building industry.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salient Features</td>
<td>Does not interfere with colour of the surface, long shelf life if kept sealed, dilutable with potable water, can be applied by semi-skilled labour, life of treatment is about 5 years.</td>
</tr>
<tr>
<td>Technology Package</td>
<td>Process know-how containing method of preparation, plant and equipment, raw materials required.</td>
</tr>
<tr>
<td>Techno-Economics</td>
<td>Investment of Rs. 7 lakh for a plant of capacity 400 liters per day.</td>
</tr>
<tr>
<td>Scale of Development</td>
<td>Commercial scale.</td>
</tr>
<tr>
<td>Status of Commercialization</td>
<td>Licensed, Technology in production.</td>
</tr>
<tr>
<td>Raw Materials</td>
<td>Commercial variety of sodium silicate, distilled water and other chemicals.</td>
</tr>
<tr>
<td>Plant, Equipment and Machinery required</td>
<td>Mixer with impeller, distillation plant, air-tight drums and laboratory equipment.</td>
</tr>
<tr>
<td>Environmental Aspects</td>
<td>No special measures are required.</td>
</tr>
<tr>
<td>IPR Status</td>
<td>Not applied for Patent</td>
</tr>
</tbody>
</table>
# Cement Paint

**Applications**
Exterior coating for cement concrete, cement plastered wall, AC sheets, brick work etc. for decorative as well as water resistant purposes.

**Salient Features**
It has good covering capacity, high water repellency, easy mixing, and better resistance to crazing, map cracking and microbial growth.

**Technology Package**
Specifications of raw materials, plant & machinery and cost economics.

**Techno-Economics**
A plant of 2 tpd (one shift) capacity requires an investment of Rs. 22 lakh.

**Scale of Development**
Laboratory and field trials conducted.

**Status of Commercialization**
Licensed, Technology in production.

**Raw Materials**
White cement, pigments, accelerators, water-repellants, hydrated lime, etc.

**Plant, Equipment and Machinery required**
Ball mill

**Environmental Aspects**
No special measures are required

**IPR Status**
Not applied for Patent
## Plant for Shaping Building Bricks from Inferior Soils/Industrial Waste by Extrusion Process

### Applications
For Shaping building bricks and other structural clay products

### Salient Features
Plant comprises a heavy duty brick extrusion m/c and Semi-automatic cutting table having capacity of 4000 bricks/hr. Extrusion m/c is of double deck design having independent clutches. Effective de-airing system facilitates shaping of good quality bricks from alluvial/inferior soils and industrial waste. Semi-Automatic cutting table, pneumatically operated is suitable for cutting clay column into bricks with the help of movable battery of wires at the rate of 10 bricks per stroke. Total power requirement-105 H.P.

### Technology Package
List of standard components with specification, List of spare parts to be supplied with the plant, Complete fabrication drawings.

### Techno-Economics
Cost of a semi-automatic cutting table would be approximately Rs.7000/-. 

### Scale of Development
Commercial scale

### Status of Commercialization
Prototype

### Raw Materials
Standard steel sections, Air compressor unit and Pneumatic cylinder.

### Plant, Equipment and Machinery required
Standard mechanical workshop facilities including foundry, machining and welding equipment.

### Environmental Aspects
No special measures are required

### IPR Status
Indian Patent No.132445
# Epoxy-phenolic IPNet-RB Coating for Steel Reinforcement in RCC

## Applications
Corrosion protection of steel reinforcement.

## Salient Features
- Resistant to chemicals, excellent adhesion to steel reinforcement, excellent bond of coated bars with concrete, durable and easy application and cost effective.

## Technology Package
Process know-how document, demonstration, assistance in production.

## Techno-Economics
Investment of Rs.40 to Rs.50 lakh for a plant of capacity 100 liters per day.

## Scale of Development
Lab Scale

## Status of Commercialization
Licensed, Technology in production.

## Raw Materials
- Epoxy resin base and hardner, prepolymer of cardanol and other additives.

## Plant, Equipment and Machinery required
- Blender, Mixer, Reaction Kettle, Sieving and laboratory equipment.

## Environmental Aspects
Normal measures adopted by the paint industry.

## IPR Status
Not applied for Patent
High Strength Plaster from Fluorogypsum

Applications

- Suitable for use in plastering – Finish coat & Base coat

Salient Features

The high strength plaster is developed by benefication and fine grinding of fluorogypsum and admixing it with suitable chemical activators. Plaster showed high compressive strength (30-35 MPa) and low water absorption (< 8 %) and porosity (<10 %) and complied with requirement as given in ASTM C-61-50. The technology for formulation of high strength plaster is simple and no heavy machinery is involved. The plaster is fire resistant, possess good acoustic properties, self strengthening with time and helps in conservation of cement.

Technology Package

- Process know-how & demonstration.

Techno-Economics

- For a plant of capacity 1000 tonnes per day (3 shifts), the cost of high strength plaster comes out Rs. 2200/- per tonne.

Scale of Development

- Developed on laboratory scale.

Status of Commercialization

- Licensed

Raw Materials

- Fluoro-gypsum

Plant, Equipment and Machinery required

- Ball mill / Vertical Roller mill

Environmental Aspects

- No special measures are required

IPR Status

- Not applied for Patent
**Direct Foam Injection (DFI) technology for the Petroleum Oil Tank Fire Safety**

For fire protection of Class B Flammable Liquid Storage Tank Fires in Petroleum refineries, Oil storage depots & Terminals, Chemical, Petro-chemical & allied industries.

**Salient Features**
- Efficient and Effective Fire Extinguishment (Extinguishment Time < 60 s), Minimum Foam Induction/Application Rate of 3 litres/min., In-built System Fire Resistance rating of ½ hr to 1 hr against any eventual fire exposure damage, due to severe heat. Suitable for protection of all non-polar flammable liquids, even with boiling point higher than 100 degree C.
- Uniform, gentle and effective foam delivery onto the flammable liquid surface without partial disintegration of the foam bubbles and the fuel pick-up, less vulnerable to serious damage in the event of explosion and, or buckling of tank plates by virtue of its inherent design features, Technically simple and economic application method, large scale oil storage tank fires can be effectively tackled by the low-cost foam compounds available in the market., No need to hold high cost foam compound inventory.

**Technology Package**
- Details on Major Plant Equipment and Machinery required

**Techno-Economics**
- Approx. Rs. 5000/- ± Rs. 1000/- per of Area of Petroleum Oil tank-fire protection.

**Scale of Development**
- Lab Scale

**Status of Commercialization**
- Ready for Commercialization

**Raw Materials**
- Fire extinguishing foam concentrates(3% or 6%) and Water

**Plant, Equipment and Machinery required**
- Vapour-sealing Fire Extinguishing Foam-Discharge Nozzles, Annular-pipe rings, Cross-member piping work, Co-flexi –Pipe for Floating Roof tanks, Foam generators, Fire resistant Vertical Risers, High capacity High pressure Pumping Unit, Water Storage, foam concentrate storage etc. Valves, gauges, and other related accessories.

**Environmental Aspects**
- Eco-friendly

**IPR Status**
- Indian Patent No. 177234, US Patent No.5573068
## Liquid Extinguishant Fire Extinguisher

### Applications

Suitable to combat the following fires with the following key uses/application areas:
- Class A all-type Combustible material Fires such as paper, wood, cloth, etc.
- Class B Flammable Liquid Fires such as petrol, diesel, kerosene.
- Class K Kitchen-Pan Fires for women’s fire safety.
- Electrical fires due to short-circuits.

### Salient Features

- Fire Suppression Time: 8-10s on 100 Size Class A & B Fires and 25-30 on 1000 Fire, Extinguishant App. Rate: 3-5 g/s for different Classes of fires.

### Technology Package


### Techno-Economics

- Less than one lakh for budding entrepreneur, approx. Rs. 20 to 25 Lakhs for budding entrepreneur to SSI unit depending upon the capacity of the plant.
  - For large-scale plants, a separate techno-economic feasibility study is required in consultation with field & financial experts.

### Scale of Development

- Laboratory-scale development to extinguish 1000 size of fires.

### Status of Commercialization

- Licensed

### Raw Materials

- Novel Fire extinguishing composition & water

### Plant, Equipment and Machinery required

- Plastic or SS304 Mixing Containers with mixing device @ 30-40RPM at ambient temp. & pressure, storage containers; Spray-bottles can be procured either from the market or the Bottling and manufacturing plant for Spray-bottles may be set-up either for Plastic or SS202/304 bottles with conveyer-belt facility.

### Environmental Aspects

- No adverse effects on the environment

### IPR Status

- Not applied for Patent
### Applications
- Boards, Panels, door panel insert and furniture items

### Salient Features
A systematic study was undertaken on the rational utilization of pine needles as an alternative to wood for making building boards and panels. It belongs to medium and high density board categories, dimensionally stable, sufficient internal bond strength, easily cut and sawn, good sound and thermal insulation, fire resistant, resistance to fungus and termite adequate screw holding and nailing property, durable against moisture, termite resistant and conforming IS: 3087.

### Technology Package
- Technical know-how produced on lab scale, right to use patent. Product hand book/ data sheet. Guidelines of setting of testing lab for Q.C. and other intellectual knowledge base related to project.

### Techno-Economics
- It can be manufactured by using existing plants, equipments and machinery. The cost of developed panels is comparable with the commercially available ligno-cellulosic panel products.

### Scale of Development
- Lab scale development

### Status of Commercialization
- Ready for commercialization

### Raw Materials
- Pine needles, resins, adhesives and additives

### Plant, Equipment and Machinery required
- Shredder and hammer mill, rotary drum mixer, hydraulic press, cutting and finishing devices.

### Environmental Aspects
- To save natural resources such as wood.
- To prevent health hazard caused by formaldehyde.

### IPR Status
- Indian Patent Application No. 0531/DEL/2010
Rice Husk Plastic Composite (Wood without tree)

<table>
<thead>
<tr>
<th>Applications</th>
<th>Window &amp; door frames, profile panels, decking, fencing, flooring, park benches etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology Package</td>
<td>Technical know-how produced on lab scale, right to use patent. Product hand book/ data sheet. Guidelines of setting of testing lab for Q.C. and other intellectual knowledge base related to project</td>
</tr>
<tr>
<td>Techno-Economics</td>
<td>Process know-how includes: rice husk flour production line, compounding line and profile extrusion line. The cost of developed products is comparable with the teak wood and alike.</td>
</tr>
<tr>
<td>Scale of Development</td>
<td>Pilot plant scale development</td>
</tr>
<tr>
<td>Status of Commercialization</td>
<td>Commercialized</td>
</tr>
<tr>
<td>Raw Materials</td>
<td>Rice husk, thermoplastic resins and additives</td>
</tr>
<tr>
<td>Plant, Equipment and Machinery required</td>
<td>Digester, k mixer/ k header, extruder, engineering moulds and other ancillary items.</td>
</tr>
<tr>
<td>Environmental Aspects</td>
<td>To save deforestation and environmental aspects caused by cutting of trees, and Plastic wastes are being utilized in the process.</td>
</tr>
<tr>
<td>IPR Status</td>
<td>Indian Patent Application No. 2193/DEL/2008</td>
</tr>
</tbody>
</table>
Modified Epoxy Cardanol IPN Protective System for Concrete & Steel Structures

## Applications
Corrosion Protection

## Salient Features
The system is based on the synthesis of epoxy cardanol under vacuum. Cardanol is a phenol obtained from fractional distillation of CNSL resin. The condensation of epoxy resin with cardanol is carried out in a reaction kettle at elevated temperature under inert atmosphere. The output is checked for alkalinity and then discharged from the vessel and collected at room temperature.

## Technology Package
Technology document

## Techno-Economics
Investment of Rs.70 to 80 lakh for a plant of capacity 100 liters per day

## Scale of Development
Lab scale

## Status of Commercialization
Licenced, Technology in production

## Raw Materials
Epoxy resin and hardener, cardanol and additives

## Plant, Equipment and Machinery required
Reaction kettle, Mixer, Blender and other laboratory equipment.

## Environmental Aspects
No specific emission study done, Paint industry norms are to be followed.

## IPR Status
Not applied for Patent
## Cement Based Vermiculite Tiles

### Applications

Suitable for thermal insulation in Residential, Commercial & Industrial Buildings

### Salient Features

Maximum heat transmission takes place through the exposed surface of the roof (more than 60%). Use of the thermally insulated material provide thermal comfort inside the room on one end and reduce the energy requirement for cooling in summer and heating in winter. Therefore, keeping this in view, we have developed cement based vermiculite tiles using water dispersible polymers along with additives. To get the improved physio-mechanical properties, high pressure compaction technique has been used. These tiles are light weight. All the parameters such as polymer ratio, conditions etc. have been optimized. These tiles can provide thermal insulation to the computer rooms, cold storages etc. as the material arrest the heat dissipation.

### Technology Package

Process know-how document, demonstration of the process

### Techno-Economics

Approx. 1000 sq, meter (profitability : 20 - 22%)

### Scale of Development

Lab Scale

### Status of Commercialization

Licenced, Product is commercially available

### Raw Materials

Cement, Water dispersible polymers, Different grades of vermiculite, compatible additives

### Plant, Equipment and Machinery required

Hydraulic Press, Vibration Table, Mixer and Moulds etc.

### Environmental Aspects

Eco-friendly

### IPR Status

Not applied for Patent
Fire Resistant Metallic Door

Uninterrupted spread of fire in buildings is one of the major issues responsible in increasing the quantum of direct and indirect fire losses. Door openings, by necessity breach compartment walls allowing failure of integrity and insulation causing fire to spread uninterrupted. It is therefore essential to restrict spread of fire to achieve the required degree of containment. Failure to do so may cause considerable loss of life and property. A fire door with a specific fire-resistance rating is used as part of a fire protection system to reduce the spread of fire from one to other and to enable safe egress from a occupancy.

Salient Features

| Applications | Uninterrupted spread of fire in buildings is one of the major issues responsible in increasing the quantum of direct and indirect fire losses. Door openings, by necessity breach compartment walls allowing failure of integrity and insulation causing fire to spread uninterrupted. It is therefore essential to restrict spread of fire to achieve the required degree of containment. Failure to do so may cause considerable loss of life and property. A fire door with a specific fire-resistance rating is used as part of a fire protection system to reduce the spread of fire from one to other and to enable safe egress from a occupancy. |
| Salient Features | Meets all the three criteria i.e. stability, integrity and thermal insulation of fire resistance rating as per BS 476 Pt. 20 & 22, IS 3614 Pt 2, Low thickness, No intumescent strip used, Material used is indigenously available, Mainly used in all types of occupancies for the confinement of fire. |
| Technology Package | A set of design drawing and process know-how |
| Techno-Economics | Viable |
| Scale of Development | Commercial Scale |
| Status of Commercialization | Licenced |
| Raw Materials | Indigenously available |
| Plant, Equipment and Machinery required | Required mainly for sheet metal work i.e. shear, bending and punching. |
| Environmental Aspects | No adverse effects on the environment |
| IPR Status | Not applied for Patent |
# Flooring Tiles from Waste Gypsum

**Applications**
Suitable for use in flooring and general purpose as a replacement to ceramic and cement tiles.

**Salient Features**
Tiles are cast by vibration moulding of moist mixture containing gypsum anhydrite plaster/fluoro-gypsum, pigments, polymers, fibres etc. Tiles are of high strength, low water absorption and wear resistance and complied with the requirement of IS: 1237-2012.

**Technology Package**
Process know-how & demonstration.

**Techno-Economics**
Investment for a plant for producing 40 sq.m tiles per day in 3 shifts is ~Rs.30.0 lakhs. The production cost of one tile (Size 300 x 300 x 20 mm) comes to Rs.25/- per sq. ft.

**Scale of Development**
Developed on laboratory scale. Pilot plant of capacity 40 sq. m per day may be set up with help of industry.

**Status of Commercialization**
Licenced

**Raw Materials**
Fluoro-gypsum/ Phospho-gypsum

**Plant, Equipment and Machinery required**
Vibrating table, moulds, mixers, curing chamber, drying chamber, rotatory kiln, ball mill, grinding and polishing machine and demoulding plates.

**Environmental Aspects**
No special measures are required

**IPR Status**
Indian Patent No.226284
## Geopolymeric Building Materials

<table>
<thead>
<tr>
<th>Applications</th>
<th>Bricks, blocks, concrete, reinforced concrete, light weight concrete etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salient Features</td>
<td>The salient features of developed product are: high early compressive strength, low water absorption, low shrinkage, durable against aggressive environments, fire resistant etc.</td>
</tr>
<tr>
<td>Technology Package</td>
<td>Technical know-how produced on lab scale, right to use patent. Product hand book/ data sheet. Guidelines of setting of testing lab for Q.C. and other intellectual knowledge base related to project</td>
</tr>
<tr>
<td>Techno-Economics</td>
<td>Process know-how includes: inter-grinding of ingredients, gradation of aggregates, preparation of activators, mixing, casting and curing. It can be manufactured with the help of existing plants and machinery. The cost of developed products is comparable with the conventional materials.</td>
</tr>
<tr>
<td>Scale of Development</td>
<td>Lab scale development</td>
</tr>
<tr>
<td>Status of Commercialization</td>
<td>Ready for commercialization</td>
</tr>
<tr>
<td>Raw Materials</td>
<td>Fly ash, alkaline activators, aggregates and admixtures</td>
</tr>
<tr>
<td>Plant, Equipment and Machinery required</td>
<td>Pan mixer, moulding machine, engineering moulds, curing chamber etc.</td>
</tr>
<tr>
<td>Environmental Aspects</td>
<td>To save natural resources, Utilization of waste materials and Low emission as compared to cement.</td>
</tr>
<tr>
<td>IPR Status</td>
<td>Indian Patent Application No. 3368/DEL/2014</td>
</tr>
</tbody>
</table>