

INSTANT CONCRETE HOUSING ELEMENTS, CONSTRUCTION KITS AND SHELTERS

IITM Technology Available for Licensing

Problem Statement

- Concrete structures that are quickly erected using easily transportable materials are required in many civilian and military applications. However, **conveying raw materials to the sites is difficult and time consuming.**
- Alternatives like precast concrete members can be viable, but if the location is inaccessible, transportation of large structural elements can be challenging. These **instant shelters, if made of flexible material, may lack adequate strength** and are not resistant to heat/ cold and leakage of rainwater. Besides, instant structures with adequate strength are necessary for emergencies, where long duration concrete curing is not feasible.
- Presently, **alkali activated concrete or geopolymer concrete is emerging as one of the most promising materials** for construction. It shows superior strength over ordinary cement concrete. Their unique properties such as **high strength and sustainability** make them an ideal candidate in most of the construction applications.
- Therefore, the present invention proposes a solution with construction materials, methods and kits that can be transported to remote locations in a compact form.

- Further, the activator solution is configured to be released in situ into the mortar mixture to hydrate, polymerize and set the mixture.

Construction Kit

The invention encompasses a **unique in situ construction kit (400)** refer Fig.1A&1B packed in a compact configuration that may include:

Guiding structural members (411), (Fig.3A-3D)

Alkali activated concrete cloth assemblies (401),

Roofing sheet (421), and

Floor mat (431) that is installable to form a structure with walls and a roof.

Intellectual Property

- IITM IDF Ref. 1530
- IN 418870 - Patent Granted
- NBA/IPR Appl. 3682/2022-23/3961

Technology Category/ Market

Construction, Structural Civil Engineering

Applications - Construction sectors such as building, infrastructure etc. Infrastructure works includes large public works, dams, bridges, highways, railways, industrial construction works.

Market - The ready mix concrete market was valued at US\$ 844.10 billion in 2022 to US\$ 1,118.18 billion by 2028; and estimated to grow at a CAGR of 4.8% from 2022-28.

Technology

- The present invention is focused upon an **alkali-activated concrete cloth assembly** that allows **in situ curable construction kits** for forming a structure with a wall and a roof.

Method

The alkali activated concrete cloth assembly (Fig. 2.) forms a **planar structure for a dwelling** that includes

- A mortar mixture**, comprising either slag or a blend of slag and one or more of fly ash, bagasse ash, or rice husk ash (RHA) enclosed between a first fabric cover and a second fabric cover for forming a planar structure.
- One or more sealed perforated pipes**, carrying an **activator solution** and placed within the mortar mixture and sandwiched between a first and a second fabric cover.

Fig. 1A

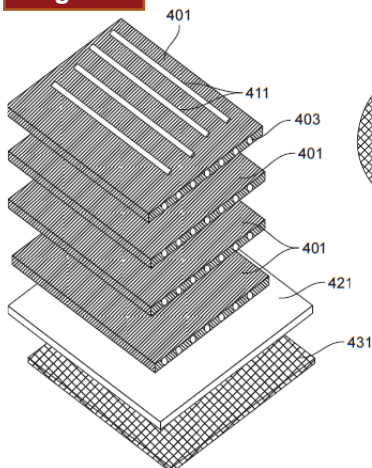


Fig. 1B

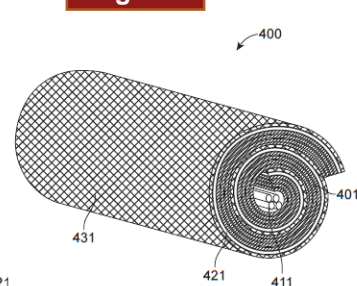


Fig. 1A. illustrates an in situ curable construction kit that includes alkali activated concrete cloth.

Fig. 1B. illustrates a rolled compact bundle of the in situ curable construction kit for transportation or storage.

TRL (Technology Readiness Level)

TRL – 2/3, Experimental proof of concept

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Key Features / Value Proposition

1. The alkali-activated concrete cloth assembly achieves **high compressive strength of at least 50 N/mm² (Fig. 4)**.
2. The construction kit is **impact resistant and can withstand being thrown from a height of up to 2000 m**. Therefore, this can be used for instant construction of concrete housing or shelters.
3. The **construction kit** may be transported to remote locations and the complete installation of the structure with walls and roof and setting of mortar may be **installed within six hours**.
4. It has **zero carbon footprint** since industrial by-products are used in its production.
5. The invention has an **added advantage of being fire proof**, thus making it the **perfect go-to choice for military shelters and camps**.

Fig. 3A

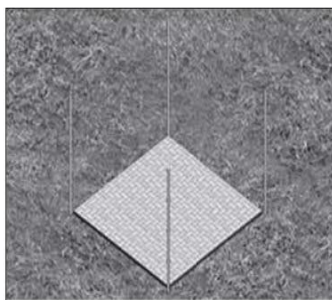


Fig. 3B

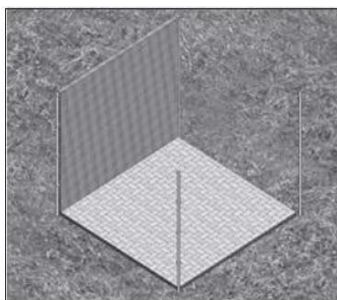


Fig. 3A. illustrates the fixing of guiding rods at four corners as support.

Fig. 3B. shows the flexible mortar cloth being converted to a hard side wall after alkali activation.

Fig. 3C



Fig. 3D

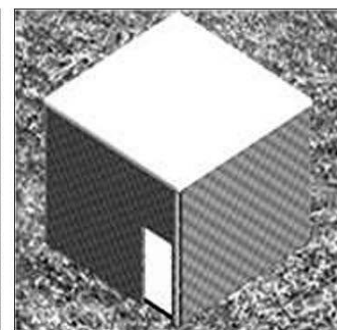


Fig. 3C. illustrates installation of all the sidewalls.

Fig. 3D. shows the installation of the entire structure, to form an abode.

Fig. 2 illustrates a method of fabricating the alkali activated concrete cloth.

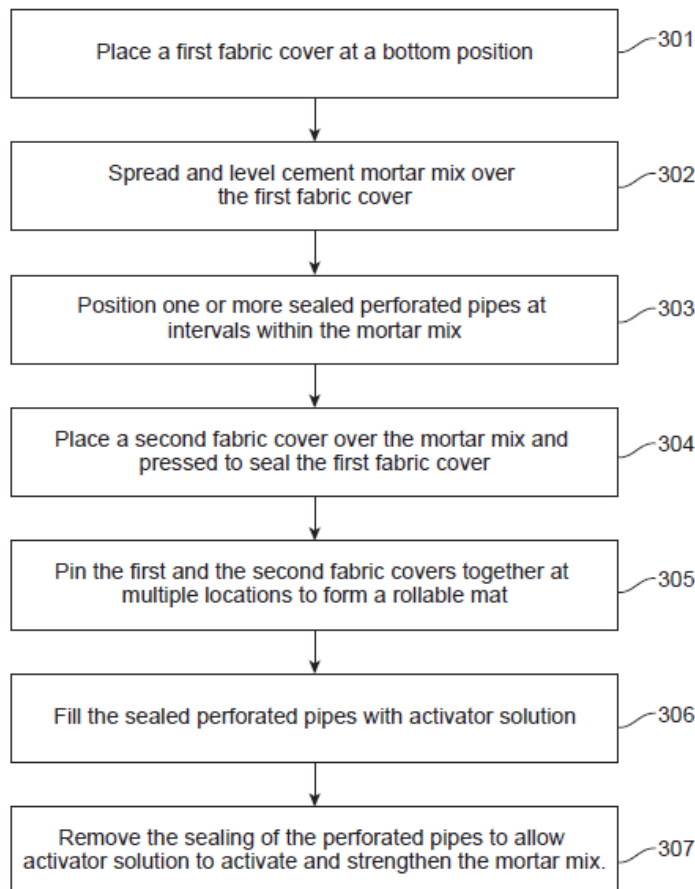


Fig. 4

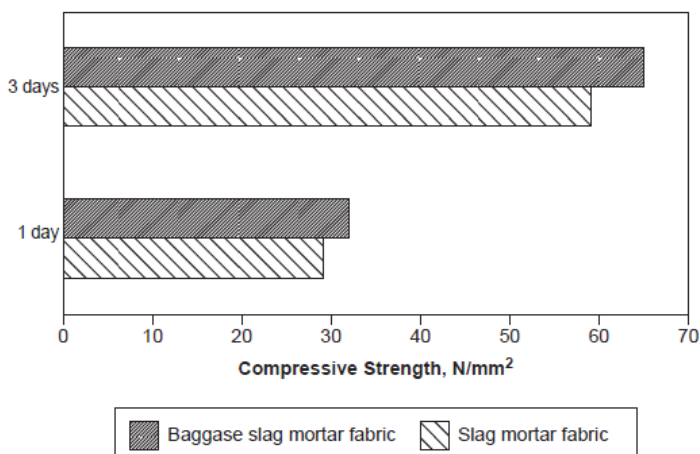


Fig. 4. illustrates the graph showing the strength of Slag mortar fabric and baggasse slag mortar fabric.

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