



IJFEAT

**INTERNATIONAL JOURNAL FOR ENGINEERING APPLICATIONS
AND TECHNOLOGY**

Experimental Study

TRANSPARENT TILES FROM WASTE MATERIAL

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KEYWORDS

TRANSPARENT TILES, LIQUIFIED TILES, EPOXY RESIN TILES

ABSTRACT

The compressive stress-strain behavior and other characteristics of treated fly ash based roof tiles have been studied by several experimental tests. This paper attempts to presents the results and observations of a study and comparison based on the past reported experimental data. Based On the results and observations of the comprehensive experimental study, five “control points” have been identified. The new sets of experiment have been carried out to investigate whether it might be possible the use of fly ash in fly ash based roof tiles for residential construction. In the present study, treated fly ash (TFA) of C category was used with different materials as a replacement of clay for making treated fly ash stone dust roof tiles (TFASDRT). Treated fly ash stone dust roof tiles (TFASDRT) were studied at varying percentages of cement, coarse sand, and radish stone dust (RSD) along with the constant percentage of waste polythene fibre (WPF). A research program was undertaken to evaluate the suitability of such test for assessing the properties of treated fly ash stone dust roof tiles (TFASDRT). The result of this study recommends that the fly ash based roof tiles provides a sustainable supplement to the traditional clay roof tiles, they increase the efficiency of traditional roof tiles and significantly help to reduce the environmental issues associated with the disposal of these waste materials.

INTRODUCTION

In construction work, each component of structure plays important role in formation of good structure. Beams, columns, foundations gives maximum support to the structure. and brick/stone wall gives more support to the beams and columns. Doors provide exit and entrance to us while Windows provide ventilation. Every part of the structure is important then what is about floor finish? Floor finish in rural area like village's is done by clay while in urban areas it is done by concrete flooring, carpeting and tiling. Carpeting and tiling are generally done on concrete flooring. While carpeting is also done on tiling. The process of tiling is also called as hard flooring. Hard flooring is a family of flooring materials that includes concrete or cement, ceramic tiles glass tiles and natural stone products. The history of ceramic industry can be traced back to 10000 BC. Since then, it has constantly evolved with changing times, lifestyle, application and technology. One of the key reason for the wide usagae of tiles for multiple surfaces is a fact that they

are easy to clean and maintain best suited for areas like the bathrooms, kitchen, medical centres, laboratory, schools, public convenience for etc. Tiles crate dramatic first impressions. Even in modest areas, indoor and outdoor, can come to life with the colours and textures of tile.

Going beyond just kitchens and bathrooms, certified tiles and digital printed tiles now offer a luxurious option for living and working places. They add value to any space, need almost no maintenance and costs less per square feet than any other permanent and long-use flooring options. Some years back, tiles were the material used for their functional aspect of providing leveled durable wall and floor surfaces. With evolving times, tiles have gone beyond their ‘only functionality’ aspect and gained aesthetic and decorative value. Indian consumers are ready to experiment with colours, textures and designs. Colours have become richer, deeper and vibrant and textures & surfaces more exciting. Design options range from tiles inspired by nature to mundane day-to-day essentials. Natural stone, wood and marble look are in much demand. Tie finishes mimicking leather; textile and geometry are also popular for wall as well as floor tiles. The global ceramic tile

market is segmented on the basis of product, industry applications and geography and is expected to grow at the CAGR of 9% during 2015-2022 and it is estimated to be \$125 billion by 2022. According to Briskinsights.com, India constitutes the biggest potential market of ceramic tiles whereas; the vitrified tiles market forms more than half of the total tiles market. India is the third largest in world ceramic tile production after Brazil with China being the world largest tile manufacturer

Ceramic Tiles today have become an integral part of home improvement. It can make a huge difference to the way your interiors and outdoors look and express. The Indian tile industry, despite an overall slowdown of the economy continues to grow at a healthy 15% per annum. Investments in the last 5 years have aggregated over Rs. 5000 crores. The overall size of the Indian ceramic tile industry is approximately Rs 18,000 crore (FY12). The production during 2011-12 stood at approx. 600 million square meters. The Indian tile industry is divided into organized and unorganized sector. The organized sector comprises of approximately 14 players. The current size of the organized sector is about Rs 7,200 Crores. The unorganized sector accounts for nearly 60% of the total industry bearing testimony of the growth potential of this sector. Nowadays, using waste materials for construction work is adopted. Hence making tiles from waste materials is becomes necessary. Waste materials used for making tiles are ceramic powder(waste) , paper pulp, fly ash, egg shell powder, granite powder, orange peel powder , debris etc .this materials can be used with some chemicals to make beautiful tiles. This tiles required less cost as compared to normal tiles and it has more strength or nearly equal strength of normal tiles. This tiles gives pleasant appearance. Covering layer of this tiles made up of chemicals.

1.1 General

Nowdays, interior design is as important as outer appearance of structure. **Interior design** is the art and science of understanding people's behaviour to create functional spaces within a building. **Decoration** is the furnishing or adorning of a space with fashionable or beautiful things. In short, **interior designers** may decorate, but decorators do not **design**. **Interior design** is the art and science of enhancing the interior of a building to achieve a healthier and more aesthetically pleasing environment for the people using the space. An **interior designer** is someone who plans, researches, coordinates, and manages such projects. Interior design is a multifaceted profession that includes conceptual development, space planning, site inspections, programming, research, communicating with the stakeholders of a project, construction management, and execution of the design.

In the past, interiors were put together instinctively as a part of the process of building.¹ The profession of interior design has been a consequence of the development of society and the complex architecture that has resulted from the development of industrial processes. The pursuit of effective use of space, user well-being and functional design has contributed to the development of the contemporary interior design profession. The profession of interior design is separate and distinct from the role of *interior decorator*, a term commonly used in the US. The term is less common in the UK where the profession of interior design is still unregulated and therefore, strictly speaking, not yet officially a profession.

In ancient India, architects used to work as interior designers. This can be seen from the references of Vishwakarma the architect - one of the gods in Indian mythology. Additionally, the sculptures

depicting ancient texts and events are seen in palaces built in 17th-century India.

In ancient Egypt, "soul houses" or models of houses were placed in tombs as receptacles for food offerings. From these, it is possible to discern details about the interior design of different residences throughout the different Egyptian dynasties, such as changes in ventilation, porticoes, columns, loggias, windows, and doors.

Throughout the 17th and 18th century and into the early 19th century, interior decoration was the concern of the homemaker, or an employed upholsterer or craftsman who would advise on the artistic style for an interior space. Architects would also employ craftsmen or artisans to complete interior design for their buildings.

Interior design contains placing of furniture, appearance of ceilings, appearance of walls, windows and doors. Flooring is also important factor of interior design.

Flooring is the general term for a permanent covering of a floor, or for the work of installing such a floor covering. **Floor covering** is a term to generically describe any finish material applied over a floor structure to provide a walking surface. Both terms are used interchangeably but floor covering refers more to loose-laid materials.

Materials almost always classified as flooring include carpet, laminate, tile and vinyl.

In India use of tiles is more popular than any other type of flooring. Tiles used for flooring are made up of different materials according to use and requirement of owner or contractor.

Unlike ceramic and stone tiles, which are made of minerals, resilient flooring is made of materials that have some elasticity, giving the flooring a degree of flexibility called resilience. Performance

surfaces used for dance or athletics are usually made of wood or resilient flooring. Vinyl flooring is available in large sheets or pre-cut tiles; the former is resilient. Some come with a pre-applied adhesive for peel-and-stick installation, others require adhesive to be spread on to the substrate.

1.2 Tiles

A **tile** is a manufactured piece of hard-wearing material such as ceramic, stone, metal, or even glass, generally used for covering roofs, floors, walls, showers, or other objects such as tabletops.

Alternatively, tile can sometimes refer to similar units made from lightweight materials such as perlite, wood, and mineral wool, typically used for wall and ceiling applications. In another sense, a tile

is a construction tile or similar object, such as rectangular counters used in playing games. The word is derived from the French word *tuile*, which is, in turn, from the Latin word *tegula*, meaning a roof tile composed of fired clay.

Tiles are often used to form wall and floor coverings, and can range from simple square tiles to complex or mosaics. Tiles are most often made of ceramic, typically glazed for internal uses and unglazed for roofing, but other materials are also



commonly used, such as glass, cork, concrete and other composite materials, and stone. Tiling stone is typically marble, onyx, granite or slate. Thinner tiles can be used on walls than on floors, which require more durable surfaces that will resist impacts.

History of Tiles

The earliest evidence of glazed brick is the discovery of glazed bricks in the Elamite Temple at ChoghaZanbil, dated to the 13th century BC. Glazed and colored bricks were used to make low reliefs in Ancient Mesopotamia, most famously the Ishtar Gate of Babylon (ca. 575 BC), now partly reconstructed in Berlin, with sections elsewhere. Mesopotamian craftsmen were imported for the palaces of the Persian Empire such as Persepolis.

Tiling was used in the second century by the Sinhalese kings of ancient Sri Lanka, using smoothed and polished stone laid on floors and in swimming pools. Historians consider the techniques and tools for tiling as well advanced, evidenced by the fine workmanship and close fit of the tiles. Tiling from this period can be seen in Ruwanwelisaya and KuttamPokuna in the city of Anuradhapura.

Early Islamic mosaics in Iran consist mainly of geometric decorations in mosques and mausoleums, made of glazed brick. Typical turquoise tiling becomes popular in 10th-11th century and is used mostly for Kufic inscriptions on mosque walls. Seyyed Mosque in Isfahan, Dome of Maraqeh and the Jame Mosque of Gonabad are among the finest examples. The dome of Jame'Atiq Mosque of Qazvin is also dated to this period.

The golden age of Persian tilework began during the reign the Timurid Empire. In the moraq technique, single-

color tiles were cut into small geometric pieces and assembled by pouring liquid plaster between them. After hardening, these panels were assembled on the walls of buildings. But the mosaic was not limited to flat areas. Tiles were used to cover both the interior and exterior surfaces of domes. Prominent Timurid examples of this technique include the Jame Mosque of Yazd, Goharshad Mosque, the Madrassa of Khan in Shiraz, and the Molana Mosque.

Other important tile techniques of this time include girih tiles, with their characteristic white girih, or straps.

Mihrabs, being the focal points of mosques, were usually the places where most sophisticated tilework was placed. The 14th-century mihrab at Madrasa Imami in Isfahan is an outstanding example of aesthetic union between the Islamic calligrapher's art and abstract ornament. The pointed arch, framing the mihrab's niche, bears an inscription in Kufic script used in 9th-century Qur'an.^[2]

One of the best known architectural masterpieces of Iran is the Shah Mosque in Isfahan, from the 17th century. Its dome is a prime example of tile mosaic and its winter praying hall houses one of the finest ensembles of cuerdasera tiles in the world. A wide variety of tiles had to be manufactured in order to cover complex forms of the hall with consistent mosaic patterns. The result was a technological triumph as well as a dazzling display of abstract ornament.

During the Safavid period, mosaic ornaments were often replaced by a haftrang (seven colors) technique. Pictures were painted on plain rectangle tiles, glazed and fired afterwards. Besides economic reasons, the seven colors method gave more freedom to artists and was less time-consuming. It was popular until the Qajar period, when the palette of colors was extended by yellow and orange.^[1] The seven colors of Haft Rang tiles were

usually black, white, ultramarine, turquoise, red, yellow and fawn.



Two panels of earthenware tiles painted with polychrome glazes over a white glaze. (Iran 19thC)

The Persianate tradition continued and spread to much of the Islamic world, notably the İznik pottery of Turkey under the Ottoman Empire in the 16th and 17th centuries. Places, buildings, mosques and türbe mausoleums were heavily decorated with large brightly colored patterns, typically with floral motifs, and friezes of astonishing complexity, including floral motifs and calligraphy as well as geometric patterns.

OBJECTIVES

The main goal of the team is to produce or manufacture something different that never would have been done by anyone else.

Objectives of our project are:

- Understanding the concept of transparent tiles
- Understanding the need of transparent tile
- Understanding the properties of component
- Studying the impact of today's pollution on future due to current construction standard
- Utilisation of best alternative raw material by omitting current high pollution standards
- Conducts details study about different factors of tiles and properties
- Performing detail study about raw material to be used and procedure for making transparent tiles
- Discuss the benefits of products and its shortcomings with remedies
- Conclude the research with appropriate result and strength quality and appearance of products

METHODOLOGY

- **There are three steps for making transparent Tiles:-**
 - 1) **Making Base**
 - 2) **Applying First Coat**
 - 3) **Applying Second Coat**

Base Used for Tile is generally made up of ceramic powder or other stones. We are using Waste materials like paper pulp, fly ash & Ceramic Powder of broken tiles.

- **Base Material:-**

Base Material Carries all the load (Live & Dead). Hence Necessary to make a strong base which is capable of take load without failure

A) Paper Pulp

Paper Pulp is made up of old waste paper. Old Paper are torn into smaller pieces and put them in a bucket. Adding Hot Water for Socking of Paper. Adding Sodium Biocarbonate for removing ink present on old papers.

Papers are Socked in water for 3 Days, After 3 Days water is changed and again sodium biocarbonate is added. Repeating this Process for 4-5 Times gives a clear paper pulp, Which is whitish in colour shows purity of pulp. The Obtained Pulp having large size pieces, So grinding this pulp in grinder to make smooth slurry. This Slurry is field in mould and compacted for hardening and gaining strength. Before Putting in mould, Glue is added in slurry for better binding Purpose. After Hardening smooth and well Finished base is obtained.

B) Fly Ash

Fly ash is a coal combusting product which composed of the particulates. To make base of tiles with fly ash, fly ash is mixed with Sodium hydroxide which is excellent binding material as well as it gives strength after hardening. The paste of fly ash and sodium hydroxide is kept in ratio 1:1. Paste is field in mould and dried for gaining strength after drying a hard base is obtained.

C) Ceramic Powder

Ceramic Powder is a material which is obtained from waste ceramic Tile. A Fine Powder is Made by grinding this ceramic stone. Obtained fine powder is mixed with water and sodium hydroxide for making paste. This paste is field in mould to make base.

- After the base is made the second step is applying first coat of epoxy resin. Epoxy resin is the material which is in liquid state and shiny glass like appearance after hardening. This material is directly poured on the and equally spread on it. It Takes about 24 Hours for 95% of hardening and 72 Hours for 100% hardening.

Procedure:-

- Take the waste material fly ash make a small particles of it with the help of any tamping hand road
- Sieve the tamped particles through the siever of 4.75 mm
- Take about 700 gm of sieved materials put it into the drum (any drum)
- Take a quantity of water mostly half of the drum .

- Put it into that drum which now contains flyash and water
 - Allow it to get that fly ash of pure quality which will be free from impurities in order to get a pure flyash
 - Allow it to settle for about 1-2 days till it stick to the base
 - After getting pure flyash take 2 solutions of sodium silicate and sodium hydroxide
 - Heat the both solutions at 700ml of sodium hydroxide and 200 gm of caustic soda
 - One the form a paste of both of these solution put that obtained pure fly ash in to it
 - Make a proper paste by stirring it properly
 - Give that paste a shape of tile of any particular lbt
 - Keep it for set into shape at atmosphere Temperature for 3 days .
 - After getting the hard tile put resin and epoxy over it
 - Spread over it in to a layer
 - Let them settle and get adhesied to it Use it for decorative purpose
- The Cost of manufacturing is less as compared to normal tile
 - The Process of manufacturing is easy
 - Can be sold at High Value
 - It has a Pleasant appearance, Which is good for interior decoration..

Environmental benefit

Recycled-content tile can be used for floors, countertops, and walls, and may be made from either recycled glass or wastes from mines or factories. Tiles come in two varieties: ceramic and glass. Ceramic tiles may be made from factory waste (known as post-industrial waste) generated by the production of conventional tiles. Some manufacturers, such as [Crossville](#), produce tiles that contain 50 percent to 100 percent in-house manufacturing waste — waste that would otherwise have ended up in landfills.

Other products, such as the Debris Series from [Fireclay Tile](#), combine post-industrial and post-consumer recycled wastes. The Debris Series tile consists of 26 percent recycled granite dust (post-industrial waste) from a granite-cutting operation. It also contains 26 percent recycled glass (post-consumer waste). Plus, the glazes used by this company contain no lead, so they're safer for the workers who apply them.

Recycled-content glass floor tiles from [UltraGlas](#) contain 15 percent to 30 percent recycled glass. Blazestone tiles produced by [Bedrock Industries](#) are made from 100 percent recycled glass, as are the

MERITS

It is a newer product that is making transparent tile

- Waste material can be recycled
- It can be used for designing purpose as a flooring material

tiles from [Sandhill Industries](#). Although recycled-content glass tiles are good for the environment, they are also prized by many interior designers because some types have special decorative qualities, such as translucent iridescence, not found in other tiles. Recycled tile for floors, walls and countertops is produced by many of the companies mentioned here and listed in the sources, below.

DEMERITS

The disadvantages of transparent tiles in your house are as follows :

1. While installing transparent tiles the roofing contractor must nail is properly with proper negligence so that it does not gets damaged because it is not metal or wood, it is made of waste material, so proper
2. installation of transparent tiles is important because if not installed properly than it can damage the home.
3. Maintenance of transparent tiles is not easy because it will need proper guidance and appropriate materials to fill in the cracks which had occurred due to any unwanted weather. The life of transparent tiles is not more than thirty years because they are made up of glass elements.
4. Air exchange issues are noticed after installing transparent tiles in your home because ventilation is important for every home and due to its structure it is not easily possible of ventile region to exchange the spoiled air to the pure air.
5. As this roof comes in cutted and shaped sheets so manual cutting is also required for more better and enhanced look of the roof where it is been installed.

CONCLUSION

Fly ash is a potential source of pollution and can have negative influences on water and soil because of their granulometric and mineral composition as well morphology and filtration properties. Fly ash is now recognized as valuable substances which confers certain advantageous characteristics in its many applications. Utilization of fly ash is already well established in a variety of construction works and waste solidification and stabilization process. There is urgent need to undertake research and development for studying the metal speciation and the change associated with fly ash reuse to utilize 100%. The chemical composition, morphology as well as the categorization of fly ash depends on coal quality and size distribution of particles despite the fact that reactivity of the ash seems to increase with surface area. Higher particle sizes low is the reactivity, so we have to take care of the fly ash to increase its grain size for different pH. Fly ash contains macro-nutrients such as N, P, and K and micro-nutrients such as Cu, Zn, Fe, and Mn in

sufficient quantity for consideration for agricultural applications. Apart from these it also contains heavy metals like Pb, Hg, As, Cd, Se, Mo, Sc, Ni, V, and Zn in trace quantity. Trace metal concentration in the leachate depends on fly ash weight/solution, pH and concentration of the elements. Some of the problems associated with fly ash are land required for disposal and toxicity associated with heavy metals leached to ground water, so we have to treat it for higher grain size. The highest level of fly ash utilization of about 62.6% was achieved in the year 2009-10 and it is, however, 55.69 % in the year 2014-15 (CEA, 2014-15). Listed below are few of the many recommendations that can further enhance the utilization level of fly ash: 1. Modernization of coal/lignite based Thermal Power Stations. 2. Use of fly ash in the construction of embankments to lay railway lines and roads has too significant potential for large scale utilization of fly ash. 3. Thermal Power Stations have to ensure the utilization of fly ash itself. 4. The use of fly ash in Agriculture and waste land improvement has large potential. 5. Thermal Power Stations have to explore and promote all possible modes of fly ash utilization by establishing in-house research cell. This obtained fly ash can be used in the manufacturing of transparent tiles from waste material due to which we

can get tiles for design purpose with addition to recycling of material

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