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Manufacturing of Sand Bricks using Mahurzari Village Lake Sand

Prof. Natish Sayyed[(1)], Shivam Singh[(2)], Nayan Lakha[(3)], Shailendra Bageshwar[(4)], Alpesh Mandlik[(5)], Nikhil Kohare[(6)], Umesh Nirmohi[(7)]

Head of Department, Department of Civil Engineering, NIT Polytechnic College, Nagpur, India[1]

Diploma Students, Department of Civil Engineering, NIT Polytechnic College, Nagpur, India [2,3,4, 5, 6, 7]

ABSTRACT: Burnt clay bricks are an old age building material which is used for housing in urban and rural parts of India. These bricks are manufactured from clay, which are obtained from agricultural land. Excess use of clay result in loss of fertile soil and diversion of agricultural land for brick manufacturing. It also involves of burning of bricks by coal and wood which results in production of greenhouse gases leading to environmental pollution. An effort for alternative approach in the manufacturing of brick was accomplished by using industrial by-product like foundry sand and eco sand derived from dolomitic lime stone with cement as key ingredients. In India there are many industries which generate foundry sand which is been dumped into vacant ground as waste. Dumping industrial waste into ground may be hazardous in nature; their disposal is a major concern. Recycling such waste by utilizing them into building materials is a moderate solution to reduce the pollution issues. Eco sand is the secondary product of rock after the separation of lime component. Eco sand can be used as an alternative for river sand and M Sand. The properties of eco sand and foundry sand are found out by using standard test procedure. In this project different proportions of cement, eco sand, foundry sand are thoroughly mixed and moulded into bricks and the test were performed for the property of Compressive strength for 7 days,14 days, 28 days of curing and 24 hours of sun drying.

KEYWORDS*:* Cement, Eco sand , Foundry sand Compressive strength.

I. INTRODUCTION

A brick is a type of block used to build walls, pavements and other elements in masonry construction. Properly, the term brick denotes a block composed of dried clay, but is now also used informally to denote other chemically cured construction blocks. Bricks can be joined together using mortar, adhesives or by interlocking them.Bricks are produced in numerous classes, types, materials, and sizes which vary with region and time period, and are produced in bulk quantities.Block is a similar term referring to a rectangular building unit composed of similar materials, but is usually larger than a brick. Lightweight bricks (also called lightweight blocks) are made from expanded clay aggregate.
Fired bricks are one of the longest-lasting and strongest building materials, sometimes referred to as artificial stone, and have been used since circa 4000 BC. Air-dried bricks, also known as mudbricks, have a history older than fired bricks, and have an additional ingredient of a mechanical binder such as straw.Bricks are laid in courses and numerous patterns known as bonds, collectively known as brickwork, and may be laid in various kinds of mortar to hold the bricks together to make a durable structure.

II.HISTORY OF BRICKS

Man has used brick for building purpose for thousands of years. Bricks date back to 7000 BC, which makes them one of the oldest known building materials. They were discovered in southern Turkey at the site of an ancient settlement around the city of Jericho. The first bricks, made in areas with warm climates, were mud bricks dried in the sun for hardening. Ancient Egyptian bricks were made of clay mixed with straw. The evidence of this can be seen today at ruins of Harappa Buhen and Mohenjo-Daro. Paintings on the tomb walls of Thebes portray Egyptian slaves mixing, tempering and carrying clay for the sun dried bricks.
The greatest breakthrough came with the invention of fired brick in about 3,500 Bc. From this moment on, bricks could be made without the heat of sun and soon became popular in cooler climates. The Romans preferred to make their bricks in spring, then they stored them for two years before selling or using them. They only used white or red clay to manufacture bricks. The Romans succeeded in introducing fired bricks to the entire country thanks to mobile kilns.

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These were bricks stamped with the mark of the legion who supervised the brick production. Roman bricks differed in size and shape from other ancient bricks as they were more commonly round, square, oblong, triangular and rectangular.The kiln fired bricks measured 1 or 2 Roman feet by 1 Roman foot, and sometimes up to 3 Roman feet with larger ones. The Romans used brick for public and private buildings over the entire Roman empire.

They built walls, forts, cultural centre, vaults, arches and faces of their aqueducts. The Herculaneum gate of Pompeii and the baths of Caracalla in Rome are examples of Roman brick structures.During the period of the Roman Empire, the Romans spread the art of brickmaking throughout Europe and it continued to dominate during the
medieval and Renaissance period. When the Roman Empire fell, the art of brickmaking nearly vanished and it continued only in Italy and the Bizantine Empire. In the 11th century, brickmaking spread from these regions to France. The History of Bricks and Brickmaking 8 During the 12th century bricks were reintroduced to northern Germany from northern Italy. This created the brick gothic period with buildings mainly built from fired red clay bricks. The examples of the Brick Gothic style buildings can be found in the Baltic countries such as Sweden, Denmark, Poland, Germany, Finland, Lithuania, Latvia, Estonia, Belarus and Russia. This period lacks in figural architectural sculptures which had previously been carved from stone. The Gothic figures were virtually impossible to create out of bricks at that time, but could be identified by the use of split courses of bricks in varying colours, red bricks, glazed bricks and white lime plaster. Eventually custom built and shaped bricks were introduced which could imitate the architectural sculptures. In the 16th century, Brick Gothic was replaced by Brick Renaissance architecture.
In medieval times, the clay for making bricks often was kneaded by workers with their bare feet. They clay was shaped into brick by pushing it into a wooden frame placed on a table, which was covered with sand or straw to prevent the clay from sticking. After excess clay was wiped off with a stick, the brick was removed from the frame.
In England the remains of buildings prove that the art of brickmaking was highly advanced by the time of Henry VIII. After the great fire of London in 1666, the city was rebuilt with mainly bricks.

III.RAW MATRIAL

Natural clay minerals, including kaolin and shale, make up the main body of brick. Small amounts of manganese, barium, and other additives are blended with the clay to produce different shades, and barium carbonate is used to improve brick's chemical resistance to the elements. Many other additives have been used in brick, including by products from papermaking, ammonium compounds, wetting agents, flocculants (which cause particles to form loose clusters) and deflocculants (which disperse such clusters). Some clays require the addition of sand or grog (pre-ground, pre-fired material such as scrap brick).
A wide variety of coating materials and methods are used to produce brick of a certain color or surface texture. To create a typical coating, sand (the main component) is mechanically mixed with some type of colorant. Sometimes a flux or frit (a glass containing colorants) is added to produce surface textures. The flux lowers the melting temperature of the sand so it can bond to the brick surface. Other materials including graded fired and unfired brick, nepheline syenite, and graded aggregate can be used as well.

IV.METHODOLOGY

The initial step in producing brick is crushing and grinding the raw materials in a separator and a jaw crusher. Next, the blend of ingredients desired for each particular batch is selected and filtered before being sent on to one of three brick shaping processes—extrusion, molding, or pressing, the first of which is the most adaptable and thus the most common. Once the bricks are formed and any subsequent procedures performed, they are dried to remove excess moisture that might otherwise cause cracking during the ensuing firing process. Next, they are fired in ovens and then cooled. Finally, they are dehacked—automatically stacked, wrapped with steel bands, and padded with plastic corner protectors.

Grinding, sizing, and combining raw materials :-
1. First, each of the ingredients is conveyed to a separator that removes oversize material. A jaw crusher with horizontal steel plates then squeezes the particles, rendering them still smaller. After the raw materials for each batch of bricks have been selected, a scalping screen is often used to separate the different sizes of material. Material of the correct size is sent to storage silos, and over-sized material goes to a hammermill, which pulverizes it with rapidly moving steel hammers. The hammermill uses another screen to control the maximum size of particle leaving the mill, and discharge goes to a number of vibrating screens that separate out material of improper size before it is sent on to the next phase of production.

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Extrusion :-

2. With extrusion, the most common method of brick forming, pulverized material and water are fed into one end of a pug mill, which uses knives on a rotating shaft to cut through and fold together material in a shallow chamber. The blend is then fed into an extruder at the far end of the mill. The extruder usually consists of two chambers. The first removes air from the ground clay with a vacuum, thereby preventing cracking and other defects. The second chamber, a high-pressure cylinder, compacts the material so the auger can extrude it through the die. After it is compressed, the plastic material is forced out of the chamber though a specially shaped die orifice. The cross-section of the extruded column, called the "pug," is formed into the shape of the die. Sections of desired length are cut to size with rotating knives or stiff wires.

In moulding, soft, wet clay is shaped in a mold, usually a wooden box. The interior of the box is often coated with sand, which provides the desired texture and facilitates removing the formed brick from the mold. Water can also be used to assist release. Pressing, the third type of brick forming, requires a material with low water content. The material is placed in a die and then compacted with a steel plunger set at a desired pressure. More regular in shape and sharper in outline than brick made with the other two methods, pressed bricks also feature frogs.

Chamfering the brick:-

3 .Chamfering machines were developed to produce a furrow in brick for such applications as paving. These machines use rollers to indent the brick as it is being extruded. They are sometimes equipped with wire cutters to do the chamfering and cutting in one step. Such machines can produce as many as 20,000 units per hour.

Coating :-

4. The choice of sand coating, also applied as the brick is extruded, depends on how soft or hard the extruded material is. A continuous, vibrating feeder is used to coat soft material, whereas for textured material the coating may have to be brushed or rolled on. For harder materials a pressure roller or compressed air is used, and, for extremely hard materials, sand blasting is required.

Drying:-

5. Before the brick is fired, it must be dried to remove excess moisture. If this moisture is not removed, the water will burn off too quickly during firing, causing cracking. Two types of dryers are used. Tunnel dryers use cars to move the brick through humidity-controlled zones that prevent cracking. They consist of a long chamber through which the ware is slowly pushed. External sources of fan-circulated hot air are forced into the dryer to speed the process.

6. Automatic chamber dryers are also used, especially in Europe. The extruded bricks are automatically placed in rows on two parallel bars. The bricks are then fed onto special racks with finger-like devices that hold several pairs of bars in multiple layers. These racks are then transferred by rail-mounted transfer cars or by lift trucks into the dryers.

Firing :-

7. After drying, the brick is loaded onto cars (usually automatically) and fired to After forming and coating, the bricks are dried using either tunnel dryers or automatic chamber dryers. Next, bricks are loaded onto cars automatically and moved into large furnaces called tunnel kilns. Firing hardens and strengthens the brick. After cooling, the bricks are set and packaged.

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High temperatures in furnaces called kilns. In general, the cars that moved the bricks through the drying process are also used to convey them through the tunnel kiln. These cars are pushed through the kiln's continuously maintained temperature zones at a specific rate that depends on the material. The majority of kilns in the United States use gas as a fuel source, though a third of the brick currently produced is fired using solid fuels such as sawdust and coal. Tunnel kilns have changed in design from high-load, narrow-width kilns to shorter, lower-set wider kilns that can fire more brick. This type of design has also led to high-velocity, long-flame, and low-temperature flame burners, which have improved temperature uniformity and lowered fuel consumption.

Setting and packaging:-

8. After the brick is fired and cooled, it is unloaded from the kiln car via the dehacking process, which has been automated to the point where almost all manual brick handling is eliminated. Automated setting machines have been

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developed that can set brick at rates of over 18,000 per hour and can rotate the brick 180 degrees. Usually set in rows eleven bricks wide, a stack is wrapped with steel bands and fitted with plastic strips that serve as corner protectors. The packaged brick is then shipped to the job site, where it is typically unloaded using boom trucks.

V.FUTURE SCOPE

Currently, the use of brick has remained steady, at around seven to nine billion a year, down from the 15 billion used annually during the early 1900s. In an effort to increase demand, the brick industry continues to explore alternative markets and to improve quality and productivity. Fuel efficiency has also improved, and by the year 2025 brick manufacturers may even be firing their brick with solar energy. However, such changes in technology will occur only if there is still a demand for brick.

Even if this demand continues, the brick industry both here and abroad faces another challenge: it will soon be forced to comply with environmental regulations, especially in the area of fluorine emissions. Fluorine, a byproduct of the brickmaking process, is a highly reactive element that is dangerous to humans. Long-term exposure can cause kidney and liver damage, digestive problems, and changes in teeth and bones, and the Environmental Protection Agency (EPA) has consequently established maximum exposure limits. To lessen the dangers posed by fluorine emissions, brickworks can install scrubbers, but they are expensive.

While some plants have already installed such systems, the U.S. brick industry is trying to play a more important role in developing less expensive emissions testing methods and establishing emission limits. If the brick industry cannot persuade federal regulators to lower their requirements, it is quite possible that the industry could shrink in size, as some companies cannot afford to comply and will go out of business.

VI. CONCLUSIONS

BasedontheExperimentalstudythefollowingconclusionhasbeendrawn.

•1.FirstclassBricksareusuallyof190X90X90mmtheSolidBlockcanbemadeof230x110x70mm.

•2.CompressivestrengthofSolidblockmasonryis8.55N/mm2to14.62N/mm2whichcameouttobehigherthannominalcompressivestrengthofbrick(3.5to5.5N/mm2).

•3.ThecostofSolidblockisestimatedtobe20%morethanthatofanormalbrick.So,blockmasonryiscostlierthannormalbrickmasonry

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