COMPARATIVE STUDY ON COMPRESSIVE STRENGTH BETWEEN MACHINE MADE BRICK & CONCRETE BLOCK

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A thesis submitted to the Department of Civil Engineering in partial fulfillment for the degree of Bachelor of Science in Civil Engineering

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Section: 19B
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DECLARATION

It is hereby declared that thesis/ project or any part of it has not been submitted elsewhere for the award of any degree or diploma.

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Dedicated
to
“Our Respectful Teachers & Parents”

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ABSTRACT

Compression when tested on compressive testing each brick has its own strength all brick does not have an equal or similar strength to each other. Compressive strength is also known as compression strength. Compressive strength is the capacity of a material or structure to with tend loads tending to reduce size, as opposed to tensile strength, which with stands loads tending to elongate. The objective of this experiment is to determine the compressive strength of brick sample. "Conducting this experiment, we can obtain the strength of the brick. This experiment their area few methods that have been used. Compressive strength of bricks is the capacity of brick to resist or withstand under chine . The Compressive strength of a material is determined by the ability of the material to resist failure in the form of cracks and fissure.

Compression when tested on compressive testing each brick has its own strength all brick does not have an equal or similar strength to each other. Compressive strength is also known as compression

Concrete Block (CB) brick is a material composition for wall building made of Portland cement, water, and fine aggregate blended with a foaming agent. The weight of the brick is light due to the air cavities formed in the Concrete Block brick. The number composition of sand and cement in the Concrete Block brick could improve the strength of the bricks. Thus, it is essential to find out the sand and cement consumption in order to improve the rate of brick strength. The study aims to improve the strength of the Concrete Block bricks with the different composition of the material and to find out the index properties of the bricks with the variable component of the materials. The study used an experimental work in the material laboratory with two variations of the material composition. The first variation is mixing concrete for the ratio of cement and sand of 1:2, while the second variation is mixing concrete for cement and sand ratio of 2:3. The wet density of the Concrete brick is about 800-900kg/m3, and the average compressive strength test was conducted at ages 3, 7and 28 days for each test. Three identical specimens were prepared for each test. The study resulted in the 28-day strength of the Concrete brick with a mass ratio of cement to sand 1:2 of 0.52 MPa, and the strength of the brick with a mass ratio of cement to sand 2:3 was 0.68 MPa. The first variation was lower by 24.5% than the second variation in terms of strength. The higher cement consumption used into the mixed can make porosity of the specimen decrease, and then the strength of the specimen will improve [3].

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CHAPTER 1

INTRODUCTION

1.1 General:

A brick is a type of construction material used to build walls, pavements and other elements in masonry construction. Properly, the term brick denotes a unit primarily composed of clay, but is now also used informally to denote units made of other materials or other chemically cured construction blocks. Bricks can be joined using mortar, adhesives or by interlocking. Bricks are usually produced at brickworks in numerous classes, types, materials, and sizes which vary with region, and are produced in bulk quantities. Whenever we consider the construction world, there are few more versatile and practical building materials than bricks. Bricks are used for a number of different projects from building walls to constructing underground tunnels to laying pathways. As they are impervious to harsh climate conditions, they can last decades before they require replacing.

1.2 Background and Motivations:

The conventional bricks are unsuitable in cold and hot weather regions. Regular cannot used in some climatic conditions like, hot, cold and rain, but the modern.

1.3 History of Concrete Block:

Around the turn of the 20th century there was a dramatic shift in architectural style from the Victorian era to the modern era. Builders and architects also began experimenting with new and cheaper materials to combat the rising costs of lumber and brick, and the scarcity of natural stone. Concrete blocks were found to be cheaper than natural stone and even cheaper than brick, especially in smaller communities where brick had to shipped long distances. Concrete block was also stronger than brick, lighter than natural stone, easy to make, and much more affordable. Sometimes you have to look closely, but rock face block, also commonly referred to as rusticated concrete block or ornamental concrete block, can be found on historic homes and buildings all over the United States and Canada.

Concrete blocks were first manufactured in England around the 1850s and are first seen in use in the United States around the 1880s. The first patent for a concrete block was granted to C.S. Hutchinson in 1866. During the 1890s Portland cement, a key ingredient used to make these blocks architecturally sound, became readily available across the US. Shortly thereafter, Harmon S. Palmer created the first block molding machine in 1900, making it quick, easy, and inexpensive the produce these blocks. It isn't until this time that you really see this building material really take off. Concrete block is one of the modern faces of concrete block.

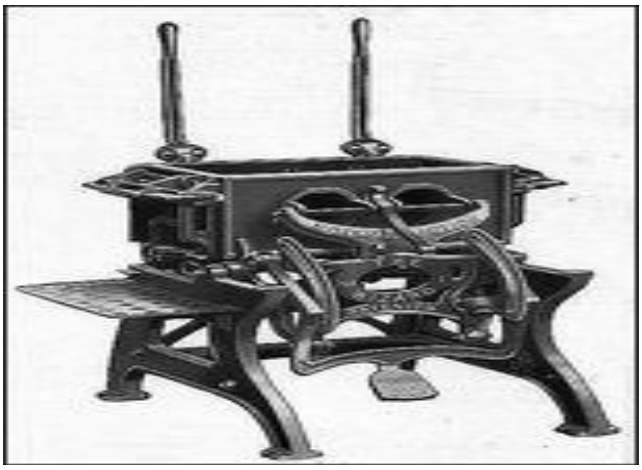


Figure 1.1 A first invented concrete block machine

1.4 Research Objectives and Overview:

Comparative study on compressive strength Between Machine made Brick & Concrete Block. If we carry out the construction work with concrete blocks, our construction cost will be reduced. The production of machine-made brick causes environmental air pollution so we can use concrete block instead of machine-made brick.

1.5 Organization of The Thesis:

Chapter 1: Introduction and Objective. This chapter provides the background of study and motivations of the research. The overall objectives and expected outcomes are also described in this chapter.

Chapter 2: Literature Review. In this chapter we discuss about concrete blocks & Machine-Made brick and their comparison. Here we highlight how to normal bricks & concrete blocks impact our environment, also they are costing and advantages and disadvantages part. In our research we find out the difference between concrete blocks and normal red bricks.

Chapter 3: Methodology. This chapter discusses the analytical process in details step by the production of concrete blocks consist four basic processes: mixing, molding, curing and compressive strength test.

Chapter 4: Results and Discussion. Machine Made Bricks are made by machines. Which is more environment friendly than bricks made from brick kiln? And concrete blocks are made by advanced machines. By which no damage is done to the environment. So, we can do any construction work with concrete blocks instead of bricks. And in terms of cost, the

cost of concrete blocks is much less than bricks. However, we found that machine made brick has more strength than concrete block.

Chapter 5: Conclusions and Future Work.

This chapter summarizes the conclusions and major contributions of this study and provides recommendations for future studies

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction:

This chapter will be reviewed on literature of compare between machine made brick and concrete block. In Bangladesh, use of brick is very widespread due to its availability and low cost. In this research we compare between machine made brick & concrete block. Machine made brick are one of the oldest and extensively used building material. That is primarily made from clay. Solid concrete blocks, on the other hand, are precast concrete blocks manufactured from cement and fine aggregates. The important difference between machine made brick and solid concrete blocks are tabulated below.

2.1.1 Machine Made brick:

Machine made brick use the following raw materials Lime Clay or Alumina, Sand, Iron Oxide, Magnesia. The sand used for red brick manufacture is mostly obtained locally. Machine made brick utilize clay which is naturally available. This production hence depletes the top fertile soil. Machine made brick also emit more carbon dioxide during its manufacture. Machine made brick can be used as a structural material for the construction of structures like buildings, foundations, arches, pavement and bridges. These can be also used for aesthetic purposes like landscaping, facing works and many other architectural purposes. Machine-made products have their own unique features, and bricks are no exception. brick manufacturers produce large quantities of high-quality bricks in bulk, to precise specifications. This ensures consistency and precision across the whole building project. The extrusion method is the most popular method of brick production. The brick extrusion process involves a machine pushing the clay (and other materials) through a die that forms a consistent size and shape. Wire cut bricks are made when the brick clay is continuously extruded to the specified shape and size, and then individually cut with a wire. Other materials, like water, for example, can be added to release the clay from the mounds, to create water struck bricks. Or sand can be used to create soft mud bricks. Heritage of machine-made bricks

Our brick making machine made by Berry and Son of Westcliff on Sea in the 1920's, is one of the last of its kind still operating and can produce up to 12,000 bricks per day. Due largely to the fact that the bricks are demolded by hand means they have more character than mass-produced machine-made bricks. Machine made bricks have a smoother texture and have the same color as handmade bricks but a lower cost.

Machine made brick production largely replaced handmade bricks after the second world war with only specials being made by hand until the revival of handmade stock bricks in the 1990's.

2.1.2 Concrete Blocks:

Concrete blocks use the following raw materials Ordinary Portland Cement, Sand, Gravel, and Water. In certain situations, fly ash can be used instead of fine sand. The amount of carbon dioxide emitted during the manufacture of solid concrete blocks is less. Solid concrete blocks are employed in construction to act both as load bearing and non-load bearing in walls, panel wall and partition walls. This can also be used as backing for piers, retaining walls, other facing materials, chimneys, fire places and garden walls etc. A concrete block is a 'building block' built entirely of concrete. Generally, the size of concrete block is 250 mm, 117 mm and 70 mm. Below is the size of concrete block.

Meer Concrete Blocks is one of the business concerns of Meer Group of Companies, which was inaugurated in 2004. We specialize in manufacturing high-quality concrete blocks. Overall improvement. The construction process in the country is of international standards, we have been introducing and using new technologies and practices since our inception

Figure 2. 1 Concrete block wide size

Figure 2. 2 Concrete Block Length Size

Figure 2.3 Concrete Block Height Size

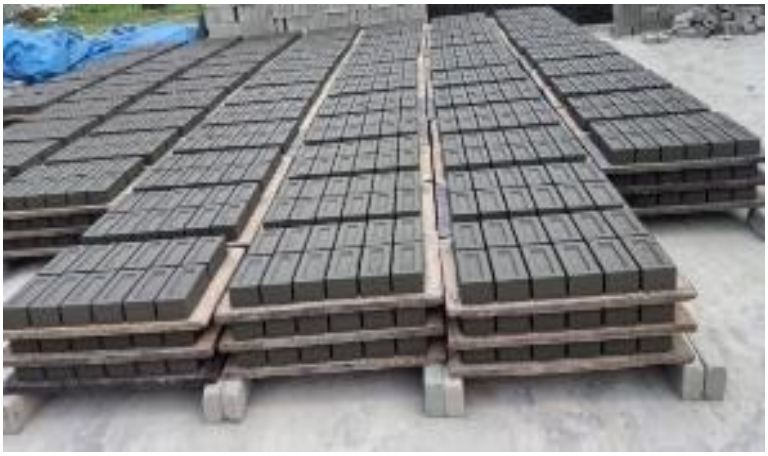


Figure 2.4 Concrete Blocks

joined with mortar to create a commanding, long-lasting construction. Depending on the exact demand, these construction blocks may be ‘hollow’ or ‘solid’ and made of heavy-duty or lightweight concrete in various conventional sizes.

2.1.3 Concrete blocks:

Types:

These concrete blocks can be divided into:

1. Blocks of solid concrete,
2. Blocks of hollow concrete.

1. Blocks of solid concrete

A block is classified as a solid concrete block if concrete makes up more than 75% of its entire mass in relation to its overall dimensions. It also goes by the name concrete brick**.**

2. Blocks of hollow concrete

A hollow concrete block only contains solid material in 50–70% of the entire volume, as determined by the overall dimensions. Hollow concrete blocks may include one or more sizable “holes” or “cavities” that may pass through the block (open cavity) or may only be there (closed cavity) to lower the bulk without sacrificing strength.

2.2 Difference between Concrete Blocks and Machine-Made Brick:

We all aspire to build with such materials to last forever. People always want to choose materials that best fit their budget and provide incredible strength at the same time. With durability and strength in mind, two-building block materials come into play: concrete and traditional machine-made brick. There are numerous differences between concrete blocks and machine-made brick as they are entirely different materials. The following section will discuss key differences between concrete blocks and machine-made brick based on properties of building block materials.

Concrete blocks have a much higher water resistance than bricks, and their compressive strength is higher. Concrete has a shorter life than brick, though it still gives efficient results for up to 100 years. It is also incredible durable and can be painted more easily than brick, which secretes metallic salts that can cause paint to peel off.

2.2.1 Concrete Block Manufacturing:

Blocks can be made by using a simple block-making machine operated by an engine or by hand. They can also be made by using simple wooden molds on a platform or floor. The mold can be lined with net steel plates to prevent damage during tamping and to reduce wear on the mold. In large-scale production steel molds are often used. The wooden mold is initially oiled overnight and need not be oiled each time it is filled. It is sufficient to wipe it clean with a cloth [2]. The concrete, of stiff or plastic consistency, is placed in the mold in layers and each layer is compacted with a 3 kg rammer. Starting the day after the blocks have been made, water is sprinkled on them for two weeks during curing. After 48 hours the blocks can be removed for stacking, but the wetting is continued. After curing, the blocks are dried. If damp blocks are put in a wall, they will shrink and cause cracks. To assure maximum drying, the blocks are stacked interspaced, exposed to the prevailing wind and in the case of hollow blocks, with the cavities laid horizontal to form a continuous passage for the circulating air.

2.3 Environmental Impact:

One of the significant differences between concrete blocks and machine-made brick that have inspired people to choose concrete blocks is their eco-friendliness. Concrete blocks are manufactured using fly ash instead of stone aggregates. Fly ash is a by-product of thermal plants. Instead of dumping fly ash into the Earth, which can make the soils toxic, researchers have figured out how to use fly ash to make concrete blocks. It reduces cost and strengthens the concrete blocks internally. With the advancement of technology, concrete blocks are now being produced with incredibly accurate machines that spit out

identical dimensional concrete blocks. So, concrete blocks will always be cheaper than traditional machine-made brick.

2.3.1 Machine Made brick:

Machine made brick utilize clay which is naturally available. This production hence depletes the top fertile soil. Machine made brick also emit more carbon dioxide during its manufacture.

2.3.2 Concrete Blocks:

The amount of carbon dioxide emitted during the manufacture of solid concrete blocks is less. The environmental impact of concrete, its manufacture, and its applications, are complex, driven in part by direct impacts of construction and infrastructure, as well as by CO_2 emissions; between 4-8% of total global CO_2 emissions come from concrete.

2.4 Costing:

Cost of construction on top of the priority list of all property owners. People want to build the most durable structure at the lowest price possible. Residential and commercial buildings consider cost before anything else as it can determine various other factors for the property. When considering cost, concrete blocks are preferred over red bricks due to numerous reasons. Viewing concrete blocks as masonry units requires much less quantity to achieve the same strength as red bricks [1]. The raw materials to make concrete blocks are readily available, and machine-made concrete blocks come in the exact sizes and shapes, reducing defective products. Manufacturing red bricks require red soil excavating, which is not easily found everywhere, and too much excavation can lead to many hazardous conditions for the environment.

2.4.1 Machine Made brick:

Our clients can avail from us a wide range of Machine-Made Bricks, which are designed in compliance with the international standards. Available in different sizes and designs, these can be used as substitute for conventional bricks used in construction of buildings. These bricks are more expensive than normal bricks.

2.4.2 Concrete Blocks:

The concrete blocks cost high as individual pieces. It consumes less mortar. It has the advantage that the same wall area can be constructed with a smaller number of solid concrete blocks than machine made brick. When it comes to living arrangements, concrete block homes make sense if you want to be environmentally conscious. Although the cost of building is higher with this material, most homeowners can recoup the difference in cost throughout the life of the property when compared to timber frames.

Table 1.Concrete blocks cost advantages and disadvantages.

Advantages	Disadvantages
Highly fire-resistant	The manufacturing process isn't environmentally friendly
More durable than their cement counterparts	Brittle and thus require careful handling
Recyclable and reusable	Offer less tensile strength
Cost effective	Uneven surfaces often lead to higher mortar consumption during construction

2.5 Machine made bricks and Concrete block Advantage and Disadvantage:

2.5.1 Machine Made brick:

have stood the test of time and have been used in masonry for centuries. Here is a brief summary of their pros and cons. Texture is the key feature in house design today and it is easily achieved through a balance of finishes and surfaces that contrast and complement.

Advantages of Machine-made bricks:

- Economical (Raw material is easily available)
- Hard and durable
- Compressive strength is good enough for ordinary construction
- Different orientations and sizes give different surface textures
- Demolishing of brick structures is very easy, less time consuming and hence economic
- Reusable and Recyclable
- Highly fire resistant
- Produces less environmental pollution during manufacturing process

Disadvantages of Bricks Machine made bricks:

- Time consuming construction
- Cannot be used in high seismic zones
- Since bricks absorb water easily, therefore, it causes fluorescence when not exposed to air
- Color of low-quality brick changes when exposed to sun for a long period of time

2.5.2 Concrete blocks:

- Concrete Blocks are a great option for partition walls because they are quick and easy to install. The inclusion of steel reinforcement adds to the structure's strength.
- Exterior and Interior Load-bearing Walls, Partition Walls, Panel Walls, and Boundary Walls are common uses for Hollow Concrete Blocks.
- Solid Concrete Blocks are perfect for Chimney and Fireplace building, but they also work well for Non-load Bearing Walls and Garden Walls.
- Concrete blocks are also used in a variety of smaller landscaping projects. Many Outdoor Furniture & Patio ideas, for example, include Outdoor Seating, Decorative screens, Outdoor Bar, Flower Bed, and many others.
- Concrete blocks can cover stored commodities from the effects of changing weather. It's no surprise that engineers prefer it to construct Material Bins.

Advantages of Concrete Blocks:

- The reduced wall thickness due to narrower Concrete Blocks than a traditional brick masonry wall makes the space is larger by increasing the carpet surface.
- Concrete block building is more systematic, faster, and stronger than brick masonry because of the vast size of the blocks.
- Better thermal insulation is provided.
- It effectively absorbs sound and protects the interiors from noise pollution. Using concrete blocks provides additional fire protection.
- Protects precious agricultural land that is extensively mined to produce clay bricks.
- Individual pieces can be manufactured to a larger customized size and shape, allowing for a quick building cycle turnaround.
- Concrete Blocks, unlike traditional bricks, have a consistent size that lowers the need for plaster, making them a more cost-effective solution. The mortar consumption rate is lower than in traditional masonry construction, but the overall strength of the structure is increased.

Disadvantages of Concrete Blocks:

- The expense of constructing a residence out of concrete blocks is significantly higher.
- Some of the blocks may need to be cut to reach critical systems.
- Concrete block homes aren't usually attractive from the outside.
- Over time, concrete blocks may be subject to water seepage.
- Some regional preferences may not be compatible with this material.
- Windows and doors can easily detract from the environmental benefits.[9]

2.6 Materials Items:

- Cement
- Sylhet Sand
- Local Sand
- Admixture chemical

2.6.1 Cement:

- This Portland cement is a fundamental component of concrete. Concrete is produced when Portland cement makes a paste with water that joint with rock and sand to harden. Cement is manufactured through a closely controlled chemical combination of calcium, silicon, Aluminum, iron and other ingredients.

- Cement is manufactured through a closely controlled chemical combination of calcium, silicon, aluminum, iron and other ingredients. Common materials used to manufacture cement include limestone, shells, and chalk or marl combined with shale, clay, slate, blast furnace slag, silica sand, and iron ore.[15]

2.6.2 Cement ingredients:

Various Types of cement ingredients and their work areas are given below,

1. Silicon Dioxide (Silica)
2. Calcium Oxide (Lime)
3. Calcium Sulphate
4. Aluminum Oxide (Alumina)
5. Alkalis
6. Iron Oxide
7. Magnesium Oxide
8. Sulfate

1. Silicon Dioxide:

- It is also a major vital ingredient of cement.
- It is familiar to silica.
- It clutches 19-23% of cement mass.
- It is chemically articulated by sio2.
- Function: The purpose of silica is also to give strength to cement

2. Calcium Oxide:

- This is the main content of the cement manufacturing process or at the top of the list of the main ingredient of cement.

- Calcium Oxide has 61% to 67% of the mass of cement, which is holding the highest percentage among all others.

- Shortly it has known CaO. Generally, the calcium Oxide familiars as lime.

3.Calcium Sulphate :

- CaSO4 is chemically composed of it. This Fixing is in the form of gypsum, and its function is to increase the initial setting time of cement.

- Function: It assists in raising the initial setting time of cement

4. Aluminum Oxide:

- It is a known alumina. The chemical name is AI2O3.
- Cement contains its 2% – 6% alumina of its mass.
- This ingredient imparts quick functioning correctly to cement.
- Express alumina weakens the cement.
- Function: It works on a quick-setting property to cement

5. Alkalis:

- The majority of the alkalis within raw material are carried away from the flue gases through heating, and only a small quantity will be abandoned.

- If they’re in excess in cement, efflorescence is caused.

- A very little quantity of it may present in the cement

6.Iron Oxide:

- It is also known as Ferric Oxide.
- Cement has 0.5%-6% iron oxide of its mass.
- Iron Oxide’s chemical name is Fe2O3.
- Function: It has to prove color and hardness to cement.
- It also gave enough strength to cement.

7. Magnesium Oxide:

- Magnesium Oxide is articulated by MgO. It provides color and hardness to cement.

8. Sulfate:

- It is familiar to Sulphur.
- It clutches 1.5%-4% of the mass of cement.
- The chemical name of Sulphur is S.
- Function: A very little quantity of Sulphur in the cement makes it (Cement) sound.

Figure 2.5 Cement Collection

2.6.3 History of cement:

Bricklayer of cement MR. JOSEPH ASPDIN of Leeds from England first made Portland cement near the beginning in the 19th century by burning powdered limestone and clay in his personal kitchen stove.

By this crude technique, he had laid the groundwork for an industry that annually processes mountains of limestone, cement rock, clay, and other materials factually into a powder so fine it will go by a sieve able of holding water. [8]

2.6.4 Sylhet Sand:

This sand is found especially in the Sylhet region hence it is known as Sylhet sand. Sylhet sand is also known as red sand due to its fine and red color. The size of red sand is 2.3 to 2.8 FM. This type of sand is commonly used as base sand in the construction of above-

ground swimming pools and for paving floors with retaining walls. Mainly, red sand is extracted from several areas including Bisnakandi and Bholaganj in Sylhet. Also, red sand is found in some areas of Mymensingh region. However, the red sand of Sylhet is of better quality than the red sand of Mymensingh. [10]

Figure 2.6 Sylhet Sand

2.6.5 Local Sand:

Local sand is collected from natural sources. This sand looks white. Local sand is generally 1.2 to 1.8 FM in size. This type of sand is usually mixed with red sand and used for casting. And, local sand is used in the construction of walls, in brickwork, and for plastering the walls of houses.

Sand is one of the most important materials in construction work, so there are certain things to be aware of before buying sand.

- Among the sands, angular sand is better than round sand.
- A small amount of local sand should be placed between two fingers and rubbed and if there is dust on the hands then this sand is dusty sand. Which is not suitable for molding work.
- Sometimes vita sand is supplied instead of local sand. So, must check before and after purchase.
- Be careful while buying Sylhet sand. Because instead of Sylhet sand, the dead stone powder is supplied.
- Sea sand has some salt mixed in it, so it can be tested by taking a small amount of sand in the mouth. If the sand has a lot of salt in it, it cannot be bought.

- Before buying local sand, you must know from which area you are getting sand. The local sand of Tangail Bhuapur is the best in Dhaka.
- If the sand is bought as a car, then the capacity of the car must be measured properly. And, if you buy sand as a vehicle, you should use a dump truck instead of a small car. Because, if you buy sand in a small car, the size is reduced.

Figure 2.7 Local Sand

2.6.6 Gravel:

Making concrete blocks with gravel involves the use of concrete as the primary material, with gravel serving as one of the essential components. Concrete blocks are a versatile construction material used for various purposes, including building walls, retaining walls and structure elements.

Figure 2.8 Gravel

2.6.7 Water:

Using concrete blocks for water-related applications, such as water storage, water channels, or erosion control, can be effective due to the durability and strength of concrete. When using concrete blocks for water-related application, it is crucial to follow engineering and construction standards to ensure the safety, stability, and durability of the structure. Additionally, proper waterproofing and sealing measures may be necessary, depending on the specific application and the level of water containment required

2.6.8 Admixture Chemical:

G. Gelardi, R.J. Flat, in Science and Technology of Concrete Admixtures, 2016

Chemical admixtures are nowadays very important for concrete design. This chapter presents an overview of the chemical structures of different organic chemical admixtures, ranging from small organic compounds to large polymers having a certain poly disparity and of both natural and synthetic origin. The choice is guided by the fact that this is where the real added value of molecular structure comes into play in terms of design of new or modified chemical admixtures. Such admixtures offer the greatest possibility to chemists to modify properties and target improved performance by specific exploitation of structure/property relationships. The overview gives a basis for better understanding of the working mechanisms of these admixtures. [11]

CHAPTER 3

METHODOLOGY

3.1 Introduction:

In this we will discuss about every step of work. The production of concrete blocks consists four basic processes: mixing, molding and curing. Some manufacturing factory produce only concrete blocks, while others may produce a wide variety of precast concrete products including blocks, flat paver stones and decorative landscaping pieces such as lawn edging. Some factories are capable of producing 2,000 or more blocks per hour.
The following steps are commonly used to manufacture concrete blocks.

3.2 Mixing:

First 1 bag cement and 2 bag Sylhet & local sand and gravel 4 bag 300gm admixture chemical are stored in silos outside and then transfer through conveyor belt when needed and the cement is stored in silos to make it safe from moisture. When the mixing has started. The dry materials enter into a mixer where they are blended for a few minutes. After the blending of dry materials, 21 litter of water is added to the mixer. The mixing chemicals and color pigments added at this time and the concrete is mixed for six to eight minutes.

Figure -3.1 Cement or Sylhet Sand or Local Sand & Admixture Chemical

Figure 3.2 Sylhet Sand Carrying

3.3 Molding:

After the mixing, transported to an elevated hopper and the mixing cycle being after the next load. There are 5 to 15 blocks are molded at one time depend on machine capacity. After that, the blocked are pushed out of the mold onto a flat steel pallet. The pallet and blocks are push out of a machine to the chain conveyor. Some of the machines have a feature of rotating brush and it removes the loose material from the top of the blocks

Figure 3.3 Concrete Block Molding Machine

3.4 Curing:

Curing plays an important role on strength development and durability of concrete. Curing takes place immediately after concrete placing and finishing and involves maintenance of desired moisture and temperature condition, both at depth and near the surface, for extended periods of time. Properly cured concrete has an adequate amount of moisture for continued hydration and development of strength, volume stability, resistance to freezing and thawing, and abrasion and scaling resistance.

American Concrete Institute (ACI) Committee 301 recommends a minimum curing period corresponding to concrete attaining 70 percent of the specified compressive strenth2. The often specified seven-day curing commonly corresponds to approximately 70 percent of the specified compressive strengths. The 70 percent strength level can be reached sooner when concrete cures at higher temperature or when certain cement/admixture combination are used. Similarly, longer time may be needed for different material combinations and lower curing temperatures.

Twenty-four hours after making the block, we keep the blocks soaked in water for 28 days, the block was properly ready to you.

Figure 3.4 Concrete Block Curing

Figure 3.5 Concrete Block Machine Made Brick Checking

3.5 Compressive strength Concrete Block:

Compressive strength of concrete depends on many factors such as water cement ratio, cement strength, quality of concrete material, quality control during production of concrete etc. Compressive strength is the ability of material or structure to carry the loads on its surface without any crack or deflection. A material under compression tends to reduce the size, while in tension, size elongates.

Compressive strength is the capacity of material or structure to resist or withstand under compression. The compressive strength of a material is determined by the ability of the material to resist failure in the from cracks and fissure. In this test, the push force applied on the both faces of concrete specimen and the maximum compression that concrete bears without failure is noted.
Concrete testing helps us majorly focus on the compressive strength of concrete because it helps us to quantity the ability of concrete to resists compressive stresses among structure where as other stresses such as axial stresses and tensile stresses are catered by reinforcement and other means. Compressive strength formula for any material is the load applied at the point of failure to the cross-section area of the face on which load was applied.

3.5.1 Compressive Strength = Load / Cross-sectional Area:

For compressive tests, we tested 3 samples of curing 3 days, 14 days and in the same way we tested 3 curing samples for 28 days.

Figure 3.6 Concrete Block Compressive Strength Test

Figure 3.7 Concrete Block Compressive Strength Test

Figure 3.8 Concrete Block Compressive Strength Test

3.6 Compressive Strength Machine Made Brick:

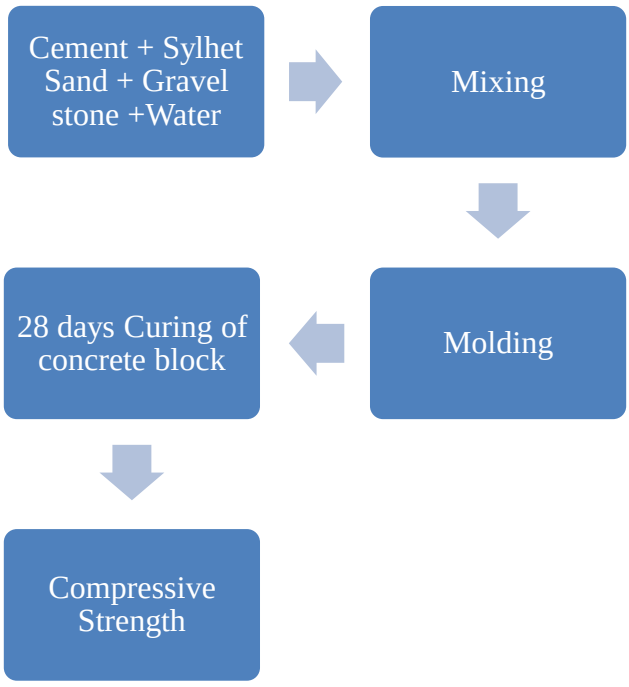
We purchase some bricks to find out the difference between concrete blocks and Machine-Made bricks and test the compressive Strength of bricks like concrete blocks. For compressive tests, we tested 3 samples of curing 3 days, 14 days and in the same way us Tested 3 for 28 days**.**

3.6.1 Compressive Strength = Load / Cross-sectional Area

Figure 3.9 Machine Made Brick Compressive Strength Test

Figure 3 .10 Machine Made Brick Compressive Strength Test

- **Flow Chart for Concrete Block**



CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction:

Building materials are materials used to construct different structures, including houses, schools, hospitals, roads, airports, pavements, etc. For construction purposes, numerous building materials are available, like bricks, concrete blocks, wood, cement, metal, and clay. The historical implication of normal Bricks dates back thousands of years. Humans have used Red Bricks or Clay Bricks to build structures that carry historical significance. As Machine-Made bricks have the importance of the past, Concrete Blocks are about to become the flag bearers of modern civilization.

4.2 Specific Aim:

In this study we compared normal red brick & concrete block. It's most important for build a building & construction sector. The Machine-Made bricks importance of the past. Now we have another option for construction. In this research we show difference between concrete block s & Machine-Made bricks & which is more suitable for construction?

4.3Analysis:

Table 4-1 Machine Made Brick's Weight, Size, And Strength.

No of sample	Weight (Kg)	Length (cm)	Width (cm)	Thickness (cm)	Pressure	Days	Compressive strength(psi)	Average Compressive strength(psi)
1st	3.74	241	116	70	compression	3	743.81	705.66
2nd	3.78	241	116	70	compression	3	603.37	
3rd	3.76	241	116	70	compression	3	769.82	
1st	3.80	241	116	70	compression	14	1274.37	1251.82
2nd	3.82	241	116	70	compression	14	1222.35	
3rd	3.80	241	116	70	compression	14	1258.76	
1st	3.82	241	116	70	compression	28	931.07	1024.69
2nd	3.82	241	116	70	compression	28	920.67	
3rd	3.84	241	116	70	compression	28	1222.35	

Table4-2 Concrete Block's Weight, Size, And Strength.

No of sample	Weight (Kg)	Length (cm)	Width (cm)	Thickness (cm)	Pressure	Days	Compressive strength(psi)	Average Compressive strength(psi)
1st	3.84	239	115	70	compression	3	502.75	504.51
2nd	3.85	239	115	70	compression	3	518.62	
3rd	3.85	239	115	70	compression	3	492.16	
1st	3.90	239	115	70	compression	14	714.43	730.20
2nd	3.88	239	115	70	compression	14	751.14	
3rd	3.85	239	115	70	compression	14	725.02	
1st	3.88	239	115	70	compression	28	829.71	866.46
2nd	3.85	239	115	70	compression	28	850.71	
3rd	3.87	239	115	70	compression	28	918.98	

Based on table 1 & 2, Machine-Made bricks and concrete block have different compressive strength values. They are:

Figure 4.1Tasted Machine-Made Brick Weight

Figure 4.2 Tasted Concrete Block Weight

We cured the bricks for 3 days, 14 days and 28 days before working in the lab. And we got the average weight of concrete block to be 3.84 kg. before calculating the compressive strength, we calculated the weight of each brick. The average weight of machine-made brick was found to be 3.74 kg.

- **After Three days of curing:**

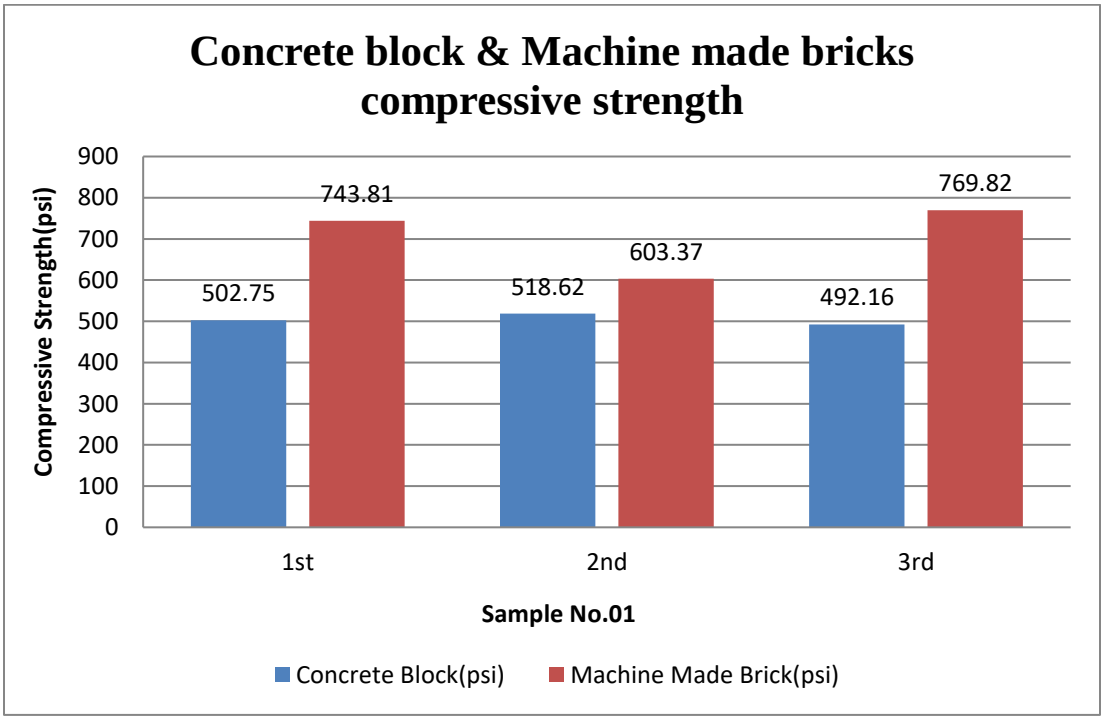


Figure 4-3 After Three Days Compressive Strength Test Bar Chart

The compressive stress of concrete blocks after three days of curing was found to be 502.75 psi 518.62 psi and 492.16 psi for three blocks. The compressive strength of machine-made brick after three days of curing was found to be 743.81 psi 603.37 psi and 769.82 psi for three bricks**.**

- **After fourteen days of curing:**

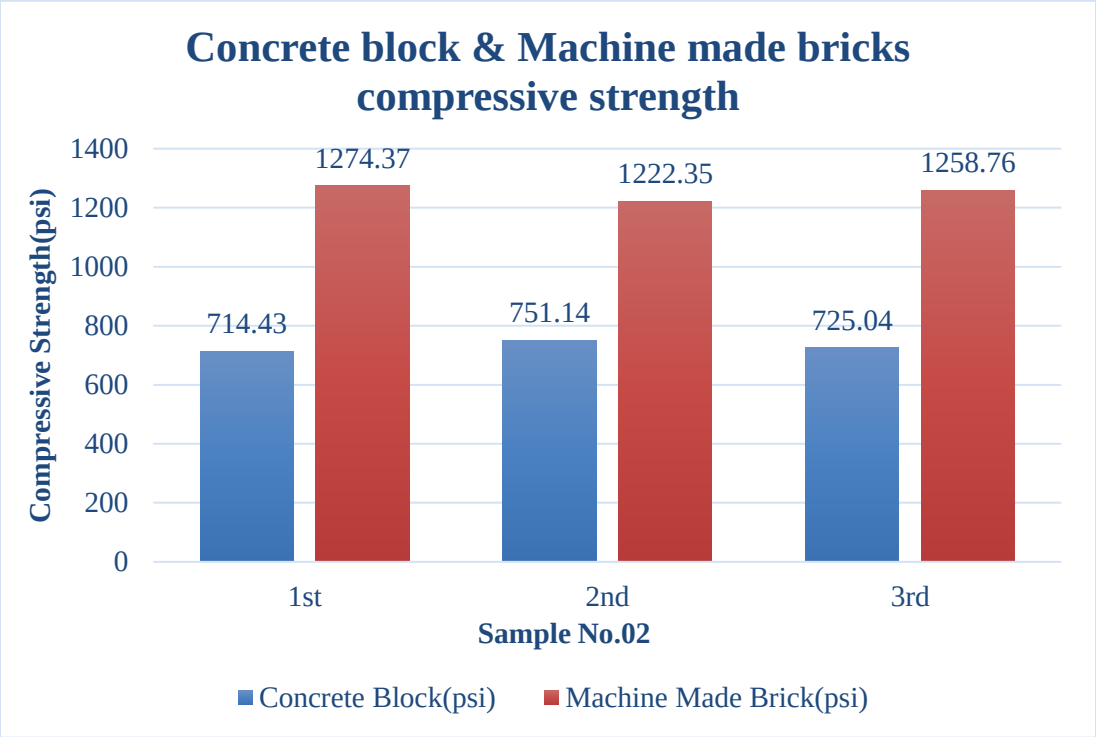


Figure 4-4 After Fourteen Days Compressive Strength Test Bar Chart.

After 14 days of curing, the compressive stress of concrete blocks was found to be 714.43 psi, 751.14 psi and 725.04 psi for three blocks. the compressive strength of machine-made brick after 14 days of curing was found to be 1274.37, 1222.35 psi and 1258.76 psi for three bricks.

- **After twenty-eight days of curing**:

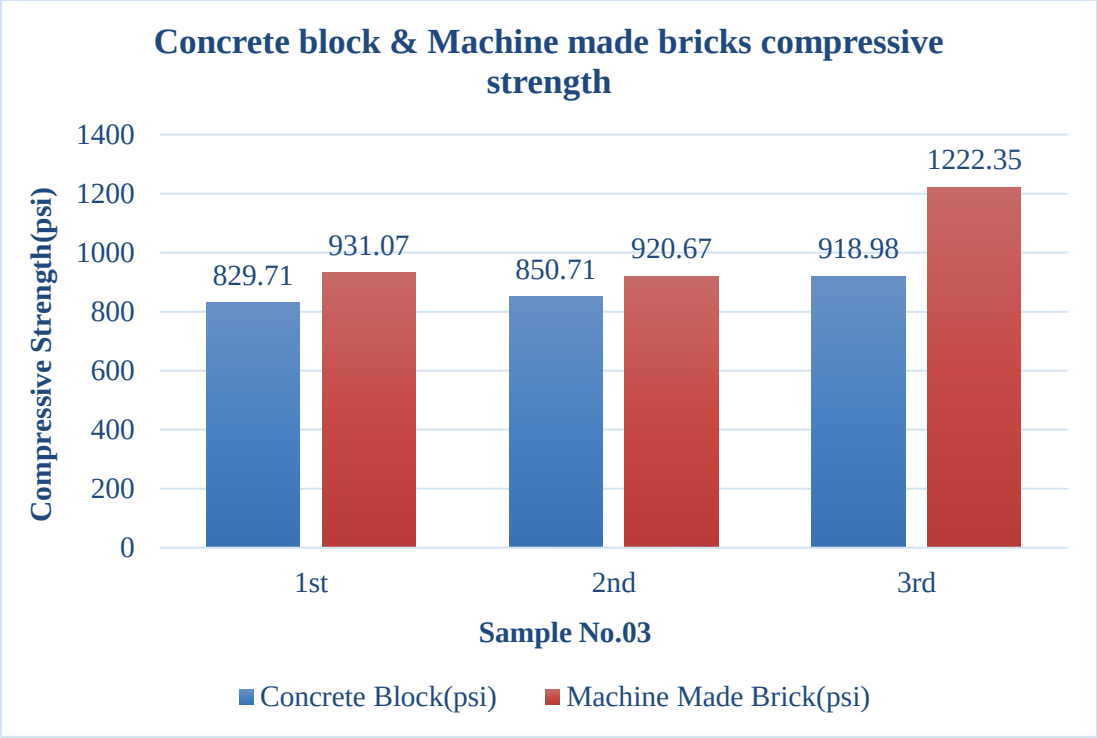


Figure 4-5 After twenty-eight Days Compressive Strength Test Bar Chart

After 28 days of curing the compressive strength of concrete block was found to be 829.71 psi 850.71 psi and 918.98 psi for three blocks and the compressive strength of machine-made brick after 28 days curing was found to be 931.07 psi 920.67 psi and 1222.35 psi for three bricks.

4.3.1 Concrete blocks and machine-made bricks:

The results of the compressive strength test in the laboratory show that Machine-Made bricks and concrete blocks have different compressive strengths.
The curing time of concrete directly controls the increase in compressive strength in. In general, the majority of strength is achieved during the 3^{rd}, 14^{th} & 28^{th} days of its curing period.

4.4 Summary:

Concrete blocks are produced in specialized factories, designed and developed at the same time. On the other hand, machine made brick is easy to find in all areas and therefore lacks compressive strength compared to concrete blocks.
Machine made brick is one type of basic material for building houses that is very commonly used in Bangladesh, from ancient times to modern times as now machine-made brick has indeed become one of the mandatory materials in building a house. Understandably

enough, machine made brick is still more widely used than concrete blocks, because apart from having been tested for its strength, getting this type of material is not difficult.
Machine made brick is a building element used in building construction and is made from clay plus water or without a mixture of other materials through several stages of work, such as digging, processing, printing, drying, burning at high temperatures until it matures and changes color. and will harden like stone when cooled so that it cannot be destroyed again when immersed in water.

In this research we show compressive strength machine made brick & concrete block. Walls are built from bricks. The durability and strength of the wall and structure depend on the quality of the brick. For a longer period of time, Machine made brick is the most common brick used in masonry. This is due to durability, low cost, affordability, comfort. From our experiment we can see the result of concrete brick is average. Its better but not more than machine made brick. But above all nature is our first priority, because nature will destroy, we must be also destroying. To safe our civilization and protect our climate we should not use that kind of things those harm our nature. A lot of country already uses concrete brick or blocks because of safe the nature.

Many countries manufacture concrete blocks a lot of quantity and use them. Led by countries such as Australia, India, and South Korea, the market in Asia-Pacific is forecast to reach 310.4 billion Units by the year 2027, while Latin America will expand at a 3.9% CAGR through the analysis period. Global Hollow Concrete Block Market Share and is segmented by Product Type (Split-faced and Smooth-faced), Application (Residential, Commercial, Industrial, and Others), and Geography (Asia-Pacific, North America, Europe, South America, and Middle East and Africa). The report offers market size and forecasts for Hollow Concrete Block in value (USD million) for all the above segments.
We should increase to use concrete block that will good for us.

CHAPTER 5

CONCLUSIONS AND FUTURE WORKS

5.1 Conclusion:

As we can see the condition of machine-made brick and concrete brick. We can see from this study that the compressive strength of concrete block is comparatively less than machine made brick. Strength of concrete blocks did not increase similarly after three stages of curing. On the other hand, machine made bricks have better load carrying capacity. Expected results from concrete blocks were not obtained. By changing the ingredients of concrete blocks, increasing the amount of cement and using better quality sand, the capacity of concrete blocks can be increased.

5.2 Limitation:

When we work with concrete blocks we suffer from several limitations. Due to limitations, it is not possible to verify the ratio of ingredients as required. To increase the durability of the concrete block, increasing the bearing capacity required to increase the quantity or quality of the material could not be done due to constraints. If there is an opportunity to work by changing the ratio of the components of the concrete block, it will be possible to make better quality blocks. Checking the quality of cement or having the opportunity to use good quality cement and having the opportunity to use different types of sand will make it possible to make good quality concrete blocks. It is possible to grow high quality concrete blocks if there are enough facilities in the lab.

5.3 Scope for Future Study:

While doing this research we faced various problems. It is difficult to make good quality concrete blocks without good own equipment system. As a result, the expected results were not obtained when working with concrete blocks. Better quality concrete blocks would have been available if there were proper facilities for making concrete blocks in the lab. By changing the mix, the next generation will be able to make better quality eco-friendly blocks. High strength concrete blocks can be made by using good quality cement and using good quality sand and select sand. This will have more load capacity than other bricks and will be environment friendly.

REFERENCES

[1]. Steve Kosmatka et al, Design and Control of Concrete Mixtures, 15th Edition EB001, PCA Engineering Bulletin EB 001, Portland Cement Association Skokie, IL 2002

[2]. ASTM C309, *Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete* (www.astm.org)

[3]. ASTM C1315, *Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete* (www.astm.org)

[4]. ASTM C192 / C192M, *Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory* (www.astm.org)

[5]. ASTM C31 / C31M, *Standard Practice for Making and Curing Concrete Test Specimens in the Field* (www.astm.org)

[6].Https://Www.Cement.Org/Learn/Concrete-Technology/Concrete-Contuction/Curing-In-Construction

[7].Https://Civiltoday.Com/Civil-Engineering-Materials/Brick/137-Compressive-Strength-Of-Brick

[8].Https://Qgreentech.Com/How-Concrete-Blocks-Are-Made/
Https://Mirconcreteblock.Com/Blog/Strength-Of-Concrete-Block/

[9].Https://Www.Fao.Org/3/S1250e/S1250e09.Htm

[10].Https://Rdso.Indianrailways.Gov.In/Works/Uploads/File/Hollow%20cement%20concrete%Block/Pdf .

[11].Https://Qgreentech.Com/How-Concrete-Blocks-Are-Made/

[12] .Http://Ss.Pwd.Gov.Bd/Document/Sor/Pwdsor2022-Revised-2.3.23-Website.Pdf

[13].Https://Www.Cement.Org/Learn/Concrete-Technology/Concrete-Contuction/Curing-In-Construction .

[14].Https://civiltoday.com/civil-engineering-materials/brick/137-compressive-strength-of-brick .

[15].Https://rdso.indianrailways.gov.in/works/uploads/File/HOLLOW%20CEMENT%20CONCRETE%BLOCK/pdf .