COMPARATIVE STUDY ON COMPRESSIVE STRENGTH OF CONCRETE USING DIFFERENT TYPES OF SAND

By

MD. ALI HAYDER JUNAL

MD BABLU MIAH

ABUL KALAM MD AZAD CHOUDHURY

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



Department Of Civil Engineering
Sonargaon University
147/1, Green Road, Dhaka- 1215, Bangladesh
Section: 23E
Spring-2025

CamScanner

COMPARATIVE STUDY ON COMPRESSIVE STRENGTH OF CONCRETE j USING DIFFERENT TYPES OF SAND

By

MD. ALI HAYDER JUNAL (ID: CE 2102023135)
MD BABLU MIAH (ID:CE 2102023148)
ABUL KALAM MD AZAD CHOUDHURY
(ID:CE2102023130)

Supervisor
Professor Md Zahid Husain Khan

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



Department of Civil Engineering
Sonargaon University
147/1. Green Road. Dhaka-1215. Bangladesh
Section: 23E Semester -Spring-2025

CamScanner

BOARD OF EXAMINERS

The thesis titled "Comparative study on compressive strength of Concrete using different types of sand" submitted by MD. ALI HAYDER JUNAL (ID: CE 2102023135) MD BABLU MIAH (ID:CE 2102023148) ABUL KALAM MD AZAD CHOUDHURY (ID:CE2102023130) accepted as satisfactory in partial fulfillment of the requirement for the degree of Bachelor of Science in Civil Engineering on Date of Defense.

1. _____ Chairman
   Md. Zahid Husain Khan Professor
   Sonargaon University

2. _____ Member
   Internal/External Member

3. _____ Member
   Internal/External Member

CamScanner

DECLARATION

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

STUDENT NAME	STUDENT ID	SIGNATURE
MD ALI HAYDER JUNAL	ID:CE 2102023135	
MD BABLU MIAH	ID:CE 2102023148	
ABUL KALAM MD AZAD CHOUDHURY	ID:CE 2102023130	

CamScanner

Dedicated

"ALL HONEST PEOPLE"

CamScanner

ACKNOWLEDGEMENTS

We are forever grateful to our Thesis Supervisor. Professor Md Zahid Husain Khan for his kind supervision and guidance throughout this important study and also with the continuous help from the beginning to the end of this study the work finally becomes positive to complete successfully.

We are grateful to our teacher for their help & kind participation while preparing this Thesis book. This encouragement, helping hand, affection and sacrifice both directly and indirectly helped to rich on the today's position. without their love, and encouragement it was impossible to reach here. Acknowledgement of their contribution is too small as a reward.

The satisfaction and euphoria that accompany the successful completion of the task would be great but incomplete without tic mention of the people who made it possible with their constant guidance and encouragement crowns all the efforts with success. In this context, we would liketo thank all the other staff members, both teaching and non-teaching, which have extended their timely help and eased our task.

ABSTRACT

In Bangladesh and many other countries worldwide, concrete is the main ingredient and most commonly used building materials for the construction industries. Concrete is primarily composed of aggregate, cement and water. At present it is currently thought that concrete properties are highly influenced on and its proportion in the concrete mix. Sand is a major component in concrete mixes. The objective of this thesis is to determine the concrete strength behavior by using different types of sand. Three types of sands such as Local sand (Savar)FM = 1.98). Panchagarh sand (FM = 2.56) and Sylhet sand FM = 2.7) are used as fine aggregates. In this investigation, fine aggregates samples are collected from available sources. Concrete Cylinder specimens (Dia 100mm and Height 200mm) are made according to mixed proportion 1: 1.5: 3. After casting the specimens are cured for the curing period of 7. 21 and 28 days and tested for compressive strength by Universal Testing Machine (UTM) after the curing period. The workability of concrete is also measured by slump test. in this study , as per mix proportion 1 : 1.5 : 3 mixed concrete to form cylinder and conduct compressive strength test. Concrete compressive strength local sand concrete is 1.48 times more than Panchagarh sand concrete and 1.16 times than Sylhet Sand concrete.

CamScanner

TABLE OF CONTENT

ABSTRACT 6

LIST OF FIGURES 8

CHAPTER-1 9

INTRODUCTION

1.1 General 9

1.2 Objectives of Study 9

CHAPTER 2 10

LITERATURE REVIEW

2.1 Introduction 10

2.2 Research Background 10

2.3 Cement 10

2.4.Properties of Cement 12

2.5 Types of Cement 13

2.6 Sand 13

2.7 Properties of sand 14

2.8 Types of Sand Available in Bangladesh 14

2.9 ASTM Standard Graded sand 15

2.10 Various types of sand 15

2.11 Coarse Aggregate 17

CHAPTER 3

METHODOLOGY 20

3.1 Materials 20

3.2 Picture 20

CHAPTER4

RESULTS AND DISCUSSION 24

4.1 Determination of finesse modulus of sand 24

4.2 Laboratory test result of Cement

CHAPTER5 33

CONCLUSION 33

5.1Conclusions&Recommendation 33

REFERENCES 34

CamScanner

LIST OF TABLE

Table 2.1: Components of Physical & Chemical Characteristics.
Table 2.2: Physical properties of different types of natural coarse aggregate.
Table 4.1: Determination of finesse modulus of Sylhet sand.
Table 4.2: Determination of finesse modulus of Panchchar sand
Table 4.3: Determination of finesse modulus of local sand (savar).
Table 4.4: Grain size distribution of sylhet sand.
Table 4.5: Grain size distribution of Panchchar sand.
Table 4.6: Grain size distribution of local sand (savar)
Table 4.7: Unit weight of sand.
Table 4.8: Specific gravity of stone.
Table 4.9: Specific gravity of local sand (savar)
Table 4.10: Specific gravity of Sylhet sand.
Table 4.11: Specific gravity of Panchchar sand.
Table 4.12: Physical poperties of cement.
Table 4.13: Compressive Strength of Cement Concrete for Different Type of sand
Table 4.14: Compressive Strength of Concrete Chart

CamScanner

CHAPTER 1
INTRODUCTION

1.1: General
Sand is a fundamental material in the construction industry, playing a pivotal role in various applications ranging from concrete production to road construction. Understanding what sand is, its types, and its applications are crucial for anyone involved in construction. This article delves into the various aspects of sand in construction, highlighting its significance, types, and how it impacts the quality and durability of construction projects.

Different construction projects require different types of sand. Assess the specific needs of your project, including the type of construction, environmental conditions, and desired strength and durability. Sand is a critical component in the construction industry, influencing the strength, durability, and quality of construction materials. Understanding the types of sand, its properties, and how to select the right sand for your project is essential for achieving optimal results. By adhering to quality standards and working with reliable suppliers, you can ensure that your construction projects meet the highest standards of excellence.

1.2 Objectives of the Study
* To compare the compressive strength of concrete by using different types of sand such is Panchaghar sand, local sand (savar) and Sylhet sand.
* To compare the compressive strength of concrete on FM of sand.

Organization of the thesis

The report of the analysis is organized in this paper to represent and discuss the results and findings that come out from the studies.

Chapter :1 introduces the topic, in which an overall idea is presented before entering into the main studies and discussion.

Chapter 2: is literature Review. Which represents the work Perfumed so far in connection with it and is collected from various references. it also represents the strategy for moving forward with the success current issue.

Chapter 3: is all about the methodology.

Chapter 4: Is concerned with the results and discussions.

Chapter 5: is about the findings of this parametric study are demonstrated and discussed in detail with a recommendation of further study scope and a conclusion.

CamScanner

CHAPTER 2

Literature Review

2.1 Introduction

Sand is a major component in concrete mixes. Sand from natural gravel deposits or crushed rocks is a suitable material used as fine aggregate in concrete production. It is used with coarse aggregate to produce a structural concrete and can also be used alone with cement for mortars and plastering works.

2.2 Research Background.

Comparative analysis of sand from different sources based on various properties, it is crucial to highlight the significance of understanding the distinct characteristics of sand samples from different location. By examining properties such as grain size distribution, color variation, mineral composition, this study aims to provide insight into the geological origins and potential application of sands sourced from different regions. This comparative analysis offers a comprehensive view of the unique properties of each sample contributing to deeper understanding of their individual qualities. Sand is a naturally occurring granular material composed of finely ground rock and mineral partials. It is a popular manufacturing material used across a broad spectrum of construction glass and transportation industries. Sand is a mixture of small grains of rock and granular material which is mainly defined by Size being finer than gravel and coarser than silt.

2.3 Cement

Cement, one of the most important building materials, is a binding agent that sets and hardens to adhere to building units such as stones, bricks, tiles etc. Cement generally refers to a very fine powdery substance chiefly made up of limestone (calcium), sand or clay (silicon), bauxite (aluminum) and iron ore, and may include shells, chalk mart shale, clay, blast furnace slag, slate (M.A. Aziz 1995).

The raw ingredients are processed in cement production plants and heated to form a rock-hard substance, which is then ground into a fine powder to be sold. Cement mixed with water causes a chemical reaction and forms a paste that sets and hardens to bind individual structures of building materials (M.A. Aziz 1995).

Cement is an integral part of the urban infrastructure. It is used to make concrete as well as mortar, and to secure the infrastructure by binding the building blocks. Concrete is made of cement, water. sand and gravel mixed in definite proportions, whereas mortar consists of cement, water and lime aggregate. These are both used to bind rocks, stones, bricks and other building units, fill or seal any gaps, and to make decorative patterns. Cement mixed with water silicates and aluminates, making a water repellant hardened mass that is used for water-roofing (M.A. Aziz 1995).

A cement is a binder, a substance used in construction that sets, hardens and adheres to other materials, binding them together. Cement is seldom used solely, but is used to bind sand and gravel (aggregate) together. Cement is used with fine aggregate to produce mortar for masonry, or with sand and gravel aggregates to produce concrete. Cements used in construction are usually inorganic, often lime or calcium silicate based, and can be characterized as being either hydraulic or non-hydraulic, depending upon the ability of the cement to set in the presence of water (Al Jabri and R. Taha 2008).

CamScanner

Non-hydraulic cement will not set in wet conditions or underwater; rather, it sets as it dries and reacts with carbon dioxide in the air. It is resistant to attack by chemicals after setting (Al Jabri and R. Taha 2008).

Hydraulic cements (e.g., Portland cement) set and become adhesive due toa chemical reaction between the dry ingredients and water. The chemical reaction results in mineral hydrates that are not very water-soluble and so are quite durable in water and safe from chemical attack. This allows setting in wet condition or underwater and further protects the hardened material from chemical attack (Al Jabri and R. Taha 2008).

In Britain particularly, good quality building stone became ever more expensive during a period of rapid growth, and it became a common practice to construct prestige buildings from the new industrial bricks, and to finish them with a stucco to imitate stone. Hydraulic limes were favored for this, but the need for a fast set time encouraged the development of new cements. Most famous was Parker's "Roman cement". This was developed by James Parker in the 1780s, and finally patented in 1796. It was, in fact, nothing like material used by the Romans, but was a "natural cement" made by burning sectarian nodules that are found in certain clay deposits, and that contain both clay minerals and calcium carbonate (F. Olutong and Amusan (2001). The burnt nodules were ground to a fine powder. This product, made into a mortar with sand, set in 5-15 minutes. The success of "Roman cement" led other manufacturers to develop rival products by burning artificial hydraulic lime cements of clay and chalk. Roman cement quickly became popular but was largely replaced by Portland cement in the 1850s, of making cement and concrete, as well as the benefits of cement the construction Apparently unaware of Seaton 's work the same principle was identified by Frenchman Louis vicar in the first decade of the nineteenth century. Vicar went, on to devise a method of combining chalk and clay into an intimate mixture and burning this. Produced an "artificial cement" in 1817 considered the "principal forerunner "of Portland cement and "Edgar Dobbs of Southward patented a cement of this kind in 1811" (F. Olutong and Amusan (2001).

In Russia'. Eger created a. new binder by mixing lime and clay. His results were published in

1822 in his book A Treatise on the Art to Prepare a Good Mortar published in St. Petersburg. A few years later in 1825, he published another book, which described the various methods of buildings and embankments (F. Olutong and Amusan (2001).

William Aspin is considered the inventor of "modem" Portland cement. Portland cement, the most common type of cement in general use around the world as a basic ingredient of concrete, mortar, stucco, and non-specialty grout, was developed in England in the mid 19th century, and usually originates from limestone. James Frost produced what he called "British cement" in a similar manner around the same time, but did not obtain a patent until 1822.In 1824, Joseph Aspin patented a similar material which he called Portland cement, because the render made from it was in color similar to the prestigious Portland stone which was quarried on the Isle of Portland, Dorset, England. However, Asp dins' cement was nothing like modem Portland cement but was a first step in its development, called a proto-Portland cement (M. S. Sheety 2002). Joseph Aspin's' son William Asp din had left his father's company and, in his cement, manufacturing apparently accidentally produced calcium silicates inthe1840s, middle step-in the development of Portland cement. William Aspin's innovation was counterintuitive for

Manufacturers of "artificial cements", because they required more lime in the mix (a problem for his father), a much higher kiln temperature (and therefore more fuel),and the resulting clinker was very hard and rapidly wore down the millstones, which were the only available

CamScanner

grinding technology of the time. Manufacturing costs were therefore considerably higher, but the product set reasonably slowly and developed strength quickly, thus opening up a market for use in concrete (M. S. Sheety 2002). The use of concrete in construction grew rapidly from 1850 onward, and was soon the dominant use for cements. Thus, Portland cement began its predominant role. Isaac Charles Johnson further refined the production of me so Portland cement (middle stage of development) and claimed to be the real father of Portland cement.

Setting time and "early strength" are important characteristics of cements. Hydraulic lines, "natural" cements, and "artificial" cement Sallrely upon their be lite content for strength development. Be lite develops strength slowly. Because they were burned at temperatures below 1,250 °C (2,280 °F), they contained no a lite, which is responsible for early strength in modem cements. The first cement to consistently contain a lite was made by William Asp din in the early 1840s: Ibis was what we call today "modem" Portland cement. Because of the air of mystery with which William Asp din surrounded his product, others (e.g.,Vicatand Johnson) have claimed precedence in this invention, but recent analysis of both his concrete and raw cement has shown that William Asp din's product made at North fleet, Kent was a true a lite - based cement. However, Asp din's methods were "rule-of-thumb" V icat is responsible for establishing the chemical basis of these cements, and Johnson established the importance of sintering the mix in the kiln (M. S. Sheety 2002).

It was not as durable, especially for highways, to the point that some states stopped building highways and roads with cement. Bertrand. wait, an engineer whose company had worked on the construction of the New York city's cats kill a queduct, was impressed with the durability of Rosendale cement and came up with a blend in the US the first large-scale use of cement was Rosendale cement, a natural cement mined from a massived posit of a large dolostone rock deposit discovered in the early 19th century near osendale, new York Rosendale cement was extremely popular for the foundation of buildings (e .g., statue of liberty capitol building, Brooklyn bridge) and lining water pipes sorel cement was patented inl 867 by French man stand is Iassorel and was stronger than Portland cement but its poor water resistance and corrosive qualities limited its use in building construction. The next development with the manufacture of Portland cement was the introduction of the rotary kiln which allowed as Stronger, more homogeneous mixture and a continuous manufacturing process (M. S. Sheety 2002).

Table 2.1: Components of Physical & Chemical Characteristics.

Property	Portland Cement	Calcareous (ASTM C618 Class C) Fly Ash	Calcareous (ASTM C618 Class C) Fly Ash	Slag Cement	Silica Fume
SiO2 Content (%)	2.9	52	35	35	85-97
Al2O3 Content (%)	6.9	23	18	12	-
Fe2O3 Content (%)	3	11	6	I	-
CaO Content (%)	63	5	21	40	<l
MgO Content (%)	25	-	-	-	-
SO3 Content (%)	1.7	-	-	-	-
Specific Surface (m2/kg)	370	420	420	400	15000-30,000
Specific Gravity	3.15	2.38	2.65	2.94	2.22
General use in concrete	Primary Binder	Cement Replacement	Cement Replacement	Cement Replacement	Property Enhancer

2. 4: Properties of Cement

Dads

CamScanner

It is always desirable to use the best cement in constructions. Therefore, the properties of cement must be in best gated. Although desirable cement properties may vary depending on the type of construction, generally cement possesses following properties (which depend upon its chemical composition thoroughness of burning and fineness of grinding).

Provides strength to masonry.

Stiffens or hardens early.

Possesses good plasticity.

An excellent building material.

Easily workable.

Good moisture-resistant

2.5: Types of Cement are available in Bangladesh Cement Manufacturers List

Alhaj Mostafa-Hakim Cement Industries Limited

Premier Cement Mills Limited.

Shahcement Industries Ltd.

Mir Cement Ltd

Madina Cement Industries Ltd.

Mongla Cement Factory

Cemex Cement Bangladesh Ltd.

Holcim (Bangladesh) Ltd.

Aman Cement Mills Ltd.

Olympic Cement Ltd. (OCL).

Nowapara Cement Mills Ltd.

Dub Bangladesh Cement Mills Ltd.

Meghna Cement Mills Ltd. (Bashundhara Group).

Bashundhara Industrial Complex Ltd Bashundhara cement: (Bashundhara Group).

Confidence Cement Limited (CCL).

S. Alam Cement Limited.

NGS Cement Industries Limited.

Royal Cement Limited Etc.

2.6: Sand

Sand is a naturally occurring granular material composed of finely divided rock and mineral particles it is defined by size, being finer than gravel and coarser than silt, sand can also refer to a textural class of soil or soil type; i.e., a soil containing more than85% sand-sized particles by mass.

The composition of sand varies, depending on the local rock sources and conditions, but the most common constituent of sand in inland continental settings and non-tropical coastal settings is silica (silicon dioxide, or sio2), usually in the form of quartz, the second most

CamScanner

common type of sand is calcium carbonate, for example aragonite, which has mostly been created, over the past half billion years, by various forms of life, like coral and shellfish, for example, it is the primary form of sand apparent in areas where reefs have dominated the ecosystem for millions of years like the Caribbean (S. Kumar 2007).

Sand is a loose granular material blanketing the beaches, riverbeds and deserts of the World. Composed of different materials that vary depending on location, sand comes in an array of colors including white, black, green and even pink. the most common component of sand is silicon dioxide in the form of quartz the earth's land masses are made up of rocks and minerals, including quartz, feldspar and Mica (S. Kumar 2007).

2.7: Properties of Sand

Quartz is a very hard mineral, ranking a 7 on the most hardness scale, pure quartz is transparent to translucent and the crystals are often hexagonal.

A lot of sand especially that found on beaches is made of basalt, an igneous rock extruded from volcanoes. Much of the crust of earth's oceans is made out of basalt, is magic, which means that it's made of iron and magnesium minerals, such as plagioclase and pyroxene. Other types of sand are made up of tiny bits of coral and crushed snail and clam shells (S. Kumar 2007). Sand can also come in many colors some beaches in Hawaii are famous for black sand, whereas beaches in the Caribbean are famous for pink sand because sand is composed of so many materials, it is possible to study grains of sand under a microscope and discover where they are from and what they are made of.

2.8:Types of Sand Available in Bangladesh

Chemical determined by x-ray analysis for local sands this test was conducted in atomic energy commission composition of graded sample for individual particle size was were used for Ottawa sand graph of x-ray analysis was given in figure 16 through figure typical values 21.

The sample that retained on sieve #30, #16. #50 and #100 are analyzed. The% presence of #30. #40, #50 and #100 are 2, 28, 45 and 25 respectively. The value of #40 can be divided between #30 and #50 equally. So weight age value of #30, #50 and #100 was 0.16, 0.59 and 0.25 respectively. Figure 22 Variation of quartz content in different sand Quartz content in sand is very important since it is chemically inert and strong enough to carry load. From X-ray analysis the values of quartz content were plotted in bar which shows that. Sand II W is best suited with Ottawa sand based on the consideration of quartz content. From X-ray analysis the values of quartz content with grain size were plotted in bar which shows that percentage of quartz content increases with the decrease in grain size.

This is because in larger particle there is a tendency to adhere foreign particles with its surface. On the other hand, in smaller particles there is low tendency to adhere foreign particles. So, there are lower impurities in smaller particles and for that quartz content is comparatively higher than that of larger particles Figure 23, Variation of quartz content with grain size in different sand from bur chart it is also seen that quartz content decreases after acid washing for both sands This is because disintegration of particles results from acid action i.e., relatively smaller particles get smaller.

Since in smaller particle the quantity of quartz is relatively high and after acid washing this smaller particle disintegrated and washed out. As a result, quartz content decreases another reason is that with the presence of acid. Fe reacts with SiO_2 and form Fe_3Si. As a result,

CamScanner

decreases. On the other hand, Fe is very strong and is not disintegrated upon acid action rather than it reacts with SiO2. So, for decreasing quartz content the relative proportion of Fe may increase or for reacting with SiO2, Fe content may decrease The Fe content of acid washed sample is the resultant of above two actions In Sand 1 Fe content increases and for Sand II Fe content decreases after acid washing 18 6.3 Graph with correlation for strength for correlation any order of polynomial may be used.

2.9 ASTM Standard Graded sand

Sand is produced by processing silica rock particles obtained by hydraulic mining of the ortho-quartzite situated in open-pit deposits near Ottawa, Illinois.

Made of local (French Source) natural silica sand (silica content 99%).

Having a water content lower than 0.1%.

The constituent grains of this sand are uncrushed and of rounded form.

The sand is used for testing hydraulic cement in accordance with ASTM C 109.

2.10 VARIOUS TYPE OF SAND

Sand is found in the seas and rivers and riverine areas of Bangladesh. Sand is used for different purposes based on its size. The unit of measurement of sand is called finesse modulus which is symbolically expressed by FM. Three types of sand are available depending on size, shape, and use.

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.

Vita Sand: Vita sand is 0.5 to 0.7 FM in size. This sand is black in color due to some soil mixed in it. Vita soil is used to fill low land during the construction of new houses. Such sand is sold as CFT and per car. As this sand is not used for construction purposes, it is available at a low cost.

Sylhet Sand or Red 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.

Best Sand for Construction in Bangladesh by Mayfield Sand Aggregate

When it comes to the construction of buildings and structures, sand is a very helpful resource to have at your disposal. This may come as a surprise to individuals who are not in the construction industry. It has a wide range of applications, is reasonably priced, and is both sturdy and long-lasting. In addition to its usage in the production of concrete, mortars, and plasters,

Sand can also be put to use in the filing process, whether it be for walls or basements. However, why should you think about including it into your upcoming project? In this piece, we are going to discuss the benefits and drawbacks of utilizing sand in your project, as well as the various varieties of sand that are utilized in the construction industry.

CamScanner

Construction Sand (Sand)

When it comes to construction, why is sand used?

In spite of the fact that many people think of sand as being associated with beaches, it is also utilized in the construction of structures and buildings that can be found all around us. The other materials that it is used with in building, like as asphalt, concrete, mortar, and cement, benefit from its bulk, strength, and stability when it is employed in construction. Considering that it has a compacted structure, it is an excellent material for filling up cavities and for leveling out flooring. Nevertheless, when it is utilized in its raw state, it is frequently utilized for reasons that are more decorative, such as the production of metal castings and glass work. Sand is a material that is not only inexpensive but also quite adaptable, and it may be utilized for a wide diverse variety of applications.

Benefits of using sand in the building industry

One of the benefits of utilizing sand in the construction industry is the extraordinary level of durability that it provides to the project that you are working on. Because of the chemical qualities that it possesses, sand is able to resist harsh settings and can be utilized in a wide range of climates. Not only does it perform well in harsh settings, but it also adds more strength than concrete does. It does not allow for "honey combing" over time, and it also prevents voids and other structural difficulties that are often encountered with concrete. Sand's lower amounts of plastic make it easier to work with, particularly when it is used in mortars. This is especially true during the mixing process.

In addition to all of these benefits associated with the utilization of sand in construction, it is furthermore important to keep in mind that sand is not only inexpensive but also versatile, and as a result, it can be utilized as an economical option for a broad variety of jobs that are performed during building.

The drawbacks of using sand in building construction

While there are a number of potential benefits associated with use sand in the construction process, there are also a few drawbacks that should be taken into consideration when utilizing sand. However, because of its angular roughness, it requires a greater quantity of water and cement in order to be workable. This is one of the disadvantages. There is also the possibility that the sand has a greater quantity of microfine particles, which can have a domino effect on the overall strength and workability of the material.

What kind of sand is most suitable for building?

The use of sand in construction can be broken down into a number of different categories, each of which can be utilized for a specific function.

Sand for concrete

Concrete sand is achieved by first crushing concrete and then filtering it to eliminate any large rocks or shards that may have been present. After that, this particular variety of sand can be combined with cement and water to produce a solid mass. This mass can then be utilized as a leveling ground for layers, patios, and walking paths. Due to the fact that the particles are larger than those that are characteristic of white sand, it can also be utilized to fill cavities. The texture and size of the sand grains that are found in concrete sand make it a very versatile material that is suitable for a wide range of applications. Sand from the pit.

CamScanner

Alternatively, we have pit sand, which is obtained from a depth of around two to three meters below the surface of the earth. Due to its unparalleled binding properties, pit sand is frequently utilized in construction projects. Because of the significant amount of iron oxide that it contains, this form of sand can be found in deep trenches. It has a color that is somewhere between red and orange. Considering that this particular variety of sand does not include a significant amount of salt, does not react to the moisture that is naturally present in the air. Because of this, it is able to maintain its strength and dryness, which provides the project that it is employed in with both strength and rigidity.

2.11 COURSE AGGREGATE:

Different types of natural coarse aggregate are available in the local market of Bangladesh, which are primarily imported from several regions of the neighboring country, India. This paper aims to find the best locally available natural coarse aggregate for concrete preparation in terms of mechanical strength. It also reports on the results of an experiment investigation that looked at the effects of six different types of natural coarse aggregate, namely Burimari, Bhurungamari, Bholaganj, Tamabil, Jaflong and Dinajpur Hili (Indian Black Stone), vailable in the local market of Bangladesh on the mechanical properties of concrete. Concrete cylindrical specimens of 100mm diameter were prepared by each type of natural coarse aggregate keeping other ingredients constant. Concrete mix ratio and water/cement ratio adopted for the study were 1:1.5:3 and 0.48, respectively. The Compressive strength, splitting tensile strength and modulus of elasticity were investigated at 7, 14 and 28 days of curing age. The obtained results showed Dinajpur Hili (Indian Black Stone) is most suitable for concreting having distinguished variation in compressive strength, splitting tensile strength and modulus of elasticity compared to other types of natural coarse aggregates used in the research.

Six different types of natural coarse aggregate (Figure 1)

Available in the local market, namely Tamabil, Dinajpur Hil (Indian Black Stone), Bhurungamari, Bholaganj, Burimari and Jaflong were collected. Various tests were then conducted to assess the physical properties of the natural aggregates, which are shown in Table 2. Particle size.



Figure 1: Different types of natural coarse aggregates

Dads

CamScanner

available in the local market: (a) Tamabil, (b) Dinajpur Hili (Black Stone), (c) Bhurungamari, (d) Burimari, (e) Bholaganj, (f) Jaflong.

Table 2.2: Physical properties of different types of natural coarse aggregate

Type / Source of Natural Stone Aggregate	Fineness Modulus (FM)	Unit Weight (SSD) (kg/m3)	% Void	Apparent Specific Gravity	Bulk Specific Gravity (SSD)	Absorption Capacity (%)
Tamabil	7.74	1498	43	2.65	2.62	0.63
Dinajpur Hili	7.11	1603	42	2.9	2.78	2.21
Bhurungamari	7.26	1511	43	2.68	2.64	1.08
Bholaganj	7.46	1578	41	2.73	2.69	0.97
Burimari	7.94	1523	43	2.71	2.66	0.94
Jaflong	7.69	1597	37	2.63	2.52	2.7

Dads

CamScanner

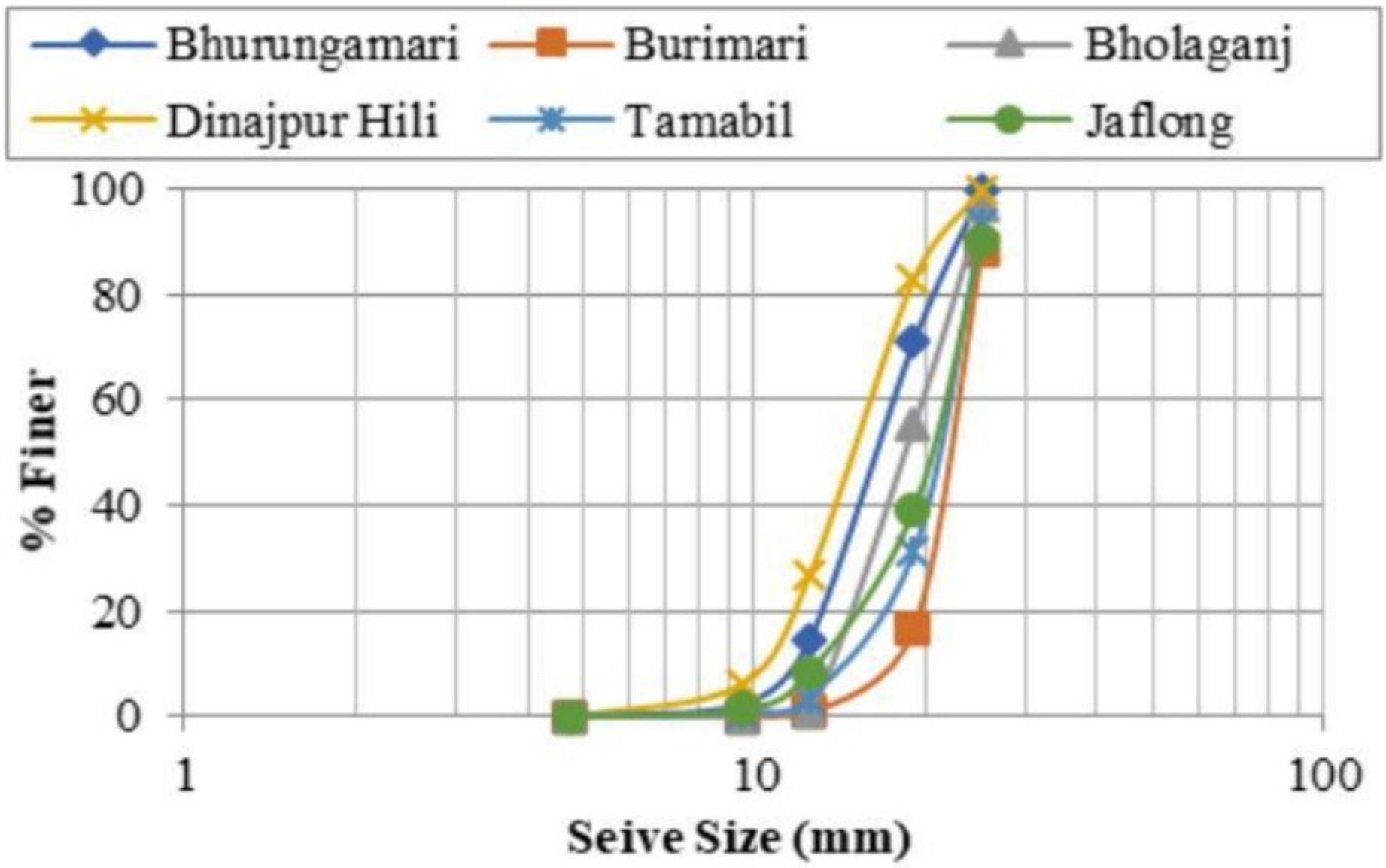


Figure 2: Particle size distributions of six different types of natural coarse aggregate.

Dads

CamScanner

CHAPTER 3
Methodology

3.1: Materials:

Coarse aggregate and fine aggregate, such as Sylhet sand samples are collected from local supply center. Panchaghar sand is collected from Supplier Local Sand are collated from Dhaka Saver. The aggregates are tested for absorption capacity, specific gravity, moisture content, unit weight, and FM. The specific gravity and absorption capacity are determined. After investigation of fine aggregates, Concrete Cylinder specimens (Size Dia l00mm and Height 200mm) are made according to mixed proportion (1 : 1 .5 : 3) The workability of concrete is all measured by slump test. The specimens are cured for the curing period of 7, 21 and 28 days and tested for compressive strength by Universal Testing Machine (UTM) after the curing period. In this study, as per mix proportion 1: 1.5:3 mix concrete accordingly to weight & conducted compressive strength text for 27 Cylinder with this mix ratio. This study is to evaluate concrete strength behavior of concrete with variation of sand by mixing proportion. We used Shah special cement CEM_2.Water cement Ratio= 0.47%, Mix proportion 1:1.5:3.

3.2:Picture



Local sand



Sylhet sand

Dads

CamScanner



Coarse aggregate



Cement

Dads

CamScanner



Concrete Making



Total 27 NOS Cylinder

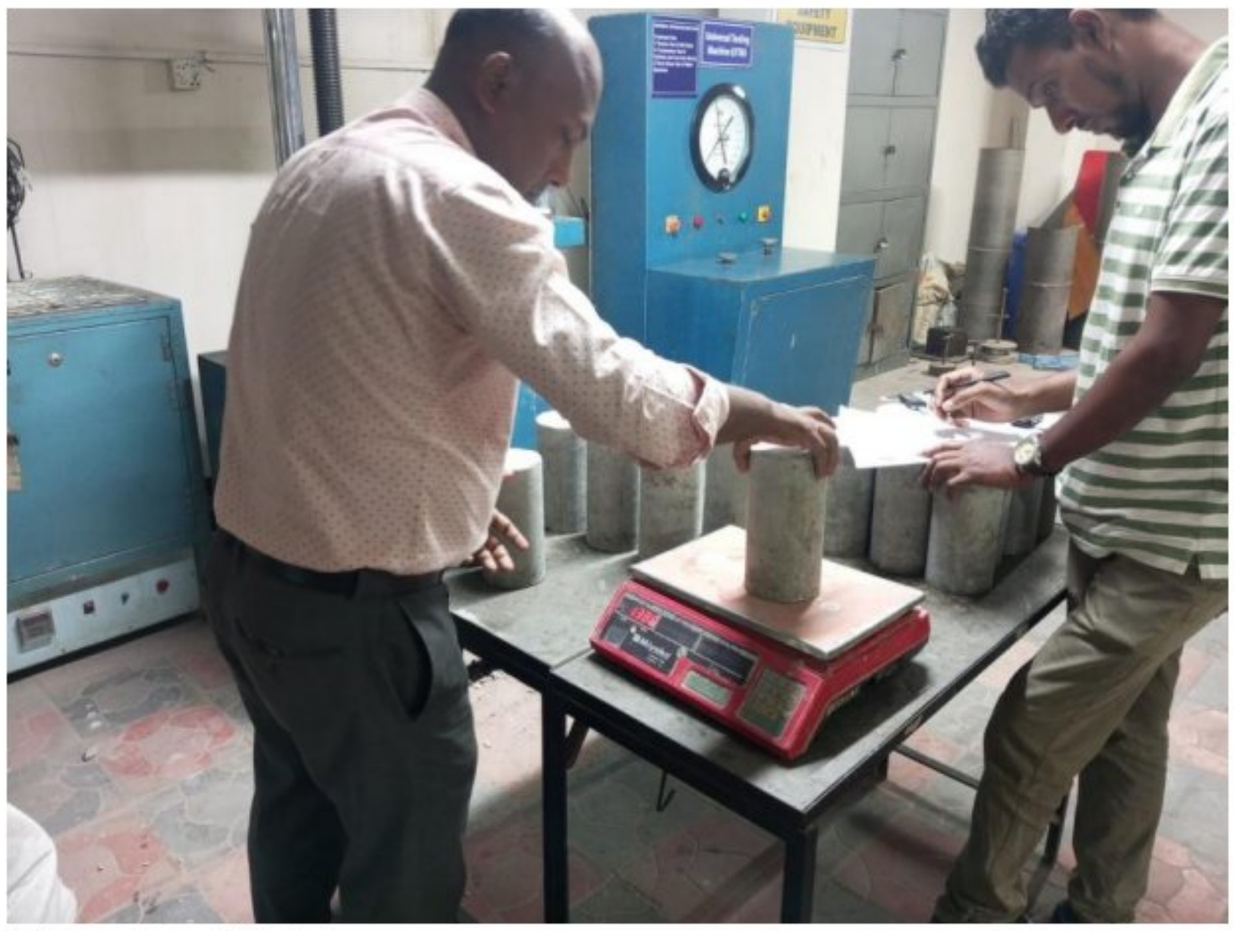


UTM Testing of Samples

CamScanner



Failure of Concrete



Mesuring Weight



Fixing cylinder is UTM

Dads

CamScanner

CHAPTER 4

Results and Discussion

4.1 Determination of fineness modulus of sand

The fineness modulus of sand is determined according to the test procedure described in ASTM Standard. The result of this test both for Sylhet sand and 1ocal sand is given below.

Table 4.1: Determination of fineness modulus of Sylhet sand

Sieve no	Sieve Opening (mm)	Materials Retained(gm)	%Materials Retained	Cumulative %Retained
#4	4.75	0	0	0
#4	2.36	34	3.4	3.4
#16	L19	218	21.8	25.2
#30	0.59	332	33.2	58.4
#50	0.30	322	32.2	90.6
#100	0.15	77	7.7	98.3

FM= $\frac{\text{Total cumulative \% retained of sand}}{100}$

= $\frac{3.4+25.2+58.4+90.6.6+98.3}{100}$

=275.9/100=2.75

Table 4.2: Determination of finances modulus of Panchaghar sand

Sieve no	Sieve Opening (mm)	Materials Retained(gm)	%Materials Retained	Cumulative %Retained
#4	4.75	2	.2	.2
#8	2.36	13	1.3	1.5
#16	1.19	99	9.9	11.4
#30	0.59	415	41.5	52.9
#50	0.30	391	39.1	92
#100	0.15	68	6.8	98.8
				=256.8

FM= $\frac{\text{Total cumulative \% retained of sand}}{100}$

= $\frac{256.8}{100}$ = 2.56

Table 4.3: Determination of finess modulus of Local sand (savar)

Sieve no	Sieve Opening (mm)	Materials Retained(gm)	%Materials Retained	Cumulative %Retained
#4	4.75	0	0	0
#8	2.36	1	.1	.1
#16	1.19	3	.3	.4
#30	0.59	75	7.5	7.9
#50	0.30	832	83.2	91.1
#100	0.15	78	7.8	98.9
				=198.4

CamScanner

FM= Total cumulative %retained of sand
100

= 198.4 = 1.984
100

4.5 Gradation of Various Types of Sand

This test methods cover the determination of particle size distribution of different types of hand by sieving. The sieve analysis of sand is determined according to the test procedure described in ASTM standard. The result of this test for Sylhet sand Panchaghar and local sand is given below

Table 4.4: Grain size distribution of Sylhet sand

Sieve no	Sieve Opening (mm)	Materials Retained(gm)	%Materials Retained	Cumulative %Retained	%Finer
#4	4.75	0	0	0	100
#8	2.36	34	3.4	3.4	96.6
#16	L19	218	21.8	25.2	74.8
#30	0.59	332	33.2	58.4	41.6
#50	0.30	322	32.2	90.6	9.4
#100	0.15	77	7.7	98.3	1.7
Pan		17	1.7	100	0

Practical size distribution curve of Sylhet sand

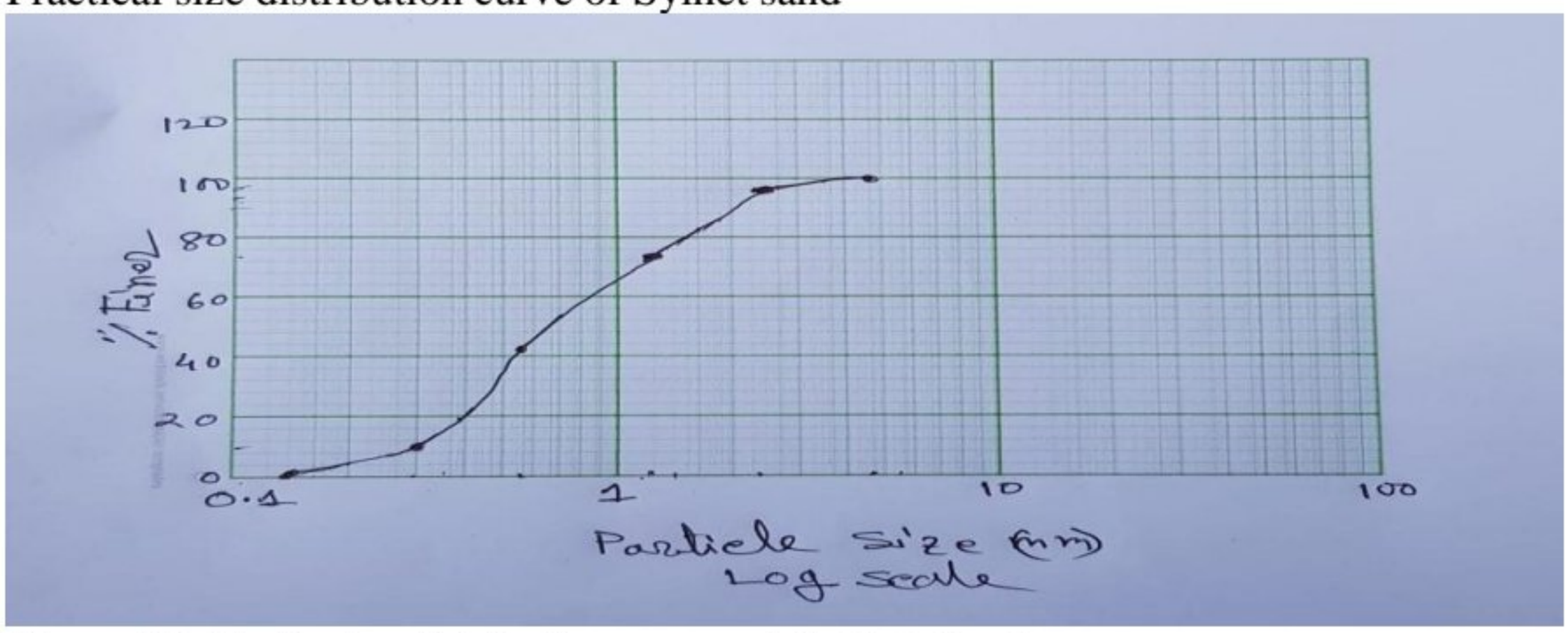


Figure 4.5: Grain size distribution curve of Sylhet Sand

Table 4.5: Grain Size distribution of Panchaghar sand

Sieve no	Sieve Opening	Materials Retained(gm)	%Materials Retained	Cumulative %Remained	%Finer
#4	4.75	2	.2	.2	99.8
#8	2.36	13	1.3	1.5	99.5
#16	1.19	99	9.9	11.4	88.6
#30	0.59	415	41.5	52.9	47.1
#50	0.30	391	39.1	92	8
#100	0.15	68	6.8	98.8	1.2
pan	_	12	1.2	100	0

Dads

CamScanner

Particle Size distribution curve

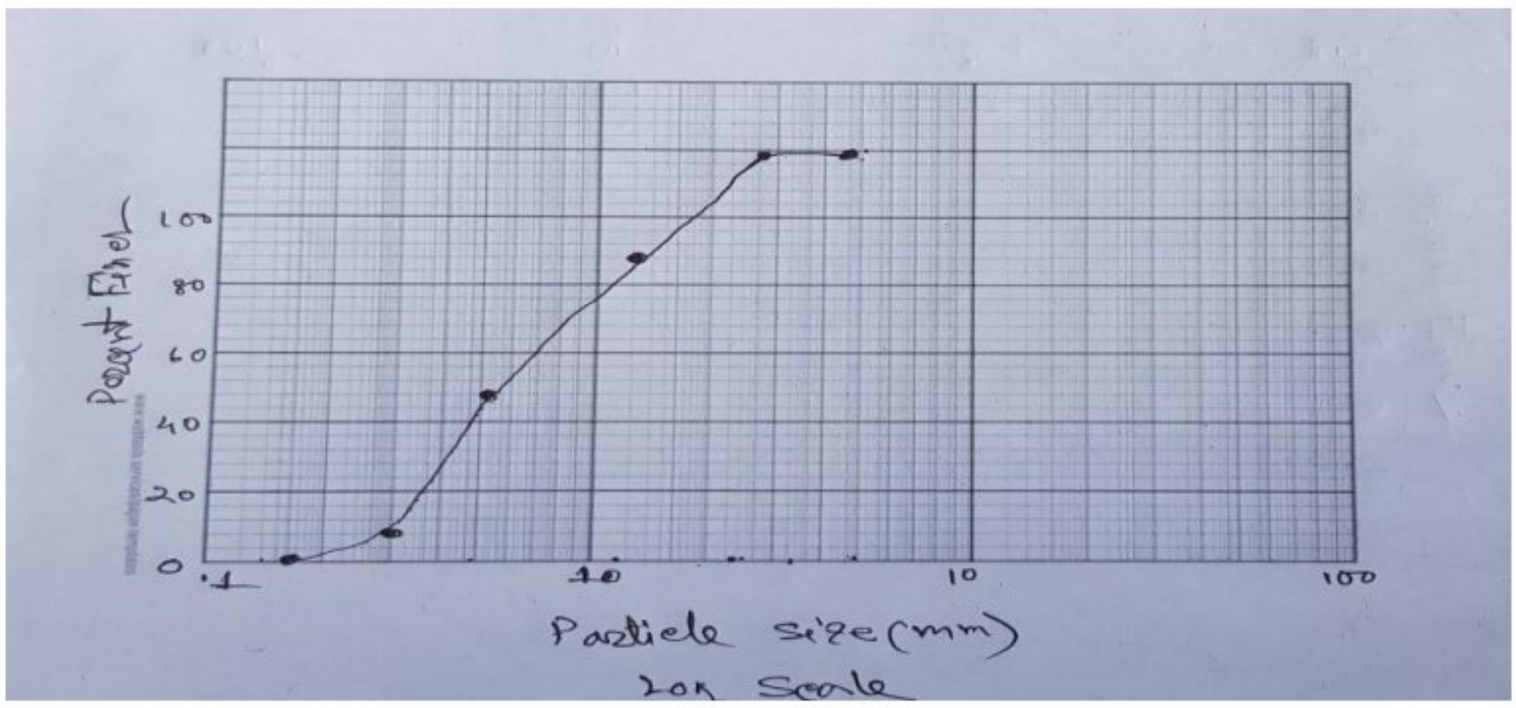
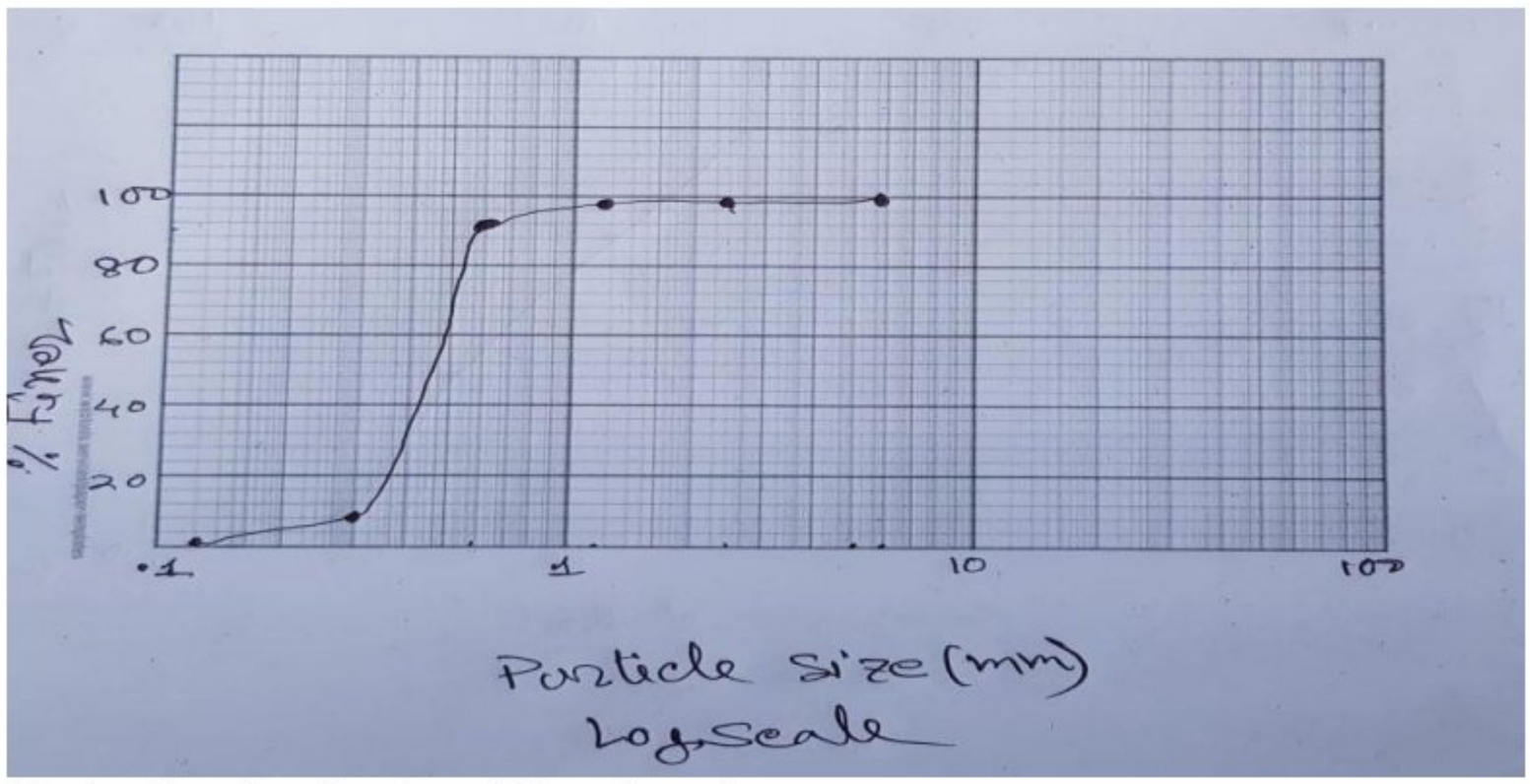


Figure 4.5: Grain size distribution of Panchaghar sand

Table 4.6: Grain size distribution of Local sand

Sieve no	Sieve Opening	Materials Retained (gm)	%Materials Retained	Cumulative %Remained	%Finer
#4	4.75	0	0	0	0
#8	2.36	1	.1	.1	99.9
#16	1.19	3	.3	.4	99.6
#30	0.59	75	7.5	7.9	92.1
#50	0.30	832	83.2	91.1	8.9
#100	0.15	78	7.8	98.9	1.1
pan	_	11	1.1	100	0

Partical Size Distribution Curye



Grain size distribution of Local sand

CamScanner

4.7:Unit weight of sand

#Unit Weight Of Sylhet Sand

Condition	Weight Of Bucket (-)	Bucket + Sand	Weight Of Sand	Volume Of Bucket (m3)	Unit weight of Sand kg/m^3
Shoveling Procedure	4000	8106	4106	0.00280	1466
Roding Procedure	4000	8370	4307	0.00280	1560
Jiggling Procedure	4000	8620	4620	0.00280	1651
					= 4677

Unit Weight Of Sylhet Sand = 4677/3=1559 gm/m^3

#Unit Weight Of Panchaghar Sand

Condition	Weight Of Bucket (-)gm	Bucket + Sand(gm)	Weight Of Sand(gm)	Volume Of Bucket (m3)	Unit weight of Sand gm/m^3
Shoveling Procedure	4000	8046	4046	0.00280	1443
Roding Procedure	4000	8412	4412	0.00280	1373
Jiggling Procedure	4000	8543	4543	0.00280	1622
					= 4640

Unit Weight Of Panchaghar Sand = 4640/3=1546 gm/m^3

CamScanner

#Unit Weight Of Local Sand

Condition	Weight Of Bucket - (gm)	Bucket + Sand(gm)	Weight Of Sand(gm)	Volume Of Bucket (m3)	Unit weight of Sand gm/m^3
Shoveling Procedure	4000	7793	3793	0.00280	1354
Roding Procedure	4000	8137	4137	0.00280	1477
Jiggling Procedure	4000	8309	4309	0.00280	1538

= 4369

Unit Weight Of Local Sand = 4369/3=1456 gm/m^3

4.8: Specific Gravity of stone

Test	Formula	Calculation	Result
Apparent Specific Gravity	A/(A-C)	2080/(2080-1315)	2.71
Bulk Specific Gravity (S.S.D Basis)	B/(B-C)	2130/(2130-1315)	2.61
Bulk Specific Gravity (Oven Dry Basis)	A/(B-C)	2080/(1230-1315)	2.55
Absorption D%	(B-A)/AX100	(2130-2080)/2080X100	2.40

CamScanner

4.9: Specific Gravity of local Sand

Test	Formula	Calculation	Result
Apparent Specific Gravity	A/(B+A-C)	287/(657+287-834)	2.60
Bulk Specific Gravity (Oven Dry Basis)	A/(B+S-C)	287/(657+300-834)	2.33
Absorption D%	(S-A)/AX100	(300-287)/287x100	4.52
Bulk Specific Gravity (S.S.D Basis)	S/(B+S-C)	300/(657+300-834)	2.43

4.10: Specific Gravity of Sylhet Sand

Test	Formula	Calculation	Result
Apparent Specific Gravity	A/(B+A-C)	290/(654+290-835)	2.66
Bulk Specific Gravity (Oven Dry Basis)	A/(B+S-C)	290/(654+300-835)	2.4
Absorption D%	(S-A)/AX100	(300-290)/290x100	3.4
Bulk Specific Gravity (S.S.D Basis)	S/(B+S-C)	300/(654+300-835)	2.5

4.11: Specific Gravity of Panchaghar Sand

Test	Formula	Calculation	Result
Apparent Specific Gravity	A/(B+A-C)	290/(657+290-838)	2.66
Bulk Specific Gravity (Oven Dry Basis)	A/(B+S-C)	290/(657+300-838)	2.43
Absorption D%	(S-A)/AX100	(300-290)/290x100	3.4
Bulk Specific Gravity (S.S.D Basis)	S/(B+S-C)	300/(657+300-838)	2.52

4.2: Laboratory Test Result of Cement

Tests were performed to determine normal consistency of Cement according to ASTM standard procedure (ASTM C187-10) and setting time (ASTM CI91-08).

CamScanner

Table 4.12: Physical properties of cement

Normal Consistency %	Initial setting Time	Final setting Time
27.5%	75-90 min	365min

Water:

Freshness of water was examined with naked eye. For this research we have used filtered water from Civil Engineering Department, SU. Other properties tests were not required for this study

CamScanner

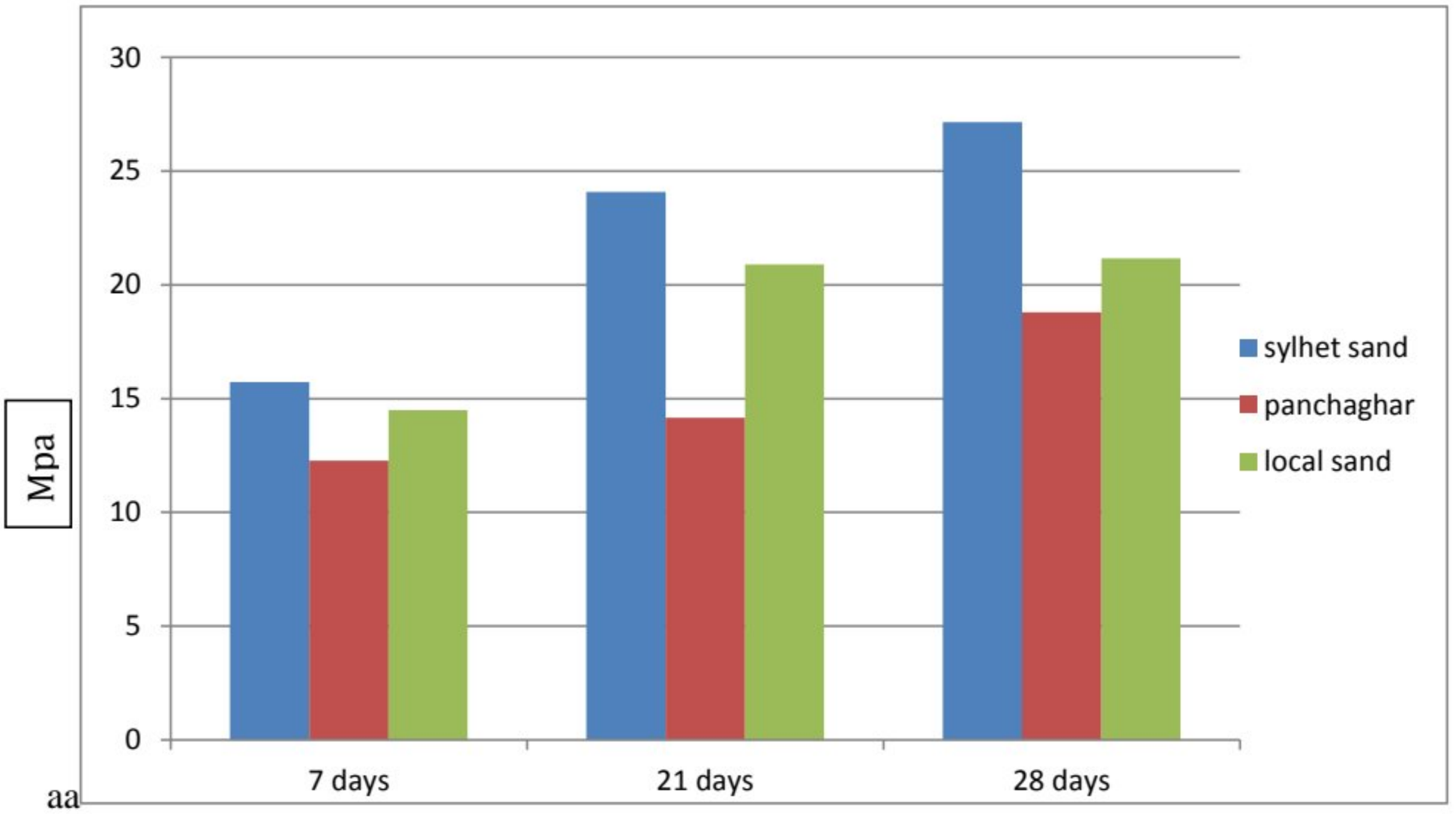
.Table-4.13: Compressive Strength of Cement Concrete for Different Types of Sand.

Mixing	Specimen no	Area (mm2)	Load (KN)			Average Load (KN)			Average strength (MPa)		
			7 days	21 days	28 days	7days	21days	28days	7days	21days	28days
Sylhet sand	1	12.65	142	200	220	128.9	196.6	221.6	15.7	24.09	27.15
	2		117	185	225						
	3		126	205	220						
Panchaghar sand	1	12.70	85	125	165	100.6	116	154	12.2	14.16	18.79
	2		122	105	150						
	3		95	118	147						
Local sand	1	12.62	108	167	172	118	163.6	172.3	14.4	20.09	21.16
	2		121	157	177						
	3		125	167	168						

Dads

CamScanner

4.14: Compressive Strength of Concrete (Mpa)



aa

Figure 4.4: Variation of Compressive Strength of cement concrete (Mpa)

Dads

CamScanner

CHAPTER 5
CONCLUSION AND RECOMMENDATION

5.1 Conclusions:

Based on the results of this experimental study, the following conclusions are made:

1. Sylhet sand gives highest compressive strength of concrete and Local sand Gives second highest compressive strength and Panchaghar sand gives lowest compressive strength.

2. Panchachar sand FM is more than local sand but Strength is less.

3. Concrete compressive strength is gradually increases according to curing period.

4. Sylhet sand unit weight is highest. Panchaghar sand unit weight is second highest and savar sand unit weight is lowest.

5. Local sand Apparent Specific Gravity is less. Sylhet sand and Panchaghar sand apparent Specific Gravity are same.

CamScanner

REFERENCES

Mahendrana et al (2006), Using hill sand in compressive strength of concrete. 4(12): 724-729.

M.A.Aziz (1995), "Engineering Material* Book, 1" Edition.

AI jabri and R. Taha (2008), Using various type of sand on the properties of high strength Concrete. 5{1), 235-241,

F. Olutong and Amusan (2001), The effects of river sand on compressive strength of concrete, 8(14), 466-471.

M. S. Sheety {2002), "Concrete Technology" Book, 5th Edition.

S. Kumar (2O07), Sand with a coefficient of variation, 7(12): 169- 174.

CamScanner