

**AMERICAN COLLEGE OF TECHNOLOGY**  
**DEPARTMENT OF BUSINESS STUDIES**  
**MASTER OF BUSINESS ADMINISTRATION PROGRAM**



**PRODUCTION OF CEMENT TERRAZZO TILES AND  
CONCRETE BLOCK SIMULTANEOUSLY**

**A PROJECT SUBMITTED TO THE DEPARTMENT OF BUSINESS  
STUDIES OF AMERICAN COLLEGE OF TECHNOLOGY**

**AS A PARTIAL FULFILLMENT OF THE REQUIREMENT OF THE  
AWARD OF MASTER OF BUSINESS ADMINISTRATION**

**By**

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**DECEMBER 2023**

**ADDIS ABABA, ETHIOPIA**

## **DECLARATION**

I, TSEHAY MISRAK hereby declare that a project work entitled PRODUCTION OF CEMENT TERRAZZO TILES AND CONCRETE BLOCK SIMULTANEOUSLY submitted to The Department of Business studies of American College of Technology in partial fulfillment of the requirements for the award of the **Master Business Administration** is a record of original work done by me during 2023 academic year under the supervision and guidance of **Mr.Tibebe Tilahun** and it has not formed the basis for the award of any Degree/Diploma/Associate ship/Fellowship or other similar title of any candidate of any university.

Place: Addis Ababa

Date: 25/12/2023

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Signature of the Candidate

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**CERTIFICATE**

This is to certify that the project work entitled PRODUCTION OF CEMENT TERRAZZO TILES AND CONCRETE BLOCK SIMULTANEOUSLY submitted to the Department of Business Administration, MBA Program in partial fulfillment of the requirements for the award of the **Master of Business Administration** is a record of original project work done by TSEHAY MISRAK during the period 2023 academic year under my supervision and guidance and the thesis has not formed the basis for the award of any Degree/Diploma/Associate ship/Fellowship or other similar title of any candidate of any University and it complies with the regulation and accepted standards of the College.

Name of Advisor: **Dr. Asmamaw Mengistu**

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

**APPROVAL SHEET**

**AMERICAN COLLEGE OF TECHNOLOGY**

**DEPARTMENT OF BUSINESS STUDIES**

**MASTER OF BUSINESS ADMINISTRATION PROGRAM**

**TITLE OF PROJECT**

**BY: TSEHAY MISRAK**

**Id Number: OMBA-286-21A**

**Approved by:**

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Name: **Tsehay Misrak**

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

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## 1. INTRODUCTION

Now days, Concrete blocks and terrazzo tiles are becoming very popular. These blocks and tiles are being widely used in construction of residential buildings, factories and multi-storied buildings.

There are two main types of concrete blocks used in the construction industry: hollow and solid. Fully solid blocks are often used for projects like paving, where stability and durability are important.

Hollow blocks, which have holes that take up more than one-quarter (and usually more than half) of their cross-sectional area, are used when building boundary fences and other large structures. The holes make them lighter and can be useful when running wiring or piping through them. These hollow blocks are commonly used in compound walls due to its low cost. These hollow blocks are more useful due to its lightweight and ease of ventilation. The blocks are made out of mixture of cement, sand and stone chips. Hollow blocks construction provides facilities for concealing electrical conduit, water and soil pipes. It saves cement in masonry work, bringing down cost of construction considerably.

Terrazzo is elegant and timeless with its long-proven history of durability, sustainability, and performance. Moreover, it was one of the first recycled composite materials. Terrazzo flooring is applicable both indoors and outdoors. It is familiar for its function in Airports, Healthcare centers, educational institutions, as well as residential areas. It is typically useful as a finish for floors, stairs, and walls.

Terrazzo it is a building material capable of forming many unique finishes. If to sum up the building material in one sentence, terrazzo is described as a composite material, poured in place or prefabricated for precast terrazzo which is used for flooring, base, walls, stair treads, countertop, and other custom products. Terrazzo consists of chips of marble, granite, quartz, glass, shell, or other suitable materials. It uses either a cement or epoxy matrix as the binder.

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## 1.1 Background of the project

A concrete block is primarily used as a building material in the construction of walls. It is sometimes called a concrete masonry unit (CMU). A concrete block is one of several precast concrete products used in construction. The term precast refers to the fact that the blocks are formed and hardened before they are brought to the job site. Most concrete blocks have one or more hollow cavities, and their sides may be cast smooth or with a design. In use, concrete blocks are stacked one at a time and held together with fresh concrete mortar to form the desired length and height of the wall. Concrete mortar was used by the Romans as early as 200 B.C. to bind shaped stones together in the construction of buildings. During the reign of the Roman emperor Caligula, in 37-41 A.D., small blocks of precast concrete were used as a construction material in the region around present-day Naples, Italy. Much of the concrete technology developed by the Romans was lost after the fall of the Roman Empire in the fifth century. It was not until 1824 that the English stonemason Joseph Aspdin developed Portland cement, which became one of the key components of modern concrete.

The first hollow concrete block was designed in 1890 by Harmon S. Palmer in the United States. After 10 years of experimenting, Palmer patented the design in 1900. Palmer's blocks were 8 in (20.3 cm) by 10 in (25.4 cm) by 30 in (76.2 cm), and they were so heavy they had to be lifted into place with a small crane. By 1905, an estimated 1,500 companies were manufacturing concrete blocks in the United States. These early blocks were usually cast by hand, and the average output was about 10 blocks per person per hour. Today, concrete block manufacturing is a highly automated process that can produce up to 2,000 blocks per hour.

Concrete blocks were first used in the United States as a substitute for stone or wood in the building of homes. The earliest known example of a house built in this country entirely of concrete block was in 1837 on Staten Island, New York. The homes built of concrete blocks showed a creative use of common inexpensive materials made to look like the more expensive and traditional wood-framed stone masonry building. This new type of construction became a popular form of house building in the early 1900s through the 1920s. House styles, often referred to as "modern" at the time, ranged from Tudor to Foursquare, Colonial Revival to Bungalow. While many houses used the concrete blocks as the structure as well as the outer wall surface, other houses used stucco or other coatings over the block structure. Hundreds of thousands of these houses were built especially in the Midwestern states, probably because the raw materials needed to make concrete blocks were in abundant

supply in sand banks and gravel pits throughout this region. The concrete blocks were made with face designs to simulate stone textures: rock-faced, granite-faced, or rusticated. At first considered an experimental material, houses built of concrete blocks were advertised in many Portland cement manufacturers' catalogs as "fireproof, vermin proof, and weatherproof" and as an inexpensive replacement for the ever-scarcer supply of wood. Many other types of buildings such as garages, silos, and post offices were built and continue to be built today using this construction method because of these qualities.

Tiles manufacturing business is part of the clay brick and product manufacturing industry and players in this industry primarily manufacture tiles, ceramic paving, pipes and conduits. Please note that the industry excludes the manufacturing of artificial stone such as cultured marble, tiles made into stands or other ornamental articles.

The Brick and Tile manufacturing industry produces clay bricks and tiles for use in the downstream building and construction markets. The Clay Brick and Tiles Manufacturing industry in the US is the 156th ranked Manufacturing industry by market size and the 587th largest in the US.

Statistics has it that in the united states of America alone, there are about 603 registered and licensed clay bricks and tiles manufacturing companies responsible for employing about 24,110 people and the industry rakes in a whopping sum of \$6.3 billion annually.

The industry grew at 0.9 percent annual growth within 2015 and 2022 and the industry is projected to grow at 1.1 percent in 2023. It is important to state that no establishment can boast of having a lion share of the available market in this industry.

The market size of the Clay Brick & Product Manufacturing industry in the US grown slower than the economy overall. Research carried out by IBIS World shows that the Clay Bricks and Tiles Manufacturing industry has a medium level of market share concentration, with the three largest players generating an estimated 20.6 percent of industry revenue in 2017.

The remainder of the market is captured by a large number of small and medium-scale operators that service relatively narrow geographical markets. However, large-scale players maintain a presence across many regional markets.

The report further stated that over the past five years, ownership concentration within the industry has increased due to acquisition activity in the US building materials market. This

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involved the acquisition of local and regional players by larger companies seeking to expand their operations, and large foreign owned manufacturing companies hoping to gain a foothold in the US market.

The Clay Bricks and Tiles Manufacturing industry is a profitable industry and it is open for any aspiring entrepreneur to come in and establish his or her business. You can choose to start on a small scale or you can choose to start on a large scale servicing a wide range of clientele not only in the United States' market space, but exporting to other countries of the world.

Terrazzo has an interesting history with roots all over the globe. Going back more than 500 years to Italy where marble was the main material of choice. Venetian workers would use scrap marble fragments that they saved from their upscale projects, placing them next to each other in a clay mortar base for their own residence and terraces.

Terrazzo is also related to the technique *seminato* (meaning seed). For this technique, workers would toss large marble chips into the wet cement that was later ground and polished. Together, these two methods create the generic form of terrazzo that involve pieces of stone that are bonded to a cement bed.

While credit is traditionally given to the Italians, as it is commonly recognized that terrazzo was invented by the Venetians, archaeologists have found evidence of such floors in ruins in Turkey dating back 10,000 years ago. Fast forward to today, and a majority of installations are epoxy-based. Introduced in the 1970s, epoxy soon offered advantages over cement systems, including quicker speeds to install, greater design flexibility, and longer life cycles. According to the NTMA, epoxy terrazzo is the best thin-set system available, and remains one of the most durable and cost-effective flooring finishes to specify.

## **1.2 Objective of the Project**

- **General objective**

- A. Use the waste material of Terrazzo tiles for concrete block production
- B. Producing both materials as a time is as its curing period are almost the same
- C. Providing the main construction elements from simultaneously, regarding time...

- **Specific objectives**

In both concrete block and cement terrazzo tiles the ingredients we use are mostly common materials. So this project focuses on using these materials for both productions without wastage of them. And just to reduce manpower and time specifying for production. Also realizing waste of one product will help us as an ingredient of another product, this helps us to minimize cost in different perspectives.

## **1.3 Statement and Justification of the Problem**

Terrazzo is a front-runner in many building projects today. Aside from being an all-purpose flooring material, terrazzo can also be engineered as wall panels or stairs that blend in nicely in schools, hospitals, restaurants, and other commercial spaces. There are different methods of installing terrazzo. Poured-in-place epoxy terrazzo has been a favorite among architects for its expansive design opportunities. Cement terrazzo is another popular option known for its vintage appearance and is highly suggested for use in exterior applications. And then we have precast terrazzo, a form of terrazzo made under a controlled environment and later transported to the construction site to be installed.

Terrazzo is a flooring material traditionally made by exposing marble chips on the surface of concrete and then polishing until smooth. Now, however, you can buy terrazzo in tile form. It's often used in public buildings because it's long-lasting and can be refinished repeatedly.

In addition to durability, terrazzo tiles are water and heat-resistant, making them an ideal flooring type for both interiors and exteriors. Whether you want them for patio or kitchen, they are a versatile option, suitable for a variety of applications.

Terrazzo is a composite material made with marble, granite, glass, or quartz chips set into cement. Its roots start in Egyptian mosaics, but it became popular in 16th century Italy to make use of stone offcut. It is either poured by hand or precast into blocks that get cut to size.

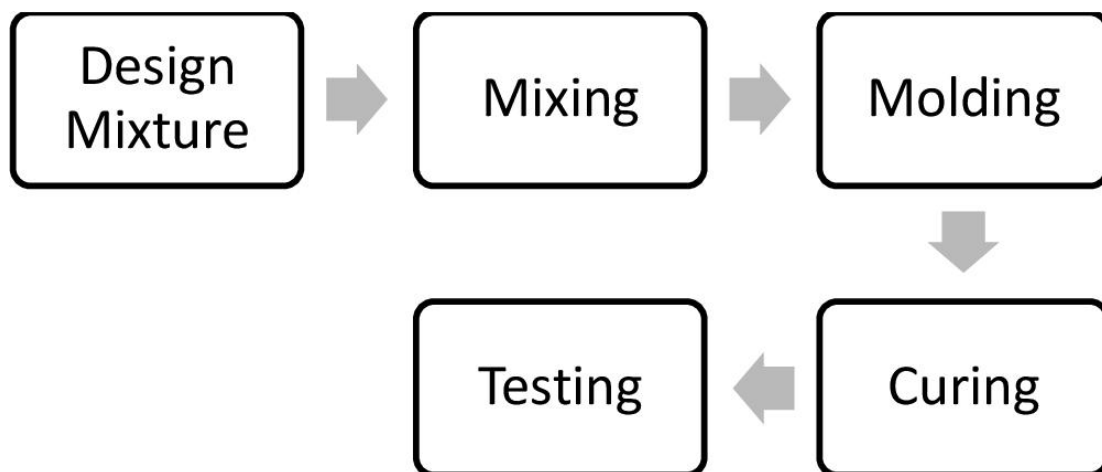
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Hollow concrete blocks bring a suite of benefits when used within a construction project: Insulation: Concrete blocks offer both acoustic and thermal insulation. This means that a building such as a house that is constructed with concrete blocks will be protected from loud external noises like traffic.

Gravel, sand, water, and cement make up Concrete blocks. They produce light gray blocks with high compression strength and surface texture. Replacing gravel and sand with slate, shale, and clay makes lightweight hollow blocks.

➤ **Production process of Concrete Blocks**

The mix design for concrete blocks consists of cement, aggregate (sand and stone), water, and chemical admixtures. All of these have a notable effect on the resulting blocks. Thus we'll look at each in turn.



**Figure 1-1** *production process of concrete block*

The overarching principle that governs this mix-design is mobility. The fresh concrete mixture is relatively dry since it must maintain shape once pressed in the block press. If the mix is too wet, the concrete will slump, ruining the block. If the mix is too dry, it will not consolidate adequately and thus be too porous. This poor consolidation considerably decreases the block's compressive strength, rendering it useless. When the mix design contains high-quality materials mixed in the correct proportions, it is fluid enough to consolidate well in the block press but dry enough to maintain its shape once pressed.

The aggregates used in block making are sand and small stones. The sand can be natural river or pit sand, or crusher sand, while the stones could be pebbles from a river bed or crushed



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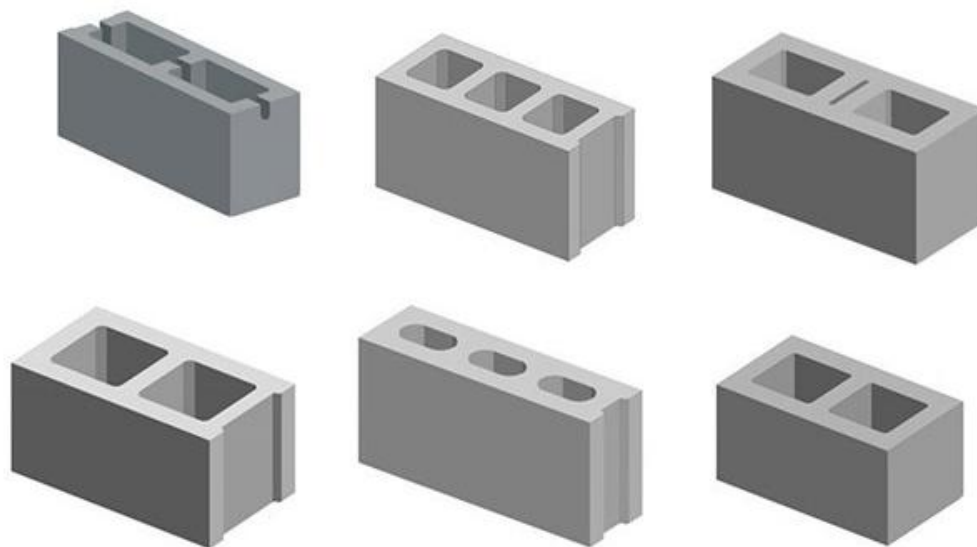
rock. European countries use more aggregates sourced from rivers, while arid regions use more crushed aggregates. This preference is based on local availability.

River sand and pebbles tend to be smooth and rounded, offering greater mobility to the mix design. They act as marbles or ball bearings in the mix design, rolling over each other during the consolidation process.

Crushed aggregates tend to be angular or flaky, leading to less mobility in the mix design. Angular aggregates don't roll easily, like a block doesn't roll as readily as a ball. Here, the mix design will require more water to facilitate mobility, which affects its ability to maintain rigidity once molded in the block press.

The aggregate's particle size distribution is also essential. River sands tend to be single-sized, with all particles falling within a narrow band of sizes. In contrast, the size distribution in crushed aggregates is easily altered and relatively well controlled.

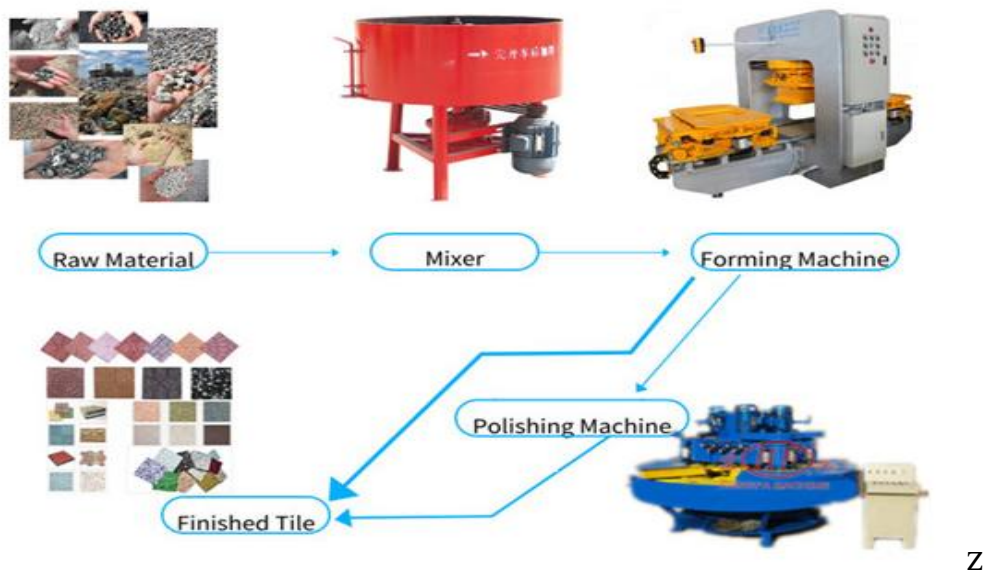
Single-sized aggregates don't offer as much mobility and the ability to consolidate as those with a more even size distribution. When particles of various sizes are present in the mix design, the smaller particles fill in the void between the larger particles, rolling over each other in the process. This distribution offers greater consolidation and decreases the voids between the particles. These factors contribute to greater strength and dimensional stability in the resulting product.



**Figure 1-2** *Different types of concrete blocks*

➤ **Production process of Terrazzo Tiles**

**1. Mix materials** Terrazzo tiles have two layers: under layer and surface layer. The materials of under layer include crushed stone, cement and water. The worker scales materials and feeds to skip hoist, then transfers to the mixer. The material mixture after mixing evenly will be discharged into mortar lorry and transferred to the forming machine. The materials of surface layer, include: marble, sand, powder stone, cement, pigment, water, ect, are fed to the mixer. After mixing evenly, the mixture is discharged into mortar lorry and transferred to the forming machine.



**Figure 1-3 production process of Terrazzo Tiles**

**2. Transfer materials to the mold** The mixture of surface layer and under layer is fed into the mold according to the order of the surface layer and the under layer to form into two separate layers.

**3. Form the shape of terrazzo tile** The forming machine uses a large hydraulic press force to form the tiles in the mold and solidify them. After forming, terrazzo tiles are separated from the mold automatically by the machine, and then workers stack on the rack.

**4. Curing terrazzo tile** Based on the atmosphere and features of product, terrazzo tiles are cured naturally in 72 hours or cured in steam room in 24 hours before grinding and polishing.

**5. Grinding and polishing** After curing, terrazzo tiles are transferred to the grinding machine to grind and polish the surface layer to have a high aesthetics, After grinding and polishing,

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the workers stack into the bales, packaging and transferred to curing yard. After 15 days, it can be sold.



**Figure 1-4 Different types of Terrazzo Tiles**

#### **1.4 Scope of the Project**

These two materials are the most common applicable used in our most part of the country. So there are a lot of production centers all around. But mostly we found them as separately as terrazzo and concrete block production. As the characteristics of the production centers are the same all over the country, am am trying focusing on around Addis Ababa and Bishoftu town only to gather and required data.

As we discussed above both materials have different types as its functionality. In any of construction industry we use either of or both at the same time. This project addresses all construction centers.

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## 1. PROJECT CONCEPT

### 1.1. Opportunity study

In addition to durability, terrazzo tiles are water and heat-resistant, making them an ideal flooring type for both interiors and exteriors. Whether you want them for patio or kitchen, they are a versatile option, suitable for a variety of applications. Terrazzo will save you money over time as it is quite durable and requires few repairs. However, the initial cost of terrazzo per square foot is higher in comparison to other materials. For people limited on budget, terrazzo seems unfavorable for projects.

Construction building blocks for walls are embedded with many gains to construction that are too important to be ignored. Perhaps before you embark on your next construction work, you may need to consider these advantages of using concrete hollow cellular block masonry in buildings before making that important choice.

Rapid Execution of work made from molds that produce hollow cinder blocks of similar shapes, sizes, and weight, it is easy to deploy hollow concrete blocks in construction works, all that is needed is to fit the right hollow brick to the right place. Then, the same solid block size and shape help quickly assemble them to form any particular shape required in a construction job.

- ✓ Highly Durable
- ✓ Better Insulation Properties
- ✓ Environmentally Friendly
- ✓ Cost-Efficient
- ✓ Low Maintenance
- ✓ Conserves Space
- ✓ Bonding of Mortar and Plaster

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## **1.2. The Nine BMC components for the production of hollow blocks**

### **Key partnerships**

- ✓ Suppliers of raw materials
- ✓ Transportation companies for logistics
- ✓ Contractors and construction companies to establish long term partnerships

### **Key Activities**

- ✓ Manufacturing concrete blocks in bulk
- ✓ Customizing blocks based on customer preferences
- ✓ Managing inventory and logistics
- ✓ Establishing and maintaining relation ships with customers

### **Key Resources**

- ✓ Raw materials such as cement, sand and gravel
- ✓ Machinery and equipment for manufacturing
- ✓ Skilled labour production and management
- ✓ Marketing and sales personnel

### **Value Propositions**

- ✓ Direct selling model for competitive pricing and customization
- ✓ Wide range of block sizes, types, and colors
- ✓ Strong relationships with customers for increased customer satisfaction

### **Customer Relationships**

- ✓ Establishing and maintaining long term partnerships with contractor and construction companies
- ✓ Providing personalized services and customization to meet individual needs

- 
- ✓ Offering excellent customer support and after sale services

### **Channels**

- ✓ Direct selling through online and offline channels
- ✓ Collaborating with partners and suppliers for logistics and distribution
- ✓ Participating in industry trade shows and exhibitions

### **Customer segments**

- ✓ contractors and construction companies
- ✓ Architects and designers
- ✓ Retailers enthusiasts

### **Cost Structure**

- ✓ Raw materials and production costs
- ✓ Labour costs for production and management
- ✓ Marketing and advertising costs
- ✓ Logistics and distribution costs

### **Revenue Streams**

- ✓ Sales revenue from direct selling of concrete blocks
- ✓ Revenue from customization and personalized services
- ✓ Revenue from participating in industry trade shows and exhibitions

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### **1.3. The project Concept and Profile**

This project comprises the production of cement terrazzo tiles and concrete block simultaneously. Both construction materials have common ingredient and also the wastage of terrazzo tiles to use for the production of concrete block.

Concrete blocks produced from cement, sand, gravel and water. And by adjusting the mix as different ratio we can produce different types as load bearing blocks, hollow blocks and solid blocks.

### **1.4. Preliminary study**

We are considering different factors, like time for production, cost of production and manpower minimization. In the production of terrazzo tiles on the process we can get of gravels as wastage from the ingredient.

Terrazzo hasn't changed much, in terms of it's consistency, since it's origin. The standard ingredients are: a mixture of stone aggregates, mostly marble ( or it can also be granite, quartz, or glass chips), marble powder, and a binding agent.

#### **1.4.1. Production process of Concrete Block**

Concrete hollow block can be produced by concrete block making machine, the product is mainly used to fill the high-level framework of the building, because of its lightweight, sound insulation, good thermal insulation effect, the majority of users trust and favor. The raw materials are as bellows:

- **Cement.** powdery hydraulic inorganic cementitious material.



**Figure 2-1 *Cement***

- **Sand.** for concrete, it can be combined with cement molecules to increase the diffusion area of cement molecules and form cement slurry to enhance the hydration of cement.



**Figure 2-2 *Sand***

- **Gravel.** The cement slurry shrinks fast, and the stone gravel acts to inhibit shrinkage and stabilize the volume.





**Figure 2-3 Gravel**

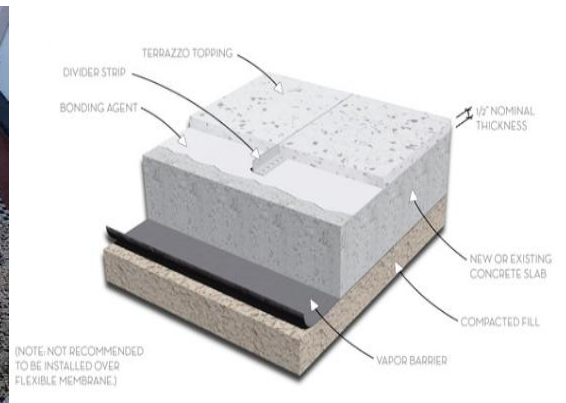
## **1.4.2. Production process of Concrete Block**

### **1.4.2.1. Types of Terrazzo**

Terrazzo can be classified into 2 broad categories based on its type of binder: **cementitious** and **resinous**. Originally, terrazzo was a cementitious material, and from the 16th century until today, cement terrazzo has provided a beautiful and durable floor finish. There have been many innovations in cementitious terrazzo, and today it takes a variety of forms. Examples of cement terrazzo systems are:

#### ✓ **Monolithic terrazzo**

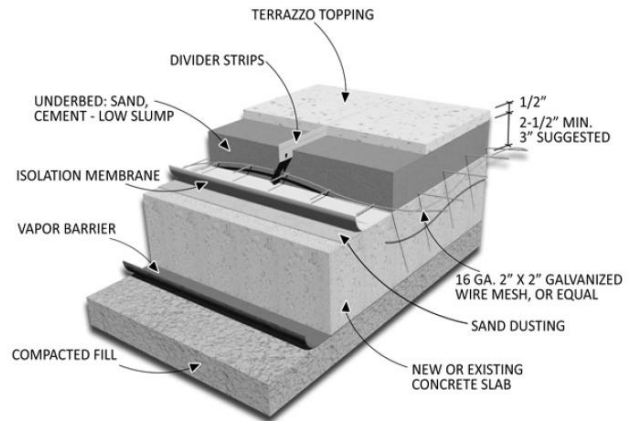
Monolithic Terrazzo is a 1/2" thick cementitious finish applied directly over a concrete sub-floor. When the sub-floor is very smooth a bonding agent is required so the terrazzo finish properly adheres to the concrete.



**Figure 2-4 Monolithic Terrazzo**

✓ **Sand cushion terrazzo**

A cement matrix topping under bed with wire reinforcing, isolation sheet, and sand layer system for interior floor use. This is the best cement system.

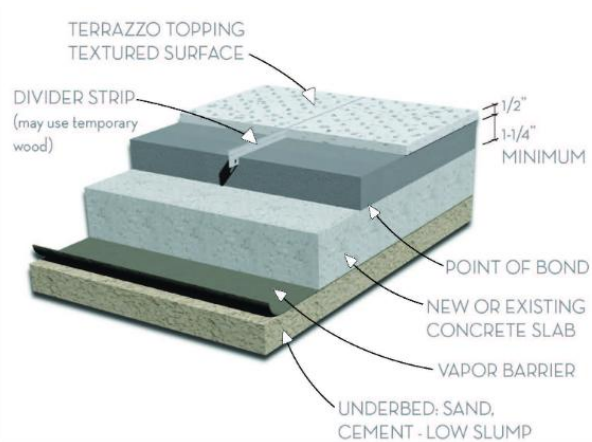


**Figure 2-5 Sand cushion terrazzo**

✓ **Rustic terrazzo**

Rustic terrazzo has a rough, textured surface that makes it slip-resistant and adaptable to any weather conditions. The total thickness of a rustic terrazzo floor ranges from half an inch to six inches.

This type of terrazzo is installed as an overlay over an existing concrete sub-bed. Rustic terrazzo can use a multitude of various colored marble chips, and the cement matrix can be colored as well; providing a vast pallet of choices for creating the perfect deck. The aggregate is washed to provide a more textural surface to help resist slipperiness.

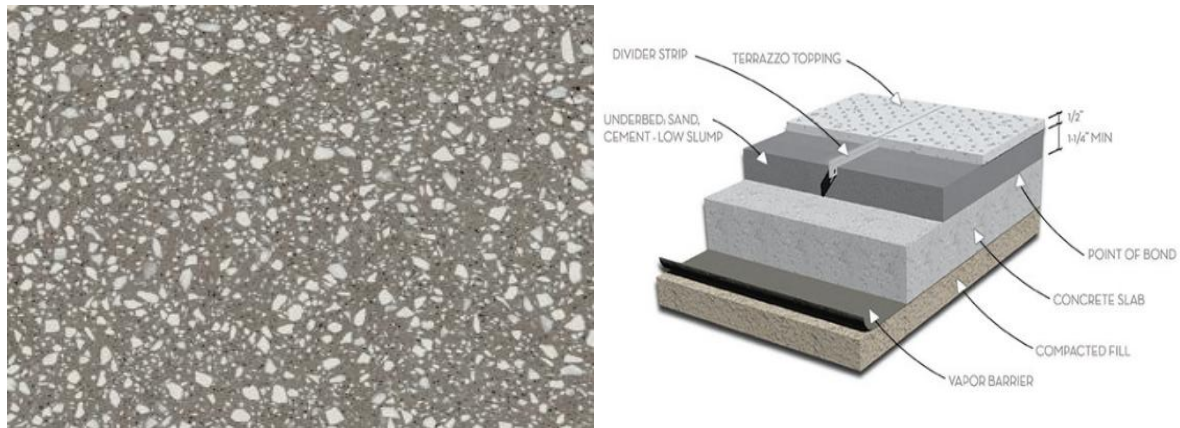


**Figure 2-6 Rustic terrazzo**

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✓ **Bonded terrazzo**

A cement matrix and under bed system for interior and exterior areas where conditions require 1.25" to 1.75" inches of recessed depth to be filled in addition to the .5" terrazzo topping.



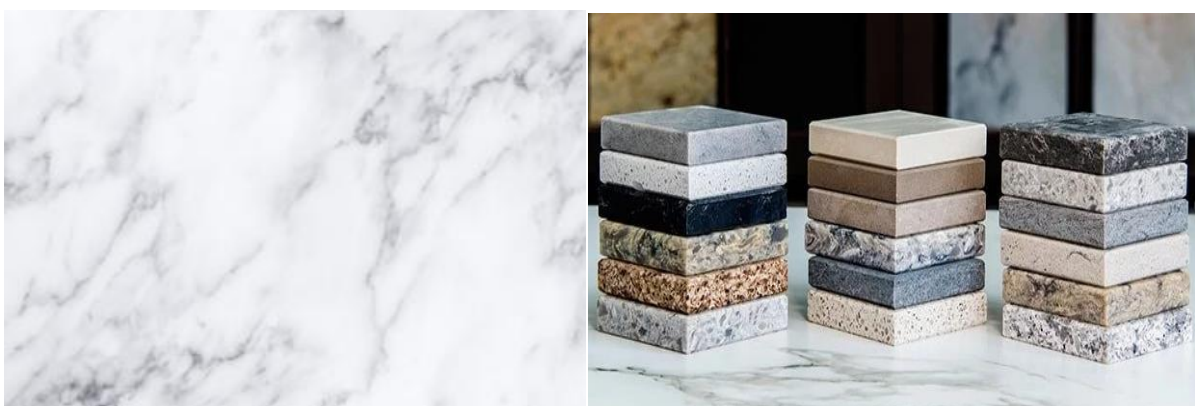
**Figure 2-7** *Bonded terrazzo*

#### 1.4.2.2. Ingredients of Terrazzo

Terrazzo is a type of composition flooring. It consists of a mix of **marble, granite, onyx,** or glass chips in **Portland cement,** modified Portland cement, or resinous matrix that is poured, cured, ground, and polished.

- **Marble**

Marble chips are the most common aggregate. Many marble chips have a distinct color that works wonderfully with any resin color to create a custom terrazzo design. Most aggregates are produced from natural sources that are extracted from quarries and gravel pits.



**Figure 2-8** *Marble*

- **Granite**

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Granite is a light-colored igneous rock with grains large enough to be visible with the unaided eye. It forms from the slow crystallization of magma below Earth's surface.

Granite is composed mainly of quartz and feldspar with minor amounts of mica, amphibious, and other minerals. This mineral composition usually gives granite a red, pink, gray, or white color with dark mineral grains visible throughout the rock.



**Figure 2-9 Granite**

- **Glass chips**

Glass Chippings are derived from industrial flat and container glass making them environmentally sustainable and friendly. Also known as Glass Gravel among certain international buyers, glass chippings have demonstrated great use in commercial projects and garden designing.



**Figure 2-10** *Glass Chipping*

- **Portland cement**

Portland cement, binding material in the form of a finely ground powder, usually gray, that is manufactured by burning and grinding a mixture of limestone and clay or limestone and shale.



**Figure 2-11** *Portland cement*

### **3. PROJECT METHODS AND PROCEDURE**

#### **3.1. Project Design**

##### **Nature**

Terrazzo is made by combining a cement base (sand, water, and cement) with a mixture of ground minerals - like marble, granite, and quartz - and can be applied to almost any surface,

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vertical or horizontal. The technique, produced using a completely hand-crafted method, was used worldwide in the construction of modern buildings and is noted for its durability, resistance (to water and abrasion), and easy maintenance. This made it a go-to material in the creation of flooring for houses and the common areas of residential and office buildings.

Today, terrazzo is experiencing a revival as one of the key trends in contemporary architecture. Here, we will discuss the whats and hows of terrazzo and illustrate some of its uses in current projects.

The proposed Terrazzo tile making machine is a simple and low-cost portable machine for making tiles. It has a mold box in which a hand-operated lever compresses a slightly moistened mixture of soil and cement or lime. They are easier to make than concrete blocks. They can be removed immediately from the press and stacked for curing without the use of a pallet. The number of tiles that can be produced per day is limited by the skill of the person work on the machine. Transportation costs are avoided since the machine is simply move and the tiles are made near the construction site. This project is low cost terrazzo machinery that is designed around readily available parts. It is simple design and its use of inexpensive although the material can be easily available components. The Terrazzo machine is reliable, easy to operate and transport place to place. Terrazzo machine so can be manufactured and repaired in our shop.

Terrazzo offers a wide range of aesthetic options based on the size, type, and color of stones used in the mixture as well as the type of finish used (polished or washed). Terrazzo is a type of facing that is molded in situ or "on site." This means that it is applied immediately to the desired surface. This can present challenges since, once applied, it's impossible to correct any flaws in the base layer.

## **Composition**

Terrazzo consists of a mortar made by mixing cement with ground marble. The mixture's exact composition depends on its use. For example, it's 50kg of cement to 80kg of marble for floors and 25:40:80 kg for walls (in this case lime is added). Color is added based on a project's specific requirements and it's possible to opt for different additives like sandstone, glass, and other stones. It's always a good idea to consult with suppliers about the properties of each mineral, especially regarding their resistance.

## **Installation**

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On top of the precautions that should be taken when installing the majority of facings found on the market today (an incline between surfaces, surface roughness, base adherence, a surface's impact resistance, a slope in a wet area or the flatness of a dry area) you should also consider the different processes involved when applying terrazzo to either floors or walls.

During production we have some particles of marbles and granite as waste, this waste material is very important for production of HCB. The one we produced the concrete block from these materials are load bearing for different construction sectors.

### **3.2. Types of data**

As we discussed the data is mainly focused on observational and as interview. As a result the data have both quantitatively which is in numeric percentile way and at the same time we try to have it in comparative way.

The main points during collection of data is checking the waste particles of terrazzo production and analyzing of concrete block production.

### **3.3. Sources of data**

Data related to our idea regarding the project concept of terrazzo production with HCB production on the same area are collected in different ways as, There are two sources of data- primary and secondary data sources. Am trying to have both sources.

- ✓ Direct personal investigation.
- ✓ The questionnaire filled by enumerators.
- ✓ journal articles that comment on or analyse research.

### **3.4. Data collection methods and tools**

We are using both primary and secondary data collection just to evaluate the production process of each material, HCB and terrazzo to know the ingredients and the waste material for each product.

Once the ingredients are gathered, their proportions need to be diligently calibrated in order to form concrete. The general mix ratio typically followed in standard concrete block manufacturing is 1:2:3 – 1 part cement, 2 parts sand, and 3 parts aggregate. Water acts as the catalyst for the cement so must be introduced to the mixture in a carefully calculated quantity.

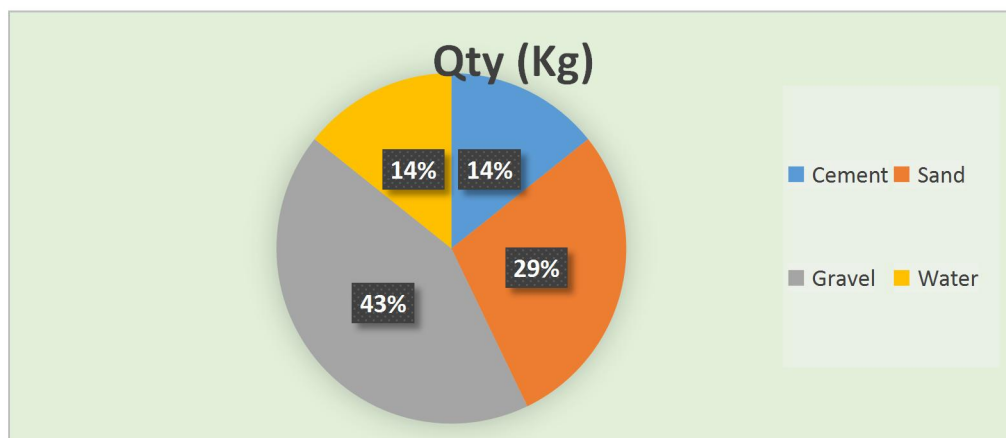
Consider the first step in the process of making a 100 concrete block: the mixture. If 50 kg of cement is used (that's roughly one bag), then we need to measure out 100 kg of sand (that's twice as much as the cement) and 150 kg of gravel materials (that's three times the amount of cement).

Material	Qty (Kg)	Cost (Birr)
Cement	50	900.00
Sand	100	30.00
Gravel	150	37.5
Water	50	20
other	–	10
<b>Total</b>	<b>350</b>	<b>997.5</b>

**Table 3-1 Composition Ratio of CB**

As we see from the above table 72% of concrete block in volume is aggregate (sand and Gravel), which covers 8% in cost ratio. So, this project aims to replace these gravel sand from the wastage of cement terrazzo tile production. To minimize cost for material , transportation cost and to have minimum time.

As we see from the table in normal condition we can produce 100 CB by ETB 997.5, means that each concrete block is costs almost only ETB10.



**Table 3-2 Proportional ratio of ingredients for CB production**

Contentious terrazzo is traditionally a mixture of 2:1 ratio of marble aggregate and cement (gray or white). For coloring, add iron oxide to the mix. Mix the materials thoroughly with water. The mix is then poured in within the specified panels and troweled to the



preferred height.



Figure 3-1 Gradients for terrazzo production

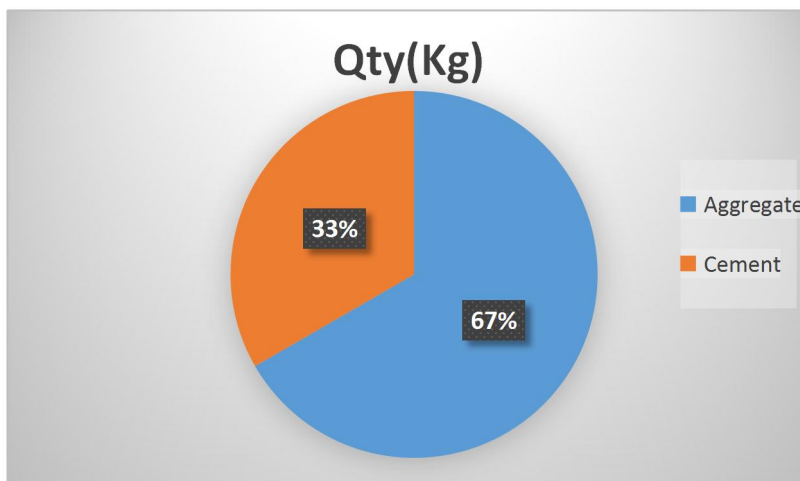


Table 3-3 Proportional ratio of ingredients for Terrazzo production

### 3.5. Population of the study

In Ethiopia there are a lot of production centre. Among we are selecting some companies which are around Addis Ababa and Bishoftu.

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### **3.6. Data analysis methods and tools**

We are organizing the data in two ways which are observation and interview. In Bishoftu there are a lot of production companies of concrete block and terrazzo tiles, among we trying to evaluate two for terrazzo tiles and two for concrete block.

First we are evaluating the ingredients for each materials and their proportions in the center.

### **3.7. Schedule**

This project is proposed financially for two years. The budget and time is concentrated regarding according to time schedule of the project.

### **3.8. Resource Budget**

Also the budget of a project is regarding the time schedule listed above.

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## References

- ✓ <https://startupback.com/concrete-block-making-business-plan/>
- ✓ <https://terrazzco.com/what-is-terrazzo/#:~:text=Cementitious%20terrazzo%20is%20traditionally%20a,troweled%20to%20the%20preferred%20height.>
- ✓ MOSAIC\_FACTORY\_Terrazzo\_tiles\_installation\_and\_maintenance\_instructions (pdf)