



EZ MOULD CONCRETE CUBE

- | | |
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POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

JUNE 2019 SESSION

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REPORT VERIFICATION

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APPRECIATION

Alhamdulillah, thank God with His grace and bounty, we can complete this final year project successfully. Highly the staff of Polytechnic Sultan Salahuddin Abdul Aziz for giving us the opportunity to do this project study as well as to deepen our deeper understanding of civil engineering, especially in general civil engineering courses.

We would also like to extend my thanks to our group supervisor, Mohd Zaidi Bin Abdul Hamid, for his advice and constructive opinions which give an encouragement to jointly work together to do this research. Without him, this project could not have been done smoothly and perfectly.

Various of the knowledge can be accomplish as we complete this task. In line with the paradigm shift in the era of globalization, the dominant role of the students, especially engineers in this country, is to discover the various civil engineering knowledge on this earth. Nowadays, various developments from all corners are so rapidly built, so is the development of engineering. Hence the students must belong to people who always compete with a great civilization of the times.

A big thanks to the lecturers that helps us at the Civil Engineering Department, Sultan Salahuddin Abdul Aziz Shah Polytechnic. The guidance and suggestions they have provided help us from all aspects of the project. We also thank our parents, family members and friends for all the encouragement they have given us. We hope that this study will bring a positive impact on the society and can be used by many parties. Thank you.

ABSTRACT

Mould concrete cube is a widely used equipment in educational institutions, testing laboratories and construction sites. This equipment is used to form specimens for concrete compressive strength testing. They can also be used as sample containers in the determination of mortar set times as indicated in ASTM C403 and AASHTO T 197. The mould cube test For example, in terms of the number of mould cube test that work, maintenance management, and the right way of use. This cube test uses solid iron, 2 clips ,bolt and nuts as well as a plate of cube test. In our project assignment, would like to combine or change the used of bolt and nuts and thinks of wall the mould cube test. Additionally, this product will be centered on the cube test. The name of the project i want to generate is "EASY MOULD". This "EASY MOULD " will simplify the work and save time users of the mould cube test. Users no longer need to set the tool to the center as the problem has been resolved by the result of this product. Additionally, this product will give more precision than ever before. This is due to the fact that the accuracy of the product's tool points previously depends on the way the mould users are installed. Any errors are likely to occur. After the mix is ready to be tested, we need the cube mould to run the experiment to determine the time taken of the mould concrete cube. That is very important because the mixture of concrete must be placed in a special mould cube for testing. Thus, it cannot be used the non properly mould for compression test or any other test about the concrete.

ABSTRAK

Kubus konkrit acuan (Mould Concrete Cube) adalah peralatan yang digunakan secara meluas dalam institusi pendidikan, ujian makmal dan tapak pembinaan. Peralatan ini digunakan untuk membentuk spesimen untuk ujian kekuatan mampatan konkrit. Mereka juga boleh digunakan sebagai bekas sampel dalam penentuan masa set mortar seperti yang ditunjukkan dalam ujian ASTM C403 dan AASHTO T 197. Ujian kiub acuan Sebagai contoh, dari segi ujian kiub acuan yang berfungsi, pengurusan penyelenggaraan, dan hak cara penggunaan. Ujian kiub ini menggunakan besi pepejal, 2 klip, bolt dan kacang serta plat ujian kiub. Dalam tugas projek kami, ia akan menjadi seperti menggabungkan atau mengubah penggunaan bolt dan kacang dan berfikir dinding ujian kiub acuan. Di samping itu, produk ini akan berpusat pada ujian kiub. Nama projek yang ingin saya hasilkan ialah "EZ MOULD CONCRETE CUBE". "EZ MOULD CONCRETE CUBE" ini akan memudahkan kerja dan menjimatkan masa pengguna uji kiub acuan. Pengguna tidak lagi perlu menetapkan alat tersebut ke pusat kerana masalah telah diselesaikan oleh hasil produk ini. Di samping itu, produk ini akan memberi lebih ketepatan berbanding sebelum ini. Ini disebabkan fakta bahawa ketepatan mata alat produk sebelum ini bergantung kepada cara pengguna acuan dipasang. Sebarang kesilapan mungkin berlaku. Selepas campuran siap untuk diuji, memerlukan acuan kiub untuk menjalankan eksperimen untuk menentukan kekuatan ujian kiub. Itu adalah sangat penting kerana campuran konkrit mesti diletakkan di dalam kiub acuan khas untuk ujian. Oleh itu, ia tidak boleh digunakan sebagai acuan yang tidak betul untuk ujian mampatan atau sebarang ujian lain mengenai konkrit.

CHAPTER 1

PRELUDE

1.1.Introduction

In the construction industries, concrete testing is the familiar thing to do before further work. This is because the testing is very important specially to maintaining a structure so it can be used for a long time period. There are many tests that are done with the concrete, such as slump test, cube test and etc. And for the cube test, the standard size of cube is 150 mm.

Cubes of 100 mm size are not suitable for concrete having a nominal maximum aggregate size exceeding 20 mm. Cubes of 150 mm size are not suitable for concrete having a nominal maximum aggregate size exceeding 40 mm.

The mould for the specimens must be made of cast iron or cast steel. The inside faces must be machined plane. The cube mould is normally made in two halves to facilitate removal of the concrete cube without damage. Each mould has a base,

which is a separate metal plate, preferably fastened to the mould by clamps or springs. When assembled, all the internal angles of the mould must be right angles.

To comply with CS 1:1990, mould are required to be within specified tolerances for dimensions, squareness and parallelism. These are covered in Section 7 of CS 1 Tolerances. The tolerances stated in various sections of this Standard shall be interpreted as follows:

Squareness. Where a surface is specified as having a squareness tolerance relative to another surface, it shall lie between two parallel planes perpendicular to the reference surface. The perpendicular distance between the planes is the squareness tolerance quoted. Where a surface is specified as having a squareness tolerance relative to a datum line

(The axis of a cylinder), it shall lie between parallel planes perpendicular to the datum line. The perpendicular distance between the two planes shall be the squareness tolerance quoted.

Parallelism. Where a surface is specified as having a parallelism tolerance relative to another surface, it shall lie between two planes parallel to the reference surface. The perpendicular distance between the planes shall be the parallelism tolerance quoted.

1.2. Background Research

As we all know, all polytechnics in Malaysia have laboratory subject that need the student to do some experiment and test. The student only has 3 hours to complete such task. The equipment that being used in the laboratory play an important role which is in time. Sometimes student cannot do the test and

experiment within the time period because some of the tools are missing or take a long time to set up.

For this project we just focusing on the cube test as we can see the equipment sometimes are damages or the component going missing. The purpose of the project is to make it easier, faster and user-friendly. We also want to reduce the component from missing. Our project is basically redesigning the previous cube test mould that just using clip instead of using nut and bolt. From the new mould the student can save time or they can do another experiment and test in just a short period of time.

1.3. Problem Statement

As we all know, every educational institution has its own concrete workshop facility. However, there are various advantages and disadvantages of each. The closest example is our own polytechnic, Polytechnic Sultan Salahuddin Abdul Aziz Shah (PSA) where the concrete workshops in PSA are not well maintained and old.

With this problem, it affects the care and use of mould cube test tool equipment which causes high cost. The reason is that the mould bolt and nut are easy to lose and the fixer easily breaks so that is too much to be repaired and maintained.

This is because, each bolt and nut are stored in containers mixed with each other with different types of conditions. This makes the bolt and the nuts when wishing to use has caused difficulty in conformity to the type of mould.

The next problem is, complicated in the conversion of the tool holder and wall of the mould cube test because it takes a long time to install because the components need to be removed one by one. With this, it requires a skillful operator in handling of mould cube test and thus complicates the student learning process.

It also takes a long time to set the middle because the process is very thorough. Then, this may result in the learning and teaching of students and lecturers disrupted and need a longer time division for the cube test.

The existing mould is quite heavier than the 'ez mould' which is around 17 kilogram. This is because it used a high thickness for the wall and also the base. So it is difficult to handle for student thus, it can damaged the storage area because they can not accommodate.

Among in the laboratory visits, we noticed that the closet was very mess because the plate of the wall requires a condusive storage space. And also, most of the embankment at the plate of the wall are broke eventhough they are so tiny but it can help to run the experiment easily.

1.4. Research Objectives

From the problem statement ,the objectives that i have emphasized on the success of this project are we want to produce a major motif tool to facilitate that easy to do the compaction test using the cube test. From the objective:

- I. To produce a friendly user mould.

The easily handler mould cube test can make giving students the pleasure to do cube test work and to understand in-depth on cube tests II. To reduce the thickness of the wall

To change the 4 slide of wall to L shape that can need the small storage or place.

- III. To create a mould with a clip to install

We are aiming for the time allocated for a new mould to be faster than the old mould.

IV. To save time especially in student learning and teaching

Save time to do the other learning and teaching

1.5 Research Question

The hypothesis to be tested in this study are:

- i) Why are the students taking more time on this task than the other task?
- ii) When, during the laboratory course, students taking more times and energy to complete the task also how can we prevent this?
- iii) What are some of the environment factors occurred to students when complete the task?

From that it is the new mould cube test that we can produce give the giving students the right to learn and to do the test work correctly. The mould storage in the lab is very unsuitable.

1.6. Research Scope

As a student of Civil Engineering at Polytechnic Sultan Salahuddin Abdul Aziz Shah, our scope of study is focused on concrete at laboratory Polytechnic Sultan Salahuddin Abdul Aziz Shah and laboratory or any other polytechnics and universities laboratory, the use of this product also follows the type and size of the tool used today which consists of compaction test or other test. we are aiming for this mould cube test for students only. It may not be suitable for use on site but can be used too. This cube test is intended for long-term use. This is because it allows the durability and durability of equipment and structures in the lab, especially concrete laboratory in the long term.

This research also focuses on the use of student learning and teaching about the Civil Engineering course. Then, through the creation of this new mould cube test is stipulated by the learning and teaching of students and lecturers in which to deliver the process smoothly and has the advantage gained by the students and lecturers throughout the use of this new mould cube test.

Study of speed of installation of mould and ensure the same original condition of the cubes by using this easy mould. We will make timing tests between new and old molds. This can provide effective use of the mould. In this case, the mould cube test is installed quickly to affect the learning and teaching of students and lecturers themselves. Then, the mould conditions are also taken into account through the manufacture of the moulds operated during the mould cube was installed. Where the cube should remain in the x length x width x height of 150mm x 150mm x 150mm.

Lastly, the estimated total cost is not less than RM 1000. With this cost because of the cost we are targeting and from discussions with the workshop for the

production of this mould cube test. This product requires high cost as the mould cube test is made of solid iron. For one piece of solid iron is priced at RM 12 according to the estimates workshop. The manufacture of mould cube test can not use other iron as aluminium, zinc or copper.

1.7 Important of Study

The findings of this study will redound to the benefit of easy mould concrete cube can solve the problems and the flaw of the products. The greater demand for graduates with civil engineering background justifies the need for effective lifechanging products approaches. Thus, Polytechnic that apply the easy mould concrete cube approach from the result of this study will be able to save time for students and lectures. This is because it is easy to handle and assemble.

It is more easier to use than using bolt and nut. Usually, it takes 2 person to lift the mould. This happened because the weight of the existed mould is more 15kg and quite high for females students. This will taking more energy for them to complete the task and might difficult to females students. This is why, we produced a friendly-user so that every gender can use it easily.

1.8 Summary of Chapter

We have analyzed the whole of the chapter 1 of our product or project is. Several factors show that. A language of the last chapters is significantly different from the writing style at the beginning of the book, the plot changes throughout the

story taking new directions, and there are no slang words closer to the end while they appear frequently at the beginning.

Every existence or creation of a new product or project needs to have a problem to be solved. At the same time, the objective of each project or product must be achieved. An example is where we make easy molds based on learning and teaching for lecturers and students in all concrete labs. Now withstanding, this is because the product is within the scope of the set and cost estimates are estimated based on the opinion of the workshop. Therefore, the product or project that we present has strong and solid support from the workshop.

Under that situation, the importance of implementing this product or project is also very helpful in restoring the circumstances and structure of our learning as a student. This allows us to find and deal with the problem with as much as possible.

CHAPTER 2

LITERATURE RESEARCH

2.1 Chapter Introduction

In this chapter, a research need to be conduct before doing improvement and changes on the existing. It help a lots when we have the references about method, materials, types and the standard in construction. It helps us to know more and also identify the concept and theory of the mould. In literature review, we basically to recap the information about existing mould. We also can check the the test from previous data and to study the test that have been done. We can also check for the needed standard for the mould before it can be use for any testing.

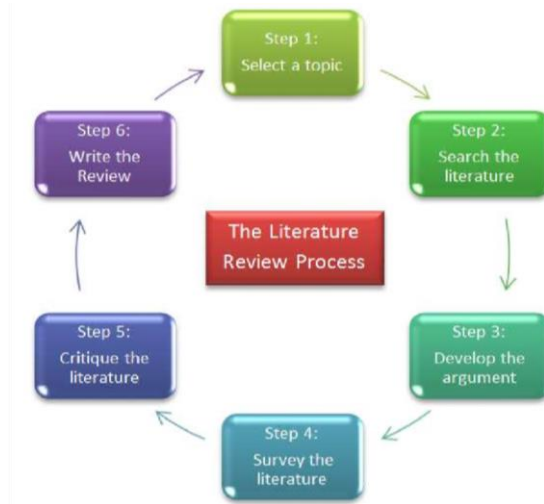


Figure 2.1: The Example Of Main Mapping Of Literature Review

2.2. Concept or Theory

The concept or theory that we can get from the project is what is the definition the mould cube test for my project. The mould cube test is the cubes of 100 mm size are not suitable for concrete having a nominal maximum aggregate size exceeding 20 mm. The cubes of 150 mm size are not suitable for concrete having a nominal maximum aggregate size exceeding 40 mm.

Hence, the moulds for the specimens must be made of cast iron or cast steel. The inside faces must be machined plane. The cube mould is normally made in two halves to facilitate removal of the concrete cube without damage. Each mould has a base, which is a separate metal plate, preferably fastened to the mould by clamps or springs. When assembled, all the internal angles of the mould must be right angles.

More effective, about the mould cube test is preparing the moulds. First thing first that before assembling the moulds, make sure that there is no hardened mortar or dirt on the faces of the flange that prevent the sections from fitting together

closely. To be sure, these faces must be thinly coated with mould oil to prevent leakage during filling, and a similar oil film should be provided between the contact surfaces of the bottom of the mould and the base. The inside of the mould must also be oiled to prevent the concrete from sticking to it. The two sections must be bolted firmly together, and the moulds held down firmly on the base plates.

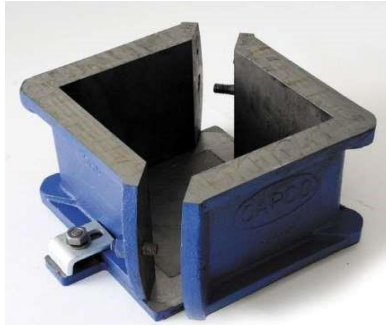


Figure 2.2 :The Example Image Of Mould

2.3 Materials

2.3.1 Cast Iron

Cast iron, an alloy of iron that contains 2 to 4 percent carbon, along with varying amounts of silicon and manganese and traces of impurities such as sulfur and phosphorus. It is made by reducing iron ore in a blast furnace. The liquid iron is cast, or poured and hardened, into crude ingots called pigs, and the pigs are subsequently remelted along with scrap and alloying elements in cupola furnaces and recast into molds for producing a variety of products.

The Chinese produced cast iron as early as the 6th century BC, and it was produced sporadically in Europe by the 14th century. It was introduced into England about 1500; the first ironworks in America were established on the James

River, Virginia, in 1619. During the 18th and 19th centuries, cast iron was a cheaper engineering material than wrought iron because it did not require intensive refining and working with hammers, but it was more brittle and inferior in tensile strength. Nevertheless, its load-bearing strength made it the first important structural metal, and it was used in some of the earliest skyscrapers. In the 20th century, steel replaced cast iron in construction, but cast iron continues to have many industrial applications.

Most cast iron is either so-called gray iron or white iron, the colours shown by fracture. Gray iron contains more silicon and is less hard and more machinable than is white iron. Both are brittle, but a malleable cast iron produced by a prolonged heat treatment was developed in France in the 18th century, and a cast iron that is ductile as cast was invented in the United States and Britain in 1948. Such ductile irons now constitute a major family of metals that are widely used for gears, dies, automobile crankshafts, and many other machine parts.

(Darshana Das, 29 April 2013)



Figure 2.3 : The Example Of Cast Iron

2.3.2 Alloy

Alloy, metallic substance composed of two or more elements, as either a compound or a solution. The components of alloys are ordinarily themselves metals, though carbon, a nonmetal, is an essential constituent of steel.

Alloys are usually produced by melting the mixture of ingredients. The value of alloys was discovered in very ancient times; brass (copper and zinc) and bronze (copper and tin) were especially important. Today, the most important are the alloy steels, broadly defined as steels containing significant amounts of elements other than iron and carbon. The principal alloying elements for steel are chromium, nickel, manganese, molybdenum, silicon, tungsten, vanadium, and boron. Alloy steels have a wide range of special properties, such as hardness, toughness, corrosion resistance, magnetizability, and ductility. Nonferrous alloys, mainly copper–nickel, bronze, and aluminum alloys, are much used in coinage. The distinction between an alloying metal and an impurity is sometimes subtle; in aluminum, for example, silicon may be considered an impurity or a valuable component, depending on the application, because silicon adds strength though it reduces corrosion resistance.

(Gloria Lotha, 12 July 2019)

2.3.3 Mild Steel

Mild steel is one of the most commonly used construction materials. It is very strong and can be made from readily available natural materials. It is known as mild steel because of its relatively low carbon content.

Mild steel is very strong due to the low amount of carbon it contains. In materials science, strength is a complicated term. Mild steel has a high resistance to breakage. Mild steel, as opposed to higher carbon steels, is quite malleable, even when cold. This means it has high tensile and impact strength. Higher carbon steels usually shatter or crack under stress, while mild steel bends or deforms.

It takes on a nice finish and is polishable. However, it cannot be hardened through heat treatment processes, as higher carbon steels can. This is not entirely a bad thing, because harder steels are not as strong, making them a poor choice for construction projects.

(14 March 2018 By David Scott)

2..4 Types of Mould

2.4.1 Cube Mould (150mmx150mm x 150mm)

The actual cube test that I use is the cube mould 150mmx150mm is the ideal size for cube making.If the cube is too big, handling will be difficult because the cube test have the specific weight which makes it heavier or lighter. As the test cube is made larger, it will negate the effects of anisotropy. Briefly, having the maximum weight of 8kg to 1 kg. Therefore, type molds have the energy and careful installation.



Figure 2.4.1: The Example Of Cube Mould With Length X Width X Height(150mm X 150mm X 150mm)

2.4.2 Cube Mould (50mmx50mmx50mm)

For this value not similar to the standard value obtained by the 150mm cubes. This cube had the same design of the cube with length x weight x height (150mm x 150mm x 150mm) but the difference is about its actual length x width x height that (50mm x 50mm x 50mm). From that the size of specimen has an effect on the standard strength.



Figure 2.4.2 : Test With The Weight, Length And Width Is (50mmX50mmX50mm)

2.4.3 Cylinder Mould (Diameter 100mm)

For this cube about the cylindrical specimen will be formed perfect & with good roundness when forming specimen, there is no concrete leakage. This is very perfectly to do the compression test. Accordingly, it is very suitable to do the compression test for the concrete because the mold still keeps good roundness after long time using. In the meantime, the cylinder mold is durable for long-term use that we want to do the test although how long for example 7 days, 21 days or 27 days. Lastly, the surface of the base plate is very flat and smooth. So that you can make the compression of the concrete well and orderly. It can also produce a beautiful concrete specimen.



Figure 2.4.3: This Is The Example An Image Of The Cylinder Mould

2.5 Summary Of Chapter

From this chapter, we can conclude that the literature review from the previous data are very helpful in making new type or design of mould. From this sight, we are able to catch up the needed standard for the mould before it is suitable for testing. Every aspect is in need to be standardized with ASTM, BS, or CS.

CHAPTER 3

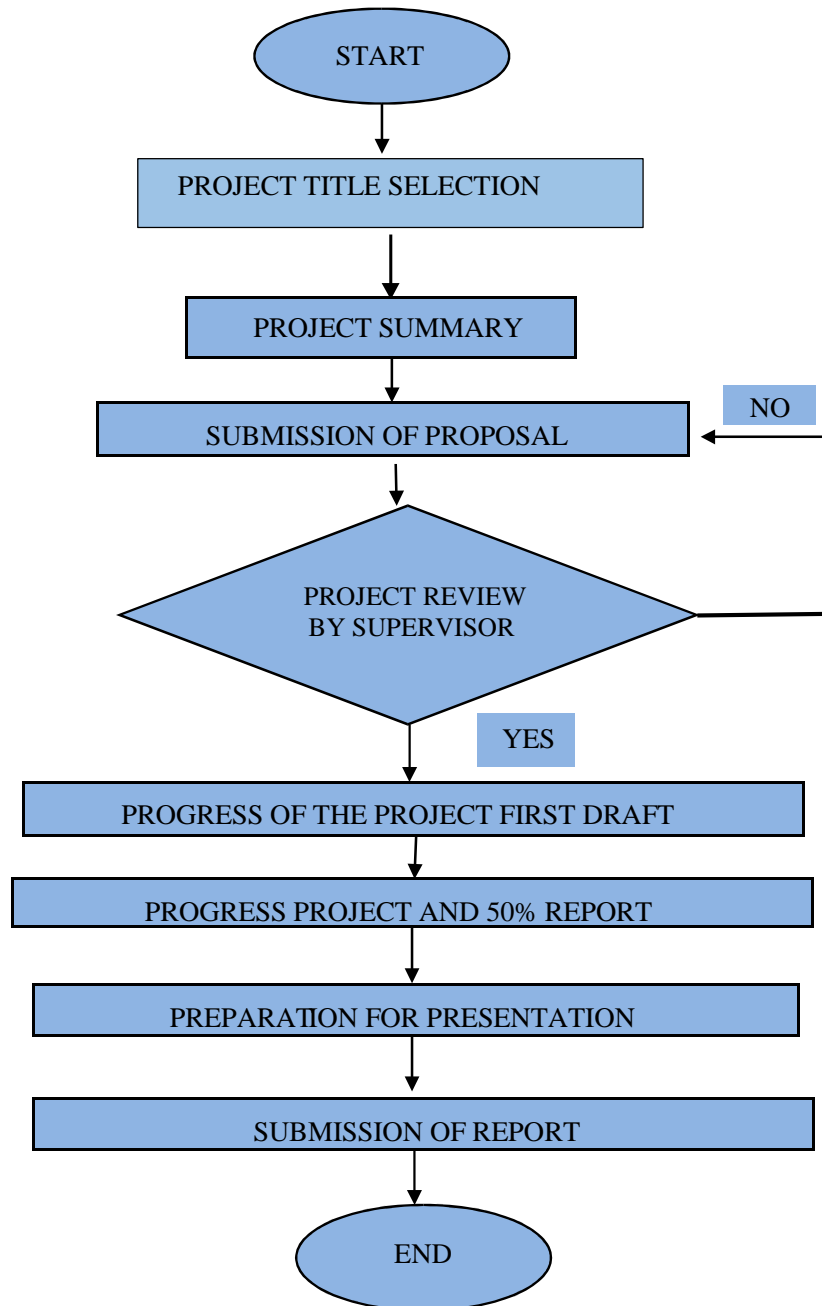
METHODOLOGY RESEARCH

3.1. Chapter Introduction

This chapter is to identify the needed method of the mould in matters of designing, materializing and changing. And for this project, we conduct a project about cube test mould. The idea is to make sure that the new design of cube test mould will be easier & faster to assemble and prevent the assemble component of the mould from missing. The previous mould basically plates that being assembled to make a cube and need to be attach with nut & bolt. so, for the new mould design, we will change the use of nut & bolt with clip that is welded to the plate itself. the plate also changes to two "L" shape plates with 90 degrees angle.

For this new design mould, we using the concept of 1 between wall of mould cube test. So, we do not need many iron plates to be carried out that make it hard to handle. Next, using the concept of the embankment at the bottom to connect between the cube test part and the base. It will make it static and cannot move when the concrete is poured. We also use clips that is welded to the "L" plates itself. The estimated thickness for the plates will be around 5 - 10 mm. Since we use cast iron for the plates and clips to attach it. The thickness is not matter as the cast iron is strong and durable enough. From the figure above, it is the (150 x 150 x 150 mm).

3.1.1 Flow Chart Plan of Project



3.2.DESIGN OF MOULD CUBE TEST:

The mould cube test is using the concept of L between wall of mould cube test. That means I have changed the old mold cube design design consisting of 4 moulded walls which separated from each other. So have used the concept where every 2 pieces of the mould wall have been implied. This can prevent the imbalance of the jenin-type of mold when arranged for storage. The width, length and the height are same with the old mould which is 150mm x 150mm x 150mm for the inside dimensions. But from the outside dimensions are different which is 216mm x 216mm x 170mm.

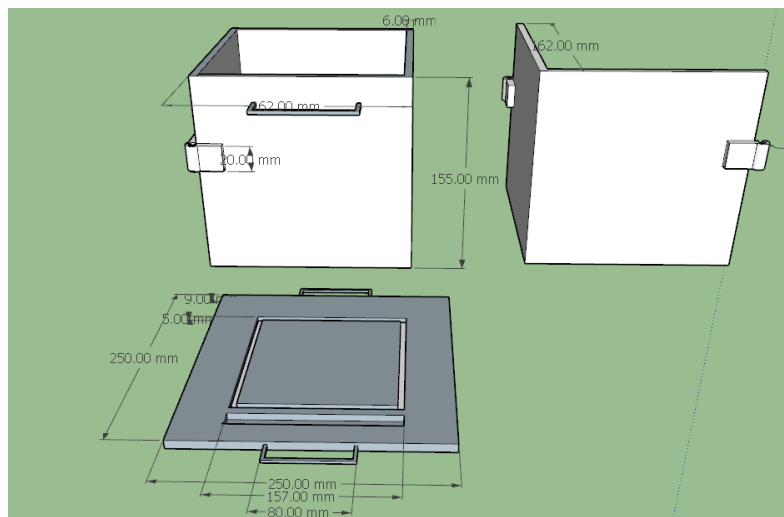


Figure 3.2.1 :The Plan View

Equally important design of the mould is using the concept of the embankment(tanggap) at the bottom to connect between the cube test part and the base. From that, the continuity between the presence of the underside is to provide a stronger and stronger wall-ding ring molding with a layer plate below. Moreover, each adjoining length of x width is 26 mm x 13mm. Each place is divided into two places per each wall of the mould.

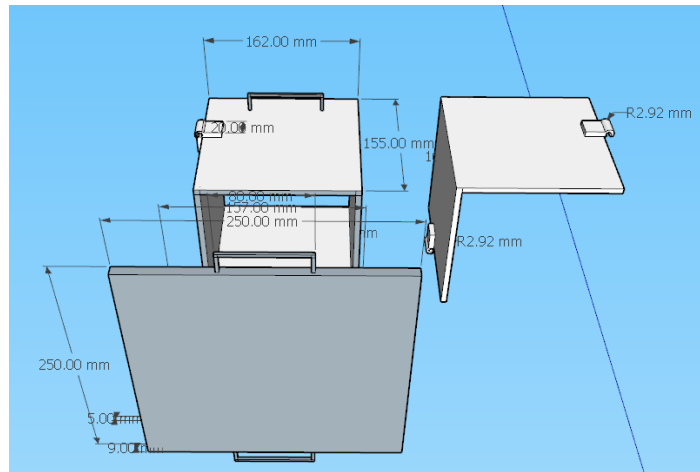


Figure 3.2.2 :The Bottom View

It is very easy and not easy to lose for the bolts, nuts or screws. The installation of this door latch or clip requires only 2 clips. This is because for the mold it requires 4 bolts, nuts or screws. This can save you the cost of buying the clip or the door bolt and does not require a conducive place for storage.

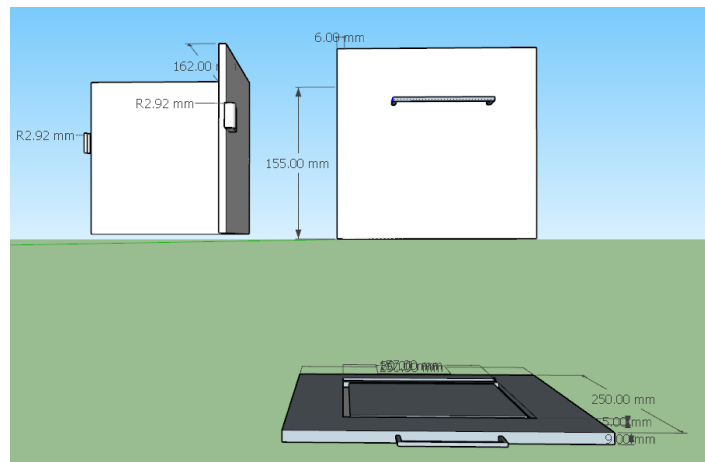


Figure 3.2.3 :The Side View

The size of thickness of the wall is 10mm for outside wall, but maintain the thinnest of inside of a wall or the inside dimensions..The tick just only 10mm but that thick can also accommodate compression when done. It is very important to know the clip or door latch that is suitable to match the thickness of the wall mold cube test.

We do the design with maintain the same of number of wall of mould,that is because because to make a test cube should have a 150mm x 150mm x 150mm count in the inside dimensions.

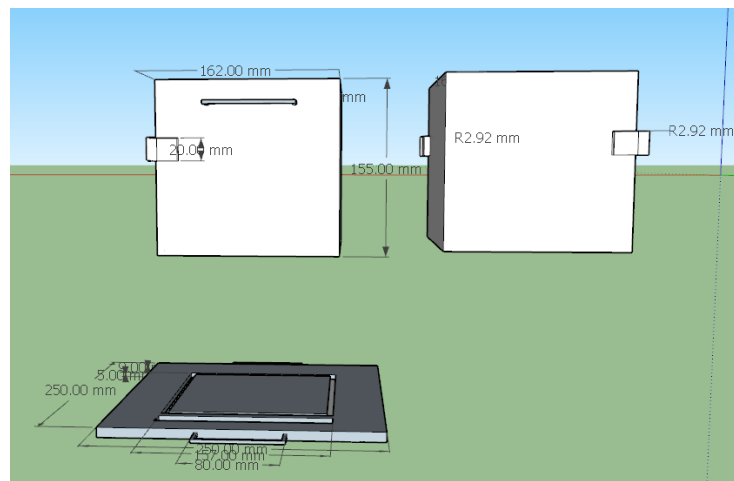


Figure 3.2.4 :The Elevation View

3.3.TOOLS AND MATERIAL USED

The main tools that we used for making the new this mold cube test is L-square. “L” square the “L” square is one of the most basic of the pattern making rulers. Function this ruler helps to create accurate 90° angles and straight edges.



Figure 3.3.1 :The L-Square

We used the grinder & cutting disk. An angle grinder, also known as a side grinder or disc grinder, is a handheld in grinding (abrasive cutting) and polishing. Although developed originally as tools for rigid abrasive discs, the availability of an interchangeable power source has encouraged their use with a wide variety of cutters and attachments.



Figure 3.3.2 : The Grinder And Cutting Disk

Welding is distinct from lower temperature metal-joining techniques such as brazing and soldering, which do not melt the base metal. For this project the responsible party must wear welding set (including welding rod, glove, mask and hammer). This is because the work exposes to danger.



Figure 3.3.3 :The Welding Machines

3.4 Method of Collecting Data

When the mould is ready, we need to run a test to collect data, the new mould and the existing one will be tested for its applicable time for it to be install. We also will make some student to use it and compared it with the existing mould. From the testing, if the result come in good shape, the data that will be recorded based on its efficiency and effectiveness compared to the existing mould.

3.7.CONCLUSION OF CHAPTER

For the conclusion that we can take is every project or product must have their own flow to make it successful. Make sure that each of our proposed and planned procedures is in line with the actual work and function of the project against the people around us.

Every tool and material must be listed according to the required specifications. Therefore, we can see how a project or product process can be successfully carried out. Furthermore, each of these methodological studies should have a solid foundation of what to do with the stages that have been determined.

Other than that, research of the product comprises defining problems, formulating hypothesis or suggested, collecting, organizing and evaluating data, making deductions and reaching conclusions and at last testing the conclusions to determine whether they fit the formulating hypothesis.

Lastly, the manipulations of things and concept and also of the problem statement to generalising to extend of objective and do more of theory problem solving or in the practice of an part of knowledge.

CHAPTER 4

RESULT AND DATA

4.1 Chapter Introduction.

	Existing Mould	Ez mould
Weight	14.14kg	8.54kg
PERCENTAGE OF WEIGHT DIFFERENCES	60.40%	

Table 4.1.1 : Weight And Time Taken

From the table,its shown different average for the male and female,but we conclude that the product save more weight than the existing mould.Around 60.40% half of 50% we expected.This is because we were reduce the thickness of the outer wall of the mold and at the same time give the effect of the weight of the mold. From the research that has been carried out based on the design of which some data can be produced that are:

1)Thickness

NO	DESIGN	THICKNESS
1	EXISTING DESIGN	25 MM
2	DESIGN 1	WALL(10 MM) PLATE(10 MM)
3	DESIGN 2	WALL(6 MM)
4	DESIGN 3 (FINAL DESIGN)	WALL(6 MM) BASE PLATE (9 MM)

Table 4.1.2 :Thickness of Design

From the table,its shown different of the thinckness that we conclude every plate and wall in every design.The final design that we set the thickness was 6mm tthickness of wall and 9mm to the thickness of the plate.

2)Time Taken For Installation

	MALE STUDENT			FEMALE STUDENT		
TEST	1	2	3	1	2	3
EXISTING MOULD (SECOND)	150	120	160	200	180	210
EZ MOULD (SECOND)	25	21	30	35	32	40
PERCENTAGE OF TIME REDUCE	83.3%	82.5%	81.3%	82.5%	82.2%	81.0%
AVERAGE OF PERCENTAGE OF TIME REDUCES	82.4%			81.9%		

Table 4.1.3 :Avarage Of Time Installation

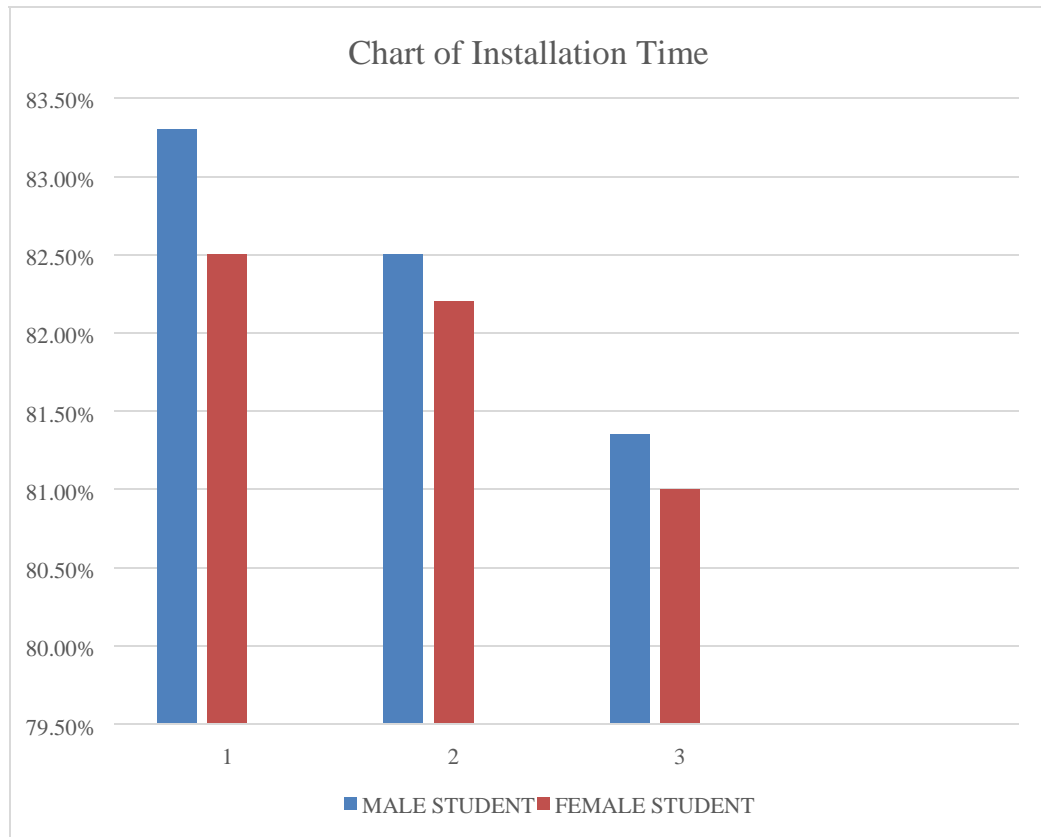


Chart 4.1.1 :Chart Of Time Open

The table shows the time taken of installation of existing mould and Ez mould. The existing mould that conduct for male student had the percentage of time reduce around in test 1 83.3% then test 2 is 82.5% and test 3 is 81.3%. Meanwhile for the Ez mould concrete cube was handle by female student for test 1 is 82.5% then for test 2 is 82.2% and test 3 is 81.0%. So, we conclude that the average of percentage handle by male student is 82.45% and for the handle by female student is 81.9%. That the time taken of installation open was over than we expected in 50%.

3)Time Taken For Open

	MALE STUDENT			FEMALE STUDENT		
TEST	1	2	3	1	2	3
EXISTING MOULD	97 SEC	90 SEC	95 SEC	115 SEC	106 SEC	99 SEC
EZ MOULD	41 SEC	31 SEC	38 SEC	50 SEC	48 SEC	45 SEC
PERCENTAGE OF TIME REDUCE %	57.7%	62.2%	60.0%	56.5%	54.7%	54.5%
AVERAGE PERCENTAGE %	60.0 %			55.2%		

Table 4.1.4 :Average Of Time Open

The table shows the time taken of open of existing mould and Ez mould. The existing mould had the percentage of time reduce around in test 1,2, and 3 is 57.7%,62.2% and 60.0%. Meanwhile for the Ez mould concrete cube is 56.5%,5.7% and 54.5% for test 1, 2 and 3. So, we conclude that the average of percentage is 60.0% for the existing mould and for the Ez mould concrete cube is 55.2%. That the time taken of installation open was over than we expected in 50%.

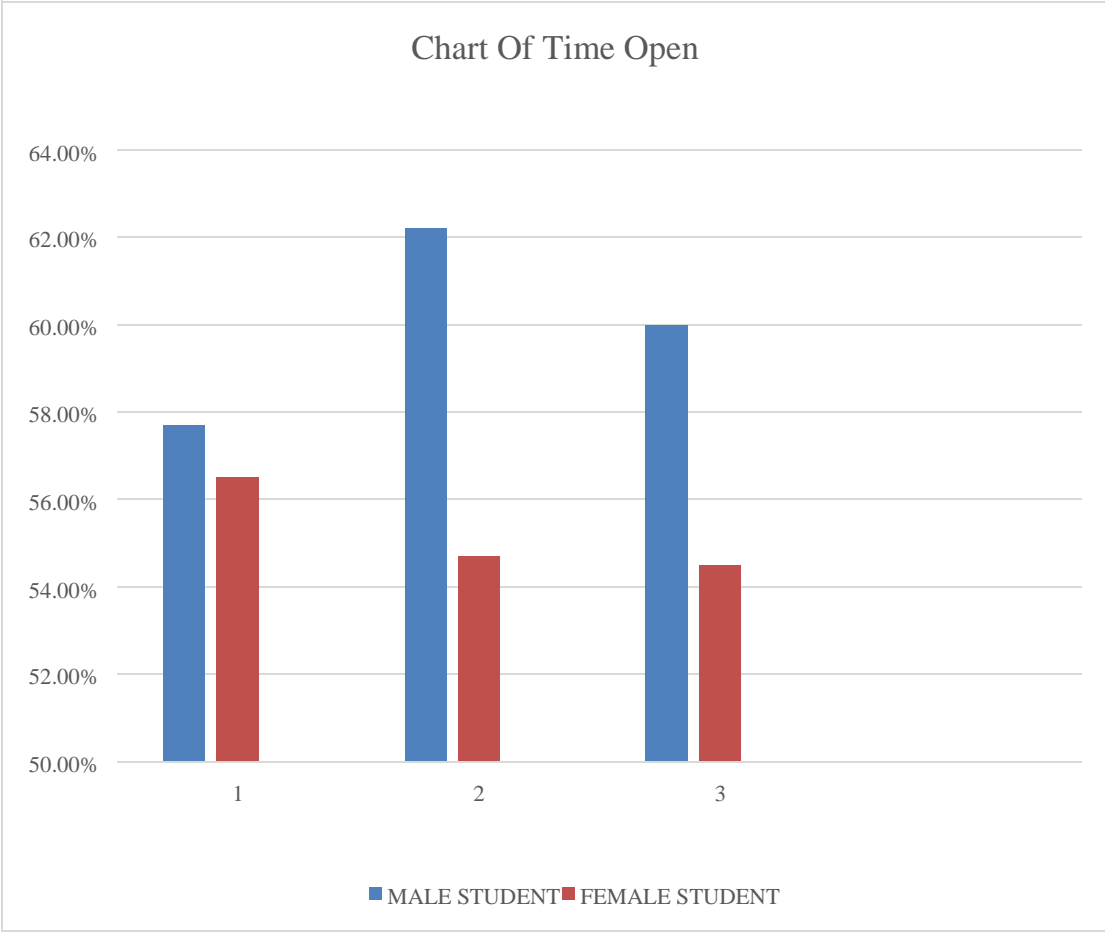


Chart 4.1.2 :Chart Of Time Open

From the table and chart ,its shows different average for the male and female did the installation and open of existing mould and Ez mould.We conclude that the our product save more time than the existing mould in about 23.33 or 76.67%.We were expected around 50% that we can achieved.

4.2 Conclusion

The data has been show that the EZ Mould Concrete Cube has the most indicates that the fastening of installing and open the mould concrete cube. This is because there is a clip that replaces the bolts and bolts. and convenient as it weighs less than 10 kg between the two concrete cube moulds.

CHAPTER 5

DISCUSSION AND CONCLUSIONS

5.1 Chapter Introduction

From this chapter, it clarified on the conclusion that can be made from the project that we have done. The process of making the product are actually really complicated as we find many flaw and obstacle, before we have done making it. Many researches have been done before we executed the EZ Mould Concrete Cube project. Further knowledge about the standard size, function and the requirements are needed as it need to be applied on the project. The skills that we have learn from the past semester help us to run the project smoothly even when we collide with obstacles. Last but not least, this project helps us to be creative and innovative as it come out with many ideas before we can proceed with the final project.

5.2 Discussion

Based on the project we have done this says that we have changed it from its original shape to its thickness. The original thickness of 25 mm has been changed to 6mm, so 24% of the amount has been used. Secondly, in terms of weight. Weight can be reduced by the original weight of existing mold is 14.14 kg to 8.56 kg. Printable weight is 60.40%. % for installation while 70.83% for opening mold of the test cube. From the test we did it at the same time we run the test at the same time as both existing mold and ez mold concrete cube which is at 12 noon to 12.20pm.

Another factor that can be attributed is the strength of manpower for the installation and opening of both molds. And also of the gender factor is that we only do it with one gender.

5.3 Recommendation

After finish all of the investigation and innovation, we believe that the rate of effectiveness of ez mould concrete cube should be commercial to the industry and institute so that it can increase the quality of learning and teaching period.

Other than that, we also hope that there will be any agencies or company can continue and detailing more about this product. This is because, ez mould concrete cube more better than the existed mould. More user friendly which is light, and usable.

Moreover, we hope that any company would like to make a investigation about the advantages and disadvantages of cube mould in our industry. From that, we can differentiate and comparing before and after using the mould.

The results of this study are intended to serve as a guide for other researchers in the implementation of concrete mold innovation. From our observations, too, we have found that clips are the best material to prevent the loss of any material that has not been disclosed by any researcher. we also look forward to more research on other materials to facilitate our users and effective workforce in the future.

5.4 Conclusion

Overall, eventhough this study has some disadvantages such as its imperfection design in all aspects such as clip, base plate thickness, wall plate thickness which is may not be appropriate. However, this pioneering pilot study may be a step forward in future studies of this concrete cube mould innovation.

This studies require a more detailed study of welding to obtain the best results to ensure it works and provides the perfect concrete sample. In fact, this product needs to be improved to achieve satisfactory results to achieve the objective of the study. However, we managed to produce this product using the same material as the existing mould. In addition, we have tested the effectiveness of this ‘ez mould’ and it has proven that no water leaks from the concrete mix come out. This is because at the existing mould, water leaks happened. In addition, we were able to reduce the weight of this mould by 60.40%.

Therefore, overall of our product meets our objectives of reducing weight, accelerating installation time and also user-friendly products. Comparison before and after use can prove the effectiveness of the products we produced.

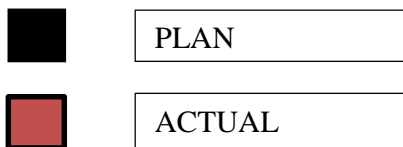
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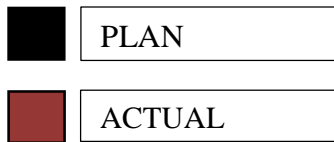
APPENDIX
 GANTT CHART
 SEMESTER 4

Activity	Weeks																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	semester break
Make a group	PLAN	ACTUAL															
Briefing and plan topic	PLAN	PLAN	ACTUAL	ACTUAL													
Submission of project title		PLAN	PLAN	ACTUAL	ACTUAL												
Meeting with supervisor		PLAN	PLAN	PLAN	PLAN	PLAN											
Submission of proposal					PLAN	PLAN	ACTUAL	ACTUAL									
Discussion					PLAN	PLAN	ACTUAL	ACTUAL									
Defence project						PLAN	PLAN	ACTUAL	ACTUAL								
Draft report, slide, chapter 1							PLAN	PLAN	PLAN	PLAN	ACTUAL	ACTUAL					
Draft report, slide, chapter q2,3											PLAN	PLAN	PLAN	ACTUAL	ACTUAL		
Presentation															PLAN	PLAN	
															ACTUAL	ACTUAL	



SEMESTER 5

Activity \ Weeks	Weeks																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	semester break
Meeting with supervisor	1																
Start the project	1	2	3	4													
Finish the project				4	5												
Testing						6											
Presentation project 1							7										
Presentation project 2															14		
PITEX																15	



ATTACHMENT

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