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**TAJUK PROJEK: LIGHTWEIGHT WALL PANEL BY USING PLASTIC BOTTLES**

**JABATAN: JABATAN KEJURUTERAAN AWAM**

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## **LIGHTWEIGHT WALL PANEL BY USING PLASTIC BOTTLES**

### **a) INTRODUCTION**

The lightweight concrete panel was constructed by using polystyrene. The natural aggregate and crush sand were replaced by polystyrene at the level of 40% and 10% by volume respectively. Lately, recycled plastic was encouraged as a material which was being introduced in line with the 'waste to wealth' strategy supporting eco-engineering. In Malaysia, plastic waste amounts to be about 24% of the domestic waste that is sent into landfill.

Wall is one component of building structure that is generally made of bricks, concrete blocks, concrete panels, wood boards, plywood and gypsum. The use of brick, concrete brick and concrete walls will produce large self-weight of wall resulting in large building's dead weight. The use of lighter wall materials is more desirable to reduce the potential risk of damage due to earthquake treat. To reduce the dead load of building, lighter weight wall has been widely used. This study is attempted to take advantage the nearly weightless plastic bottles waste into light weight wall panels. Plastic bottles are well known as waste material that is hardly decomposed by nature. It is expected that this research will be able to bring a hope of the potential utilization of waste plastic bottle as environmentally friendly building materials to support nature conservation efforts.

### **b) PROBLEM STATEMENT**

The use of plastic-based products is increasing nowadays and also in Malaysia. Plastic are also a major source of contributing to environmental. Plastic bottles make life so much easier. They're lightweight and easy to hold, and they're also strong and hard to break. A plastic bottle is the best way to contain and carry many kinds of liquid, from water and soft drinks to oil to household cleaners and baby formula. Based on research from Claire Schilling (2009) since the 1970s, people who care about the environment and the health of our planet

have been worried about how to dispose of plastic once it's been used. Today, about 60 million water bottles are thrown away every day, and it can take up to 700 years for just one plastic bottle to break down in a process called biodegrading.

The use of plastics is increasing and leading to environmental destruction. According to Dyrop (2009) the use of plastic has been increasing rapidly from hundreds of tons in 1930s to 150 million tons per year in 1990s and 220 million tons per year in 2005, and the number keeps getting higher. Plastic is considered a non-organic waste, whose waste can be dissolved and processed to become a packing material for various purposes.

### **c) RESEARCH METHODOLOGY**

Study methodology is the process of preparation, planning and determination of the material to be used on the sample, product design and tests taken on samples in research. In this research, this project replaced bricks to plastic bottles and also used PU200 foam to place in plastic bottles and make it a substitute for bricks to make lightweight wall panel. This project used plastic bottles was easier for installation because it is lighter than bricks. Furthermore, there were 3 tests conducted on this sample which was water absorption test, compressive strength test and density test. Water absorption test was conducted to get the percentage of water absorption from the panel. Compressive strength test used to determine either the wall panel is passing the minimum strength of wall panel which is 3.0 mPa. Furthermore, density test was conducted to compare the density of lightweight wall panel and the conventional wall panel. The result showed this project was under the normal range of wall density which proved this project was lightweight than conventional wall panel.

#### **d) SOLUTION SUGGESTION**

Plastic bottles and (PU200) are used as a replacement in the wall panel. Plastic bottles are constructed from high-density plastic and it can store liquid so the bottles will be filled up by (PU200) that will be hardened in a short while. The panel has been tested with compression strength test after curing for 7, 14 and 28 days. The data can be calculated, and the average of the data will be taken.

#### **E) BENEFITS**

A plastic bottle is the best way to contain and carry many kinds of liquid, from water and soft drinks to oil to household cleaners and baby formula. Since the 1970s, people who care about the environment and the health of our planet have been worried about how to dispose of plastic once it's been used. By implementing this research to the construction work, the plastic waste can be deducted, and the project will save a green house. Hence, the average of percentage plastic waste can be decrease in every year.

Lightweight wall panel as building material has been widely used in Europe for many years, but it is still not very popular in construction work in Malaysia. This research will produce a lightweight wall panel compare to the conventional wall panel by using the bottles and PU200 as a replacement of brick. The research will also decrease a dead load in building and structure and minimize the density of the wall panel in order to archive the target of lightweight wall panel. By using a recycle bottles and PU200, the construction has become more easier to workers in construction site because it uses a tridipanel and precast wall panel.

#### **F) HOW TO IMPLEMENT/METHOD OF USE**

The method uses in this research was tridipanel method. PU200 will be filled into the bottles before tied up with the cage. The tridipanel which is the cage be placed into the formwork with a bit of mortar inside. After insert the tridipanel into the formwork, the mortar will fill up to cover all the cage and fulfill the formwork. After 24 hours, the formwork will be

removed, and the wall panel has gone through a curing process. The curing process has completed 7 days, 14 days and 24 days before the test has been implement on all the wall panel. This research has gone through 3 tests on the wall panel which is water absorption test, compressive strength test and density test. The lightweight wall panel is considered success if all the result passed all of the test.

## **G) CONCLUSION**

In conclusion, the main objective of this research is to analyze the strengths and abilities lightweight wall panels made using plastic bottles filled with foam (pu200) as a replacement for bricks in the construction of lightweight wall panels. The goal is to finish the problem of too much waste of plastic bottles being neglected and not managed properly causes environmental pollution. It is the probability of this product will reduce the waste of plastic bottles and be able to save the environment. The product using friendly recycled materials can help reduce material costs for the construction industry. Thus, with the advancement of technology and innovation like this, society can live in a harmonious and healthy community in line with the aim of preserving the environment for the progress of the country in the future.

## H) APPENDIX



Figure: lightweight wall panel prototype has been replaced with bottle plastic filled with foam (pu200) as a brick



Figure: Testing of water absorption and compressive strength on lightweight wall panel