



**KEMENTERIAN PENGAJIAN TINGGI**



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**TAJUK PROJEK: PLASTIC WASTE AS CEMENT REPLACEMENT IN BRICK**

**JABATAN: JABATAN KEJURUTERAAN AWAM**

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## **PLASTIC WASTE AS CEMENT REPLACEMENT IN BRICK**

### **a) INTRODUCTION**

The use of bricks and cement has become a key ingredient in the construction industry in Malaysia. According by Zhang. L (2013) the source of this material has always been in demand in the market due to the physical nature and cost of production of the unit of the material at fair market price. However, cement market prices are rising today due to the country's economic factors and rising construction activity. The worldwide annual production of bricks is currently about 1391 billion units and the demand for bricks is expected to be continuously rising. To protect the environmental, ecosystem and more sustainable in development, numerous researchers have considered the usage of waste materials to create bricks.

A wide assortment of squander materials has been contemplated, including fly powder, limestone powder, oil effluent treatment plant, cigarette butts and squander tea. Diverse techniques have been utilized to create bricks from waste materials.

### **b) PROBLEM STATEMENT**

The use of plastic-based products is increasing in Malaysia. Plastic is a major source of contributing to the environment. Based on research from Elpawati (2015) disposal of plastic-based materials such as plastic bottles, plastic bags and other contaminated rivers and the environment. In fact, dumping also causes odor to the environment. Plastic waste without specific treatment needs at least fifty (50) years to be degraded. Production of microorganisms may solve the problem in degrading the plastic waste, particularly non-recyclable plastic.

The use of this plastic can also pose a health hazard. According to Nurhenu Karuniastuti (2013) if the plastic is exposed to sunlight or heat it can remove chemicals from the plastic and it can absorb into food and drinks. The use of plastics in life is most likely to endanger health and cause cancer, skin diseases and others. According to research, improper use of plastic can cause various health problems as it can cause cancer and tissue damage to the human body (carcinogenic). If the plastic is burned it will produce gas that will pollute the air and endanger human respiration, and if plastic waste is accumulated in the soil it will contaminate the soil, ground water.

### c) RESEARCH METHODOLOGY

The research methodology is a test of the process of preparation, planning and determination of materials, design and tests on the sample in the research. In our research, the brick design used has referred by BS 3921:1985 with the size 215mm X 104mm X 65mm. The number of bricks produced is 24 bricks which will be 2 different tests. Each sample is determined by the different percentage values of plastic waste replacement. The tests will be carried out on 24 brick samples are compressive strength test and water absorption test. The test conducted refers to ASTM C109 for compressive strength and ASTM C 67 for water absorption test. All steps and procedures will follow the reference already stated. The main materials will be used in this study are cement, sand and crushed High Density Polyethylene (HDPE) plastic. The HDPE plastic are obtained from plastic recycling factory at Sungai Besi, Kuala Lumpur.

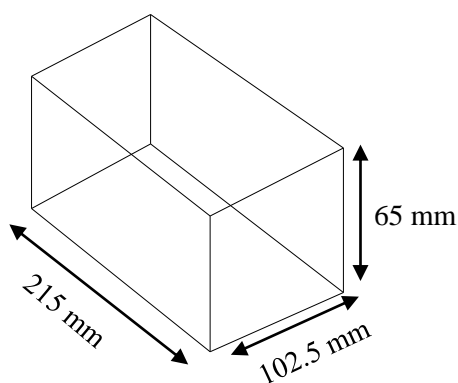


Figure 1: Original Size of Brick



*Figure 2: Crushed High Density Polyethylene (HDPE) plastic*

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

Crushed plastic HDPE is used as a small replacement to cement in bricks with a certain percentage of 0%, 5%, 10% and 15%. The ratio of bricks used 1: 8. The amount of crushed HDPE plastic used is 5kg for produce 24 bricks. 12 bricks with different percentage of plastic waste will be tested with compression strength test while another 12 will be tested with water absorption test. Data will be taken from the test results and will be calculated with the formula that has been stated in the procedure.

#### **e) BENEFITS**

##### Environment

Based on the research, plastic waste can be used and applied in the construction industry. As such, it is likely to be applicable to interior decoration or water catchment structures involving tanks. At the same time, building structures and interior decoration become eco-friendly by using recyclable waste. Indirectly, the construction industry will develop and focus on caring for the environment by using plastic waste. Eventually, the quantity of plastic waste will decrease and various innovations can be made to produce products that are environmentally friendly and do not pollute the environment.

### Community

The use of plastic will reduce the amount of dumping and plastic that needs to be disposed. This will maintain the sustainability and well-being of the community and the environment. The amount of garbage dumping will decrease by the time and will restore the level of community and environmental health. therefore, the health of the community and the community will be guaranteed due to the quantity of waste and plastic waste that can be reused in the construction industry.

### Economy

Recycling plant operators can take this opportunity by segregating according to the type of plastic. In this way, recycling plant operators can generate income by reselling plastic waste that has been isolated either in small patches or crushed plastic. Moreover, such operators can sell to contractors or construction companies. therefore, the cost of materials can be reduced by applying plastic waste in building structures and building design.

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

The use of cement-HDPE bricks can be used and applied to construction structures involving walls, retaining walls and water drainage areas. The use of cement-HDPE bricks can be used and applied to construction structures involving walls, retaining walls and water drainage areas. However, the allowable percentages are 5% and 10% due to reaching the test range for compressive strength and test water absorption test. Therefore, the percentage is able to withstand the load of either a dead load or a live load. In addition, the brick surface is waterproof will prevent water from absorbing into it and damaging the structure and content of the HDPE-cement bricks.

### g) CONCLUSION

In conclusion, the main objective of this research is analyze the strength and capability of bricks made using plastic waste as a little bit replacement in cement. The purpose is to solve the problem of too much plastic waste in the earth's environment causing pollution. It is probability that this product will reduce plastic waste and save the environment. The products will be eco-friendly and can reduce material costs for the construction industry. In fact, the range of health and well-being of the community will increase as the materials used will preserve the environment from being polluted.

### h) APPENDIX



*Figure 3: HDPE-cement brick sample that has been replaced with plastic waste with replacement*



*Figure 4: Testing of compressive strength and water absorption tested on HDPE-cement brick samples*