CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

The purpose of this research is to study the optimum ratio of coconut shells in cement sand brick, where coconut shell is the natural waste material and it is used in cement sand brick production in this research, in order to find out how the brick properties will differ from the actual one. The motives of this chapter are to outline the research methodology of this study, explaining on the waste material, the apparatus and procedure, and design properties that will be defined by undergoing necessary testing and analysis.

This chapter is an alternative to find out the outcome of the objective of this study. This clause will ensure that the progress of this study will be conducted with efficiently, smooth and according to the framework. The benefit of this research methodology is to avoid any issues or problem that can affects the probability to find out the final result. The overall of this chapter covers from the early step on conducting the research until the final phase of the study. This will assure the research on the right track and to ensure the right order of work sequence for the whole project.
3.2 CONCEPTUAL FRAMEWORK OF RESEARCH

**Figure 3.2:** Conceptual framework of research
3.3 CEMENT SAND BRICK DESIGN

The cement sand brick are designed as shown in figure below. The design dimension of cement sand brick are according to the Public Work Department, Standard Specification for Buildings Works, 2005.

![Cement Sand Brick Dimension](image)

**Figure 3.3:** Cement Sand Brick Dimension

Height = 75 mm, Width = 113 mm, Length = 225 mm

In this research, the dimension of the sand brick based on Public Work Department, Standard Specification for Buildings Works, 2005, it stated that, all cement sand brick shall comply with Malaysia Standard 27 (MS 27). Cement sand brick shall be nominal size as given in the table below.

<table>
<thead>
<tr>
<th>Length (mm)</th>
<th>Width (mm)</th>
<th>Depth (mm)</th>
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<tbody>
<tr>
<td>225 ± 3.2</td>
<td>113 ± 1.6</td>
<td>75 ± 1.6</td>
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**Source:** Public Work Department