



Developing Sustainable Alternatives from Destroyed Buildings Waste for Reconstruction Projects

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Abstract

This paper examines the huge destruction that has taken place in some cities of Iraq due to the terrorist acts in recent years that led to the destruction of many buildings. It examines some of the factors that encourage the use of residues of these buildings in reconstruction processes, especially the sustainability factor, so that some residues of these buildings can be used as substitutes for natural building materials and find a difference in terms of energy consumption in the case of using natural building materials and again in the case of using the proposed alternatives. In this study, three alternatives were used: 10% recycled fine aggregates (RFA), 100% RFA, and crushed clay brick aggregate (CCBA) to produce recycled coarse aggregates. The results obtained through the use of building information modeling (BIM) technology were compared with the actual consumption of the building in the case of reconstruction using natural building materials. The simulation results were comparable to real data. They were analyzed in terms of the energy consumption life cycle and annual carbon emissions for each alternative. The best alternative was selected from the results obtained from BIM. The best alternative was found in the use of CCBA in the production of concrete roofs and floors. His final model is that the energy consumption was five times lower than the original unit, while the results of carbon emissions were equal as for the electricity consumption decreased from 23,500 kW/h to less than 23,000 kW/h.

Keywords: BIM; RFA; CCBA; Reconstruction; Destroyed Buildings in Iraq.

1. Introduction

Waste of destroyed buildings is one of the biggest problems going through some parts of Iraq. Which has a significant impact on the environment if it is buried in the landfill. The common causes of mass production of destroyed buildings are either natural or man-made disasters [1, 2]. It is very difficult to get rid of these large quantities of debris, and thus the process of managing the waste of destroyed buildings has become an unjustifiable social concern in modern and developed societies [3, 4]. The massive destruction that has taken place in some cities of Iraq recently due to terrorist acts weakens the country's economic ability to provide the necessary building materials for reconstruction. The most important factor will be the impact of these wastes on the environment in the future. Therefore, it is the right management to exploit these wastes and use them as substitutes for natural resources without affecting the proportion of the building's energy and electricity, so these proposed alternatives become environmentally friendly and sustainable.

BIM can be used to conduct energy analysis using natural materials or alternatives over the design phase [5]. This analysis can help find the percentage of the impact of using alternatives on the energy consumption of the building to choose the right alternative to achieve sustainable economic design [6-8]. In recent years, there has been a clear success using BIM in many projects to achieve sustainable design [9]. This will help improve the estimation of quantities,

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