Ain Shams University
Faculty of Engineering
Department of Structural Engineering

Optimization of Site Selection for Concrete Batch Plants Using Analytical Hierarchy Process (AHP)

A THESIS
Submitted in Partial Fulfillment for the Requirements of the Degree of
MASTER OF SCIENCE IN CIVIL ENGINEERING (STRUCTURAL)

Submitted by

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Degree : Master of Science in Civil Engineering (Structural)

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STATEMENT

This dissertation is submitted to Ain Shams University for the degree of Master of Science in Civil Engineering (Structural Eng.).

The work included in this thesis was carried out by the author in the Structural Engineering Department, Faculty of Engineering, Ain Shams University, Cairo, Egypt.

No part of this thesis has been submitted for a degree or qualification at any other university or institution.

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DEDICATION

ESPECIALLY DEDICATED

To

Our Holy God

Who guide and never leave me in making this research

My Beloved Father's Soul Dr. Abdul Hameed Elba

Who was the first teacher and will remain a great source of inspiration, support and always encourage me to believe in myself.

My Wonderful Mother, Dr. Shadia El Massry

A strong, patient and gentle spirit who taught me to trust in Allah and believe in hard work and without her I will not be able to succeed in my work

My Dear Brothers Shady, Ali and their beloved families,

My Beautiful Daughter, Leen

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ABSTRACT

The selection of the Concrete Batch Plant (CBP) location is the most essential element for success of a project. Recently, most of the companies are fully dependent on the Ready Mix Concrete (RMC) in their projects. The need for (RMC) is increasing due to the quality and conformity to standards provided and its appropriateness to the construction conditions for any country. Due to its value and availability project managers prefer to rely on RMC in their projects construction. In addition to increasing the demand on RMC attracts and encourages investors to establish projects inside the country. The selection of optimum location for CBP is a very important decision due to the difficulties and problems may results in selecting in-proper location. This thesis presents the most important factors affecting on deciding the optimum location. These factors are identified through structured interviews with expert engineers who are working in RMC industry and high qualified workers in CBP using structured interviews and Delphi method. An integrated model for deciding the optimum batch plant location is developed using the analytic hierarchy process (AHP). The selection process is reassessed using another analytical techniques which is the analytic network process (ANP) to provide more flexibility and considering mutual impact which enhance the selection decision. The AHP tool was applied with the help of SuperDesision Software to select the optimum CBP location, for the two alternatives with respect to selected factors ranking and after completing all pairwise comparisons ; Results show that (CBP location in region) is obtained 56%, alternative (CBP location outside region) is obtained 44%. Applying the ANP to select the optimum, showed that: (CBP location in region) is obtained 45%, alternative (CBP location outside region) is obtained 55%. Comparison of results of applying AHP and ANP are showing that there are significant differences between their outcomes in identifying the optimum CBP location. This is due to interdependencies, outer dependencies and feedbacks. In addition, the AHP model is using a unidirectional hierarchical relevance between decision elements to make a proper decision to select the optimum location for CBP, while the ANP allows for more mutual relations among decision elements and this is called "feedback".

Keywords: Location Selection, Concrete Batch Plant, Analytic Hierarchy Process, Analytic Network Process, Optimum site selection, Ready Mix Concrete.

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