ANALYSIS AND DESIGN OF FOUR LEVEL PRE-STRESSED CONCRETE PARKING BUILDING AT SILANG CROSSING EAST TAGAYTAY CITY

Design Project

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ABSTRACT

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The study entitled "Analysis and Design of Four Level Pre-stressed Concrete Parking Building at Silang Crossing East Tagayatay City" was conducted at Cavite State University – Main Campus from June 2015 to February 2016.

The study aimed to design a four level pre-stressed concrete parking building and apply the existing scientific principle and engineering application on its design and analysis. The study was limited to four level pre-stressed concrete parking building wherein only the beam are pre-stressed and the other members of the structure are conventional reinforced concrete. The proposed building has an area of 3114.16 square meters. The plan is composed of a four-level pre-stressed concrete parking building. The study included the architectural plan and structural details of the proposed building. It also included the layout of plumbing and electrical in the proposed four-storey building.

The study provides knowledge on the proper application of fundamental engineering principles, structural analysis and structural stability to guard against collapse under possible overloads.

The collected data include the criteria based on the computation of beams, slabs, columns, column footings, ramp and stairways. Different civil engineering books such as ASEP Steel Handbook, Reinforced Concrete Design, and Pre-stress Design and design projects of former civil engineering students were used as references for different design computations. The Structural Aided Analysis and Design (STAAD) software was used to

determine the factored axial load (Pu), ultimate shear (Vu) and ultimate moment (Mu) which were used in designing the section of structural members.

The structural design of the parking building is done following the procedures and other requirements as per NSCP standards. For the design of tie beam the section used was 200 mm x 300 mm and was reinforced with 2-20 mm diameter steel bar on top and 2-20 mm bar diameter for anchorage. And for the design of pre-stressed beam the section used was 350 mm x 500 mm. Tendons used were 3 pieces of 12.5 mm Ø - 7 wire strand. The section obtained for the design of columns was 650 mm x 650 mm and reinforced with 14-20 mm diameter vertical bars.

The footings were designed as isolated square footings. The sections obtained were 4.0 m x 4.0 m x 0.570 m and 4.3 m x 4.3 m x 0.640 m and was reinforced with 52-28 mm diameter bars both ways 64-28 mm diameter bars both ways respectively. The slab was designed using the coefficient method analysis. For the design of car ramp, it was analyzed as a slab. The live load used was 7.2 KPa, adopted from NSCP 2010.

Based on the comprehensive studies and computation done, it can be concluded that all sections and materials used in the project are safe and economical. The authors recommend a more comprehensive study of the design of the parking building.

The estimated total project cost of the proposed building is Php 25, 016, 275. 60.

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INTRODUCTION

Pre-stressed concrete is one of the most reliable, durable and widely used construction materials in building around the world. It has made significant contributions to the construction industry. It has led to an enormous array of structural applications, including buildings, bridges, foundations, parking garages, water towers, nuclear reactors, TV towers and offshore drilling platforms. Here the steel reinforcement is prestretched to avoid later excessive lengthening of the structure when subjected to severe loads. The concrete is precompressed to prevent later cracking under tensile stresses.

The use of pre-stressed concrete offers a more economical approach for new structures. High quality concrete and predictable structural behavior are key reasons prestressed concrete resists deterioration. Pre-stressed concrete components are uniformly mass produced under strictly controlled, inplant manufacturing conditions for reliable