Design Of ELV and LV System for High Rise Residential Building

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Abstract - This engineering project entails the comprehensive design of low voltage, high voltage, and extra low voltage electrical systems for a high-rise residential building. The project comprises several essential components following industry best practices. The initial phase involves the development of a Concept Design Report, which serves as the foundational document for the detailed design process. This report meticulously outlines the design basis, encompassing crucial features of equipment and systems such as incoming power supply, high voltage switchboard, distribution transformer, low voltage main switchboard, standby diesel generator, distribution boards, low voltage power distribution system, lighting, communication system (voice, data, and television), intercom system, security system, and automatic meter reading system. Following the Concept Design Report, detailed design calculations are performed to determine the optimal rating of various components. These calculations include maximum demand calculations, transformer sizing calculations, generator sizing calculations, cable sizing calculations, and earthing calculations. These meticulous calculations ensure the efficient and reliable operation of the electrical systems within the high-rise residential building. Design drawings play a pivotal role in illustrating the intricacies of the systems and installations. These drawings encompass schematics, lighting layouts, power layouts, cable layouts, and other relevant details, providing a visual representation of the propose electrical infrastructure. Furthermore, the project entails the formulation of a comprehensive technical specification for the design, supply, and installation contract. This specification outlines the requirements and standards to be adhered to throughout the project lifecycle, ensuring compliance with international engineering standards and regulatory guidelines. By adhering to industry best practices and utilizing advanced engineering methodologies, this international project aims to deliver a robust, efficient, and sustainable electrical infrastructure for the high-rise residential building, meeting the diverse needs of its occupants while prioritizing safety, reliability, and performance.

Index Terms – Smart Building, Automatic Meter Reading, Design Process, Transformer, Generator

I. INTRODUCTION

This document details the criteria that will be used for the design and documentation of the electrical system and equipment for this project. design of ELV & LV switchboard for high rise residential building includes security camera and alarm system, fire extinguisher system, smoke detection system, building West elevation, South elevation, East elevation power control of apartments with the help of PLC & SCADA. This research aims to address the complexities and unique requirements of high-rise buildings, where electrical systems must meet stringent safety standards, optimize energy usage, and maintain uninterrupted power supply. This includes addressing technical challenges related to electrical design, safety, and optimal power distribution while also ensuring compliance with regulations and cost-effectiveness. The project aims to deliver a reliable electrical system that meets the specific needs of high-rise structures, providing uninterrupted power supply and enhancing the overall quality of life for residents.

II. LITERATURE REVIEW

Design of ELV and LV switchboard for a high-rise residential building," covered a comprehensive range of crucial electrical engineering aspects". We studied the basics of earthing, lightning arrestors, distribution transformers & standby generators. These are fundamental components for ensuring the safety and reliability of the electrical system, particularly in a high-rise structure. Subsequently, this project shifted

focus to switchboards, power factor correction units, building wiring, and cable sizing, design and calculations involved in this phase aimed to create a well-planned and efficient electrical infrastructure tailored to the building's unique needs.

III. SYSTEM DESIGN

IV. RESEARCH METHODOLOGY

Designing electrical systems for a high-rise residential building is a complex task that often involves collaboration with electrical engineers and professionals. It's essential to consult with experts and follow local regulations and standards for a successful project. Designing electrical systems for a high-rise residential building involves careful planning and consideration of various factors.

V. INDUSTRIAL AUTOMATION PROGRAMMING

1.Siemens: - TIA (Totally Integrated Automation)
2.Software Allen Bradley: - RS Logix Software
3.Mitsubishi: - GX Works Software

For HMI (Human Machine Interface) Screening:
1.Siemens HMI: - TIA Software (Model: - KTP400)
2.Delta HMI: - DOP Software (Model: - 103 WQ)
3.Schneider HMI: - Fstudio2

For SCADA (Supervisory Control and Data Acquisition) Screening: -

1.General Electric (GE) SCADA: - iFix5. 9 Software
2.Wonderware SCADA: - InTouch Software

For DCS: - Simatic WinCC software

CONCLUSION

In conclusion, this international engineering project has successfully addressed the complex requirements of designing low voltage, high voltage, and extra low voltage electrical systems for a high-rise residential building. Through meticulous planning and adherence to industry standards, the project team has developed a comprehensive Concept Design Report, conducted detailed design calculations, and produced precise design drawings and specifications. By prioritizing safety, reliability, and efficiency, the project aims to deliver a robust electrical infrastructure capable of meeting the diverse needs of the building's occupants. Through collaboration and innovation, the team has laid the groundwork for a sustainable and technologically advanced electrical system that will enhance the comfort and functionality of the high-rise residential building for years to come.

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