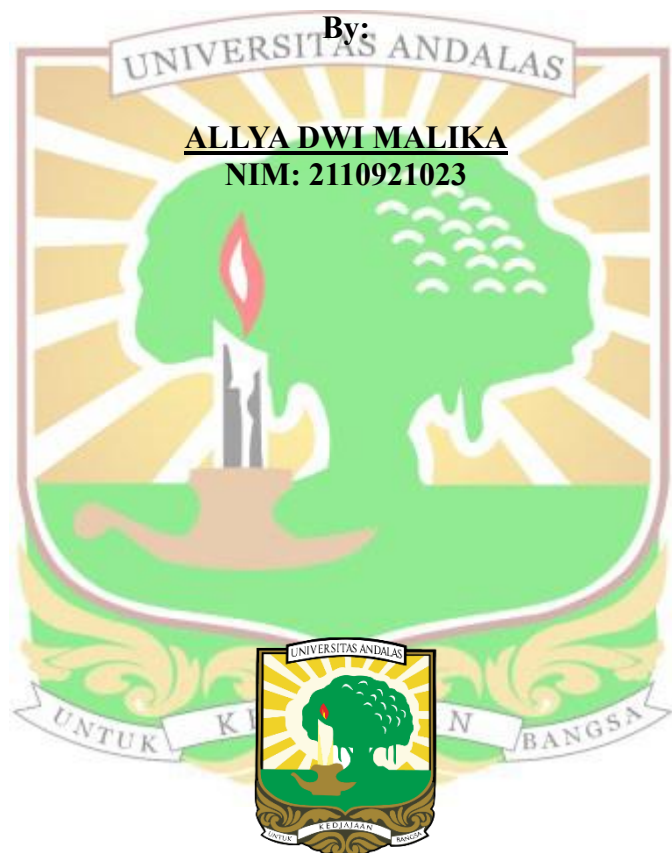


SAFETY ENGINEERING ANALYSIS FOR MULTI UTILITY TUNNEL (MUT) CONSTRUCTION METHODS IN IBU KOTA NUSANTARA (IKN) DEVELOPMENT

FINAL PROJECT



**BACHELOR'S DEGREE PROGRAM IN CIVIL ENGINEERING
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ABSTRACT

The construction of the Ibu Kota Nusantara (IKN) involves a significant infrastructure initiative, including the Multi Utility Tunnel (MUT). MUT is crucial for integrating underground utilities such as electricity, telecommunications, water supply, and drainage systems. However, the complexity of MUT construction introduces various safety risks, including excavation hazards, structural failures, and worker injuries. The urgency of this study arises from the necessity to enhance workplace safety, minimize accidents, and establish an optimal construction approach for MUT projects in IKN. Ensuring a well-structured and effective safety management system is critical for the successful execution of large-scale infrastructure projects. The primary objective of this study is to identify key safety risks in MUT construction, assess the effectiveness of existing safety management systems, and compare the safety performance of pre-cast concrete and cast-in-place construction methods. This comparative analysis will provide essential insights for stakeholders to implement safer and more efficient construction practices. The research methodology employs field observations, surveys, interviews, and project document analysis to gather empirical data on safety practices. The study further utilizes descriptive analysis, risk assessment matrices, and safety analysis methods to calculate and evaluate safety implications and compare both construction techniques. Results indicate that the cast-in-place method exhibits higher overall risk, with critical hazards including trench collapse, formwork failure, and prolonged on-site exposure. In contrast, the precast method demonstrates a lower risk profile, primarily concentrated in heavy lifting and rigging operations. Risk assessments using a structured matrix revealed that precast construction significantly reduces on-site hazards by transferring high-risk activities to controlled off-site environments. Mitigation strategies are proposed based on hazard type, referencing international standards (ISO 45001, OSHA 1926) and national regulations (Permen PUPR No. 10/2021). The findings support the adoption of precast methods for improved safety performance in IKN's MUT construction and offer actionable recommendations for enhancing safety management systems in large-scale infrastructure projects. This research provides empirical evidence to guide policymakers, project managers, and industry practitioners in implementing safer, more sustainable construction practices.

Keywords : Safety Engineering, Multi Utility Tunnel (MUT), Construction Method, Pre-cast vs. Cast-in-Place, Ibu Kota Nusantara