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Proceedings of

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Quantifying Physical Strain and Posture Risks in Formwork Labourers Through Ergonomic Analysis

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ABSTRACT

In the construction industry, formwork laborers frequently engage in physically demanding tasks, placing them at high risk of musculoskeletal problems. Repetitive handling of heavy formworks and working in uncomfortable postures further elevate this risk. This study evaluates the postural hazards and physical strain of formwork labourers using standardized ergonomic tools such as REBA (Rapid Entire Body Assessment), RULA (Rapid Upper Limb Assessment), and the RPE (Rating of Perceived Exertion) scale. The research analyzed the duties of 42 labourers performing activities such as carrying, lifting, and positioning form panels. Results showed that 72% of workers fell into high to extremely high-risk categories based on REBA scores, indicating an urgent need for ergonomic interventions. RULA analysis revealed that 68% of upper limb postures were in the medium to high-risk category, suggesting long-term susceptibility to musculoskeletal disorders, particularly in shoulders, elbows, and wrists. The average RPE score was 14, reflecting “rather hard” workload. The main contributors to increased physical strain were heavy manual lifting and prolonged bent postures during shuttering works. Recommended interventions include mechanical aids for lifting, workstation redesign to reduce stooping, and training programs to correct posture. Overall, the study highlights the urgent need for ergonomic redesign in construction to protect formwork labourers’ health and ensure a safer working environment.

Keywords: RULA, REBA, RPE, Ergonomic, Musculoskeletal Diseases



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**DEPARTMENT OF MECHANICAL ENGINEERING
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**Qualifying Vulnerability: Using Oshi and Mwasto
Correlate Welfare Access with Workplace Safety Among
Migrant Workers**

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ABSTRACT

This study presents an extensive analysis of the safety and welfare conditions of migrant workers in Tamil Nadu, particularly urban areas applying an integrative framework dependable in rights of labors, occupational health standards and their socio-economic labor rights, occupational health standards, and socio-economic accessibility. This methodological triangulation integrates both the qualitative data from key stakeholder's interviews and quantitative data collected from structured survey. The stakeholders involved in this study are industry laborers, Labor department officials, Construction Managers, Project Managers and NGOs. The Quantitative data were examined using SPSS software for Descriptive statistics, logistic regression and correlation matrices for identifying the main determinants influencing welfare access and workplace safety. To analysis the data in better way, Occupational Safety and Health Index (OSHI) and Migrant Welfare Access Score (MWAS) were assessed to standardize comparisons amount the sectors. The analyzed data have been spatially analyze to determine the clusters of vulnerability by using GIS mapping. A considerable majority of respondents of 68% (labors) were found to be living in the housing which exceeds the occupancy limit suggested by Bureau of Indian Standards (BIS), an overcrowded standard. About 53% of workers were lacking in their basic health insurance coverage under Employee State Insurance Scheme (ESI) or any other form of health insurance. Nearly 46% workers were lacking in safe environment, as the site does not operate with mandatory provision of Personal protective equipment (PPE). Through Regression analysis, it is clear that there is a direct and statistical significance between the lack of welfare access and workplace safety. The laborers whose score is below 0.4 in MWAS were found to be 3.8 times more likely to encounter a workplace accident with high correlation ($p < 0.01$).

Keywords: MWAS, OSHI, SPSS software, State Insurance Scheme, Migrant Welfare Access Score



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**DEPARTMENT OF MECHANICAL ENGINEERING
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**Investigation of Enhancing Tile Performance
with Silicon-Based Cement and Waste Tire Ash**Noushadali.V.C¹, Venugopal.S², Soundarya.M³¹Research Scholar, Department of Mechanical Engineering, VISTAS, Chennai²Associate Professor, Department of Mechanical Engineering, VISTAS, Chennai³Assistant Professor, Department of Civil Engineering, VISTAS, Chennai

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ABSTRACT

This research investigates the sustainable production of high-performance tiles by incorporating industrial waste, specifically tire ash, into a silicon-based cement matrix. Tire ash, a byproduct from combusting waste tires, offers a dual benefit: it serves as a reinforcement material while promoting eco-friendly waste management. The study developed tiles using a modified processing technique, varying the proportions of silica fume cement (85%, 80%, 70%) and tire ash (0%, 5%, 15%), with a fixed 15% tungsten carbide content. The results demonstrate that the inclusion of tire ash significantly enhances key material properties. Compressive strength, surface hardness, and corrosion resistance all improved, indicating that the additive contributes to greater structural integrity, wear resistance, and longevity. This approach successfully transforms an industrial waste product into a valuable resource for creating superior building materials. By diverting tire ash from landfills and incorporating it into tile manufacturing, the research supports the principles of a circular economy and green construction. The findings pave the way for adopting silicon-based compounds and tire ash in civil engineering applications, offering a sustainable path to both reduce environmental impact and improve material performance.

Key words: Tire Ash, Silica Fume Cement, Sustainable Construction, Mechanical Properties, Waste Valorization



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