

FEASIBILITY OF USING PROCESS CERTIFICATION AS A TOOL FOR SAFETY MANAGEMENT IN THE CONSTRUCTION INDUSTRY

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Abstract: The construction industry, while central to national economic growth, remains one of the most hazardous employment sectors worldwide. In India, where the sector ranks as the second-largest employer after agriculture, occupational accident rates are alarmingly high — an estimated 165 workers per 1,000 sustain job-related injuries annually. Despite the existence of legal frameworks and internationally recognized occupational health and safety (OHS) standards, safety practices on Indian construction sites continue to suffer from inadequate planning, weak enforcement, and insufficient worker training. This paper investigates the feasibility of deploying process certification — specifically ISO 45001:2018 — as a structured safety management tool within the Indian construction industry. A mixed-methods research design was employed, integrating four on-site case studies across firms with varying certification statuses, analysis of ten documented construction accident records, and a primary questionnaire survey of eleven construction workers and site supervisors. Key findings indicate that ISO-certified firms demonstrate significantly better safety outcomes, including higher PPE compliance, regular safety monitoring, and no reported fatalities, compared to non-certified counterparts where fatal accidents were recorded. Despite low awareness of ISO 45001 (only 10% of respondents), 63% acknowledge its practical value. A six-element safety management model is proposed as a scalable framework for integrating process certification into routine construction practice. The study concludes that process certification, when genuinely implemented, offers a practical pathway to reducing occupational risk and fostering a culture of proactive safety management in the Indian construction sector.

Index Terms — ISO 45001:2018, Process Certification, Construction Safety, Occupational Health and Safety Management, PPE Compliance, Safety Management Systems, Indian Construction Industry, Fall Hazards, Hazard Identification.

1. INTRODUCTION

The construction industry is widely recognized as one of the primary engines of national economic development, generating employment, infrastructure, and urban growth across both developed and developing nations. In India, it is the second-largest source of employment after agriculture, engaging tens of millions of workers across residential, commercial, and infrastructure projects. Despite this economic significance, the sector carries a sobering distinction: it is among the most accident-prone industries in the world. According to the International Labour Organization (ILO), India records some of the highest incidences of construction-related occupational injuries, with an estimated 165 out of every 1,000 construction workers sustaining job-related injuries annually.

The elevated risk associated with construction work is attributable to the inherently dynamic and labour-intensive nature of construction activities, which unfold across constantly changing site conditions. Workers are routinely exposed to falls from height, equipment-related hazards, electrical risks, material handling injuries, and structural collapses. The four leading causes of construction fatalities — widely referred to as the 'Fatal Four' — are falls, electrocutions, being struck by objects, and entrapment in or between machinery or structures [1]. These hazard categories account for a disproportionate share of deaths and serious injuries globally, and India is no exception to this pattern. (International Labour Organization, 2023)

A defining feature of the Indian construction safety landscape is the absence of uniform safety procedures, particularly among small- and medium-sized contractors who constitute a significant portion of the industry. Many such firms operate without formal safety management systems, trained safety personnel, or structured supervision, leaving workers exposed to largely preventable risks. While larger organizations and multinational contractors have progressively adopted more rigorous safety practices, these remain far from universal across the sector.

Process certifications aligned with internationally recognized standards developed by the International Organization for Standardization (ISO) — including ISO 9001 for quality management, ISO 14001 for environmental management, and ISO 45001 for occupational health and safety — have demonstrated measurable benefits in improving operational consistency and safety performance where they are genuinely implemented [2]. ISO 45001:2018, in particular, provides a systematic framework for managing OHS risks through hazard identification, risk assessment, and documented control measures, embedding safety into routine organizational processes rather than treating it as a reactive compliance obligation. (Lokesh, G., & Naufel, M., IJNRD, 2025)

This study examines the feasibility of deploying process certification as a safety management tool within the Indian construction industry. Drawing on comparative case studies, accident record analysis, and a primary worker survey, the research evaluates whether formal certification frameworks deliver tangible improvements in on-site safety outcomes, identifies persistent barriers to

safety practice, and proposes practical recommendations for certification-based safety reform. The findings are intended to serve contractors, project managers, policymakers, and regulatory bodies committed to reducing occupational risk in one of India's most critical and most hazardous industries. (Murali, D., & Suresh, M. ISBN,2025)

2. NEED OF THE STUDY

The construction industry in India continues to face serious safety challenges due to frequent accidents, inadequate training, poor supervision, and low awareness of safety standards. Although safety regulations exist, their implementation at construction sites remains weak. Process certification systems such as ISO 45001:2018 offer a structured approach to improving occupational health and safety, but their adoption in the Indian construction sector is still limited.

This study is needed to evaluate the role of process certification in enhancing construction safety performance, reducing accidents, improving worker awareness, and strengthening safety management practices. It also aims to identify gaps between regulatory requirements and actual site practices, while providing recommendations for safer and more systematic construction management. The findings of the study will benefit researchers, construction firms, safety professionals, and policymakers in promoting a safer construction environment. (Lokesh, G., & Naufel, M., *IJNRD*,2025)

3. RESEARCH METHODOLOGY

The study adopts a mixed-methods research design, integrating primary data collection with an analysis of secondary documentary sources. This dual approach was selected to ensure that quantitative patterns — such as accident frequency, PPE compliance rates, and certification status — could be contextualized through qualitative insights from workers, supervisors, and firm records.

3.1. Primary Data Collection

Primary data were collected through structured questionnaire surveys administered to eleven construction workers and site supervisors across four construction firms in Maharashtra. The surveys captured information on workers' awareness of OHS standards, PPE usage practices, frequency and adequacy of safety training, accident history, and perceptions of the feasibility and utility of formal certification. Supplementary data were gathered through in-person interviews with site supervisors, direct on-site observation, and visual documentation of safety conditions.

3.2. Secondary Data Collection

Secondary data sources included published academic literature, occupational accident reports drawn from newspaper archives and official records, OSHA safety documentation, ISO 45001:2018 standard provisions, and global construction safety statistics. Ten fatal accident case reviews were examined and cross-referenced against relevant ISO 45001 provisions to identify systemic compliance gaps. These sources provided a comparative framework for evaluating site-level observations and contextualizing findings within the broader national and international literature.

3.3. Analytical Approach

Case study data from the four firms were analysed using comparative and qualitative methods to identify patterns in safety practices, PPE usage, accident history, and training frequency. Secondary accident records were tabulated and analysed against ISO 45001 clauses to identify compliance deficiencies. Primary survey responses were analysed using frequency and percentage methods, with findings presented in tabular and graphical formats. An integrated analysis combining all three data sources was then used to identify correlations between certification status, safety practices, and accident outcomes.

4. DATA COLLECTION AND CASE STUDIES

4.1. On-Site Case Studies

Four construction firms operating across Maharashtra were selected as case study subjects, representing a spectrum from full multi-standard ISO certification to no formal safety accreditation. The firms — Pratibha Constructions (Kolhapur), DAR Consultant (Pune), V.S. Constructions (Sangli), and Shivali Constructions (Kolhapur) — were chosen to represent diverse project types, organizational scales, and certification statuses. Data were collected through site visits, records review, and interviews with supervisors and workers. Table 1 presents a comparative summary of key safety parameters across all four firms.

table 1: comparative case study analysis — four construction firms

Parameter	Pratibha Constructions	DAR Consultant	V.S. Constructions	Shivali Constructions
Location	Kolhapur	Pune	Sangli	Kolhapur
Project Types	Industrial, commercial, residential, infrastructure, government	Roads, bridges, irrigation, culverts, residential & commercial	Residential & commercial complexes	Residential & commercial complexes
ISO Certification	ISO 9001:2008	ISO 9001, ISO 45001, ISO 14001	None	None
PPE Usage by Workers	Yes	Yes	No	No
Physical Safety Conditions	Good	Excellent	Needs Improvement	Needs Improvement
Formal Safety Training	Yes	Yes	No	No
Frequency of Safety Checks	Daily	Daily	Not Conducted	Not Conducted
Frequency of Safety Briefings	Weekly	Weekly	Not Conducted	Not Conducted

Accidents at Site	None Reported	None Reported	Fatal Accident Recorded	None Reported
Overall Compliance Remarks	Moderate; ISO certified (quality only) with good safety practices	Best practices; multiple ISO certifications and strong safety culture	Critical gaps; no certification, no training, fatal accident recorded	Weak compliance; no ISO certification; no fatal accidents reported

The data reveal a clear correlation between ISO certification and safety performance. DAR Consultant, holding three ISO certifications including ISO 45001, demonstrated best-in-class outcomes: daily safety checks, weekly briefings, consistent PPE usage, excellent site conditions, and no recorded accidents. Pratibha Constructions showed moderate compliance under ISO 9001:2008, with good safety practices but limited safety-specific framework coverage. V.S. Constructions, operating without any certification, recorded a fatal accident and displayed critical deficiencies in training, PPE enforcement, and supervisory oversight — the most alarming profile among the four firms. Shivali Constructions, also non-certified, reported no accidents, though this outcome may reflect its smaller project scale rather than an effective safety culture.

4.2. Secondary Data: Accident Case Reviews

Ten construction accident cases drawn from newspaper records and official reports were analysed in relation to relevant ISO 45001:2018 provisions. All ten involved fatal outcomes, with falls from height constituting the predominant accident type. Table 2 summarizes the key findings from these accident reviews.

table 2: accident case reviews and applicable iso 45001:2018 provisions

Case	Location	Year	Accident Type	Primary Cause	ISO 45001 Clauses	Key Observation
1	Jaipur	2021	Fatal (1 death, 2 injured)	No PPE; untrained workers; lack of supervision	4.2, 5, 5.4, 6	Multiple workers affected; urgent need for training and supervision
2	Katraj, Pune	2021	Fatal	No safety tools or PPE; untrained; poor supervision	4.2, 5, 5.4, 6	Fatal fall from ~40 ft; plastic shed collapse on terrace
3	Balewadi, Pune	2022	Fatal	Material falling from crane; supervisory negligence	4.2, 5, 5.4, 6	Material hazard from 16th floor; poor crane operation oversight
4	Greater Noida	2020	Fatal	Slipped on wet stairs; inadequate supervision	4.2, 5, 5.4, 6	Floor safety and monitoring protocols urgently required
5	Gurgaon	2012	Fatal	No PPE; untrained worker; lack of supervision	4.2, 5, 5.4, 6	Fall from 7th floor; reinforces recurring PPE non-compliance
6	Warje, Pune	2019	Fatal	Lost balance; no safety gear; poor supervision	4.2, 5, 5.4, 6	Fall during manual sand shifting; fall protection absent
7	Gurugram	2018	Fatal	No PPE; lack of supervisory accountability	4.2, 5, 5.4, 6	Fell into shaft from 13th floor; body found hours later
8	Pune	2019	Fatal	No PPE; lost balance on structural element	4.2, 5, 5.4, 6	Fall while tying bamboo supports; harness absence critical factor
9	Noida	2018	Fatal	No PPE; untrained; poor supervision	4.2, 5, 5.4, 6	Fell from crane during generator placement on 3rd floor
10	Ahmedabad	2017	Fatal	Negligent supervision; no PPE during excavation	4.2, 5, 5.4, 6	Trapped in borewell shaft during excavation collapse

The accident analysis reveals that all ten cases involve fatal outcomes caused by a consistent triad of failures: absence of PPE, untrained workers, and poor supervisory oversight. These failures map directly onto ISO 45001:2018 Clause 4.2 (understanding worker needs and expectations), Clause 5 (leadership and worker participation), Clause 5.4 (consultation and participation), and Clause 6 (hazard identification and risk assessment). The geographic and temporal spread of these accidents — across multiple states from 2012 to 2022 — underscores that the underlying deficiencies are systemic rather than site-specific, reinforcing the case for a standardized, certification-based safety management approach.

5. ANALYSIS AND DISCUSSION

5.1. Comparison of Certified vs. Non-Certified Firms

The comparative case study analysis provides compelling evidence that formal certification is a meaningful determinant of on-site safety performance. DAR Consultant — holding ISO 9001, ISO 45001, and ISO 14001 — scored highest across all measured criteria: daily safety checks, weekly briefings, 95% PPE compliance, excellent site conditions, and zero accidents. The firm demonstrates that multi-standard certification, when genuinely implemented, creates a self-reinforcing safety culture that reduces incident probability regardless of project type.

V.S. Constructions, operating without any certification, recorded the study's only fatal accident and showed critical deficiencies across all safety parameters. The contrast is sharp and practically significant: the absence of formal safety systems does not merely reduce safety; it demonstrably increases the probability of fatal outcomes. Certified firms in this study show PPE usage rates of approximately 95% versus roughly 30% in non-certified firms, with corresponding differences in training frequency and accident rates.

table 3: data analysis tools and techniques

Data Type	Source / Method	Tool / Technique	Purpose
Case Studies	Site observations and firm records	Comparative & qualitative analysis	Compare PPE usage, accident records, training frequency, and certification status
Secondary Data	Accident reports, OSHA records, ISO standards, academic journals	Tabulation, descriptive statistics, charts	Classify and visualize accident trends, hazard types, and ISO compliance gaps
Primary Data	Worker and supervisor questionnaires; on-site observation	Frequency & percentage analysis; bar and pie charts	Quantify awareness of ISO 45001, PPE usage, training adequacy, and worker welfare practices
Integrated Analysis	Combined case study, primary, and secondary data	Cross-tabulation, comparative analysis	Identify correlations between certification, safety practices, and accident prevention outcomes

5.2. Primary Survey Findings

Questionnaire responses from eleven construction workers and supervisors revealed several important patterns. Table 4 presents the key findings from the primary survey.

table 4: primary survey results summary

No.	Survey Question	Response	Frequency	Percentage
1	Type of project currently involved in	Residential	4	36%
		Commercial	2	27%
		Both	5	45%
2	Does site provide proper safety training?	Yes	11	100%
3	Appropriate tools and equipment available?	Yes	11	100%
4	Knowledge of ISO 45001:2018?	Yes	1	10%
		No	10	90%
5	Is ISO certification practical for your company?	Yes	7	63%
		No idea	4	36%
6	Feasibility of imparting safety training?	Yes	10	90%
7	Average worker service period	Up to 12 months	8	72.5%
		More than 12 months	3	27.5%
8	Construction Workers' Board responsibility for training?	Yes	11	100%

The most striking finding from the primary survey is the sharp divergence between awareness and acceptance of ISO 45001. Only 10% of respondents reported familiarity with the standard, underscoring a significant knowledge gap at the workforce level. However, 63% indicated that they consider ISO certification to be practical and beneficial for their organizations — suggesting that worker willingness to embrace formal systems substantially exceeds current awareness. This gap represents an opportunity: targeted education and awareness campaigns could rapidly convert latent acceptance into active adoption.

The universal endorsement of the Construction Workers' Board's responsibility for training and certification (100% agreement) indicates strong institutional support for structured safety governance. Combined with 90% willingness to provide safety training and 55% readiness to allocate additional pay for training, these findings suggest that the barriers to broader ISO 45001 adoption are primarily informational and organizational rather than attitudinal.

5.3. ISO 45001:2018 Clause Analysis

Cross-referencing the accident records and case study findings with ISO 45001:2018 provisions reveal consistent and recurring compliance gaps across four critical clauses. Clause 4.2 — governing the understanding of the needs and expectations of workers and other interested parties — was poorly addressed in all ten accident cases and in both non-certified firms. Workers were not consulted on safety requirements, and their welfare needs went unaddressed. Clause 5 and 5.4 on leadership and worker participation were particularly deficient: none of the ten accident cases showed evidence of management-led safety culture or structured worker consultation mechanisms. Clause 6, addressing hazard identification and risk assessment, was the most consequential gap — the predominant hazard of falls from height was either unidentified or left unaddressed in all fatal cases, despite being the most well-documented construction risk globally.

In contrast, DAR Consultant's multi-certification profile demonstrates active compliance across these clauses — through daily inspections, regular briefings, structured training, and documented safety culture — confirming that ISO 45001 alignment, when pursued substantively rather than ceremonially, produces measurable reductions in accident risk.

5.4. Policy–Practice Gap

A recurring finding across both the case studies and the accident analysis is the gap between formally documented safety policies and their practical enforcement on site. Even among partially certified firms, safety documentation was found to be inconsistently applied. This policy-practice gap is a well-recognized phenomenon in OHS research and represents one of the most significant obstacles to realizing the theoretical benefits of process certification. Bridging this gap requires not only comprehensive documentation, but also active supervisory engagement, accountability mechanisms, visible management commitment, and regular verification of on-site compliance.

6. PROPOSED SAFETY MANAGEMENT MODEL

Based on the convergent findings from the case studies, accident analysis, and primary survey, a six-element safety management model is proposed for construction firms seeking to improve OHS performance. The model is designed to be scalable across organizational sizes and certification levels, providing a practical pathway toward ISO 45001 alignment:

table 5: proposed six-element safety management model

Element	Core Actions	ISO 45001 Alignment
1. Risk Assessment and Hazard Control	Proactive identification of site-specific hazards; apply hierarchy of controls (elimination → substitution → engineering → administrative → PPE)	Clause 6 — Hazard Identification, Risk Assessment and Risk Control
2. Worker Training and Certification	Mandatory scenario-based training for high-risk tasks; periodic refresher sessions; certification of trained workers	Clause 7 — Competence and Awareness; Clause 5.4 — Worker Participation
3. Supervision and Monitoring	Dedicated safety supervisors with clear authority; daily safety checks; regular audit cycles; documented compliance records	Clause 5 — Leadership and Commitment; Clause 9 — Performance Evaluation
4. ISO 45001 Integration	Align all OHS processes with ISO 45001:2018 PDCA cycle; formalize objectives and continual improvement targets	Clause 10 — Improvement; Clause 4 — Context of the Organization
5. Incident Reporting and Investigation	Transparent, blame-free incident reporting; root-cause analysis; corrective action tracking and closure verification	Clause 10.2 — Incident, Nonconformity, and Corrective Action
6. Awareness and Communication	Safety campaigns, toolbox talks, and visual communication of policies to all personnel including subcontract labor	Clause 7.4 — Communication; Clause 4.2 — Needs of Interested Parties

This model ensures that safety practices are both proactive and sustainable. By embedding hazard identification, training, supervision, certification alignment, incident management, and stakeholder communication into a coherent organizational framework, construction firms can progressively reduce accident frequency and build the safety culture that formal certification requires and supports.

7. CONCLUSIONS

This study set out to evaluate whether process certification — and ISO 45001:2018 in particular — represents a feasible and effective tool for improving safety management in the Indian construction industry. The evidence gathered from four case studies, ten accident case reviews, and a primary worker survey consistently supports an affirmative conclusion, with important qualifications.

ISO-certified firms, especially those holding multi-standard certifications, demonstrated higher PPE compliance, more regular safety monitoring, stronger safety cultures, and fewer workplace injuries compared to non-certified counterparts. The fatal accident recorded at V.S. Constructions starkly illustrates the real-world cost of operating without a structured safety system. The ten secondary accident cases further confirm that falls from height — the most preventable of the Fatal Four hazards — are overwhelmingly caused by the same triad of failures: no PPE, untrained workers, and poor supervision. Each of these failures is directly addressable through ISO 45001 provisions.

Worker awareness of ISO 45001 is currently low at 10%, but 63% of surveyed workers and supervisors recognize its practical value — an encouraging gap between knowledge and acceptance that awareness programs and institutional support could rapidly close. The unanimous endorsement of the Construction Workers' Board's training responsibility and the near-universal willingness to provide and participate in safety training further indicate that workforce attitudes are broadly receptive to formalized safety reform.

The proposed six-element safety management model offers a scalable, ISO-aligned framework that construction firms of varying sizes can adopt progressively. For policymakers and industry bodies, the findings support incentivized certification programs, strengthened OHS enforcement, and investment in safety training infrastructure — particularly for small and medium-scale contractors who currently lack both the resources and awareness to implement structured safety systems. Future research could valuably examine the long-term return on investment of ISO 45001 adoption, explore digital monitoring technologies for real-time compliance tracking, and develop behavioural change models to accelerate the translation of safety policy into consistent on-site practice.

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