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# A Collaborative Model for Securing Occupational Safety and Health Management Costs in the Subcontracting Structure of the Construction Industry

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## Abstract

**Purpose:** This study explores the impact of cost-cutting practices in the multilayered subcontracting structure of the construction industry on the reduction of occupational safety and health management costs (OSHMC). **Research design, data and methodology:** By analyzing legal and contractual limitations of the current system, and the shortcomings of existing cooperative safety models, this study aims to identify structural issues and suggest alternatives. **Results:** The findings indicate that subcontracting cost reductions often lead to the omission or reduction of essential safety expenses, including the deployment of safety managers and training programs. Current institutional frameworks—such as mandatory contract clauses, cost adjustment systems, and partial prepayment models—show limitations in ensuring actual safety implementation, particularly for small subcontractors. **Conclusions:** Based on the analysis, this study proposes an 'Automated Safety Cost Linkage and Guarantee Platform' that ensures real-time calculation, monitoring, and validation of safety expenditures through a digital system. The platform aims to enhance transparency, prevent cost shifting, and improve safety outcomes, ultimately contributing to a safer and more sustainable construction industry.

**Keywords:** Monopoly·Monopolization Strategies, Oligopoly and Other Imperfect Markets, Transactional Relationships, Industrial Structure, Construction

**JEL Classification Code :** L12, L13, L14, L16, L74

## 1. Introduction

In the modern construction industry, subcontracting has become a routine practice, driven by the pursuit of division of labor, specialization, and cost-efficiency. However, this subcontracting structure often leads to repeated cost reductions and multi-tiered subcontracting, ultimately resulting in a situation where even the essential costs for on-

site safety personnel cannot be adequately secured at the lowest tier of project execution. The construction sector accounts for the highest proportion of all industrial accidents, many of which stem from the lack of fundamental safety management. In particular, the shifting of responsibility and cost burdens between general contractors and subcontractors has become a structural issue that reduces the occupational safety and health management system to a

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mere formality. This study aims to examine how cost-reduction practices within the subcontracting structure of the construction industry lead to reductions in the deployment of safety managers and occupational safety and health management costs. Furthermore, it seeks to identify the legal and contractual limitations inherent in this process. Based on these findings, the study proposes a practical, field-oriented cooperative model to ensure the protection of safety-related budgets. It also aims to explore new structural alternatives by analyzing the limitations of existing practices and suggesting measures for improvement.

## 2. Literature Review

### 2.1. Subcontracting and Cost-saving Structures

In the construction industry, subcontracting has been widely utilized as a routine means to enhance project efficiency and technical specialization. However, multi-layered subcontracting structures have evolved beyond mere task delegation, institutionalizing a system of repeated cost reductions and profit extraction. The prime contractor allocates a fixed portion of the total project budget to the first-tier subcontractor, who subsequently engages in further subcontracting. At each level, a profit margin is secured, while the final subcontractor responsible for the actual construction work is left with a significantly reduced budget.

For instance, in a project with a total budget of KRW 10 billion, the first-tier subcontract may be contracted at approximately KRW 9 billion, the second-tier at KRW 8 billion, and the final executing subcontractor may be required to complete the project with less than KRW 6 billion. This structure results in cost reductions not only in materials and labor but also in public-interest expenditures such as safety management costs, personal protective equipment (PPE), and occupational safety and health training.

Among these, the cost of employing safety managers is particularly vulnerable. As their role is essential but does not produce immediate or visible outcomes, it is often deprioritized in budget allocation. This cost structure frequently leads to the absence of dedicated safety personnel on-site or the assignment of safety responsibilities as an additional role, which in turn undermines the site's capacity to respond effectively to safety incidents. Consequently, the incidence of workplace accidents tends to increase, and the protection of workers' rights to life and health becomes severely compromised.

### 2.2. Current Status of Safety Management Cost Reduction

In an effort to address these challenges, the Korean government has introduced relevant laws and official notices to explicitly guarantee and regulate the allocation of safety management costs. A representative example is the Ministry of Employment and Labor's revised notification titled "*Guidelines for the Estimation and Use of Occupational Safety and Health Management Costs in the Construction Industry*" (Notification No. 2025-11). This guideline mandates that "occupational safety and health management costs must be separately stated in the construction contract," reflecting a legislative effort to formalize the budgeting and implementation of such expenses.

However, in actual practice, omissions and superficial inclusion of safety management costs remain prevalent. According to a 2023 subcontracting fairness perception survey jointly conducted by the Korea Management Construction Consulting Association (KMCCA) and the Korea Construction Association (KOSCA), approximately 34% of small-scale subcontracting contracts did not include safety costs as a clearly separated line item or simply bundled them under fixed overheads. Among the 11 categories related to unfair contract terms, all received lower perception scores than the overall average of 72.0, indicating a serious level of unfair subcontracting practices in these areas.

These findings highlight a significant gap between institutional intentions and field-level implementation, suggesting that the current legal framework and cooperative models often emphasize procedural formalities rather than practical enforcement. As such, there is a growing need for complementary measures to enhance the accessibility and effectiveness of safety cost regulations for small and medium-sized subcontractors.

Indicator	2023	2024	Change
Average Perception Score	67.9	72.0	▲ 4.1
Adjustment of Subcontract Prices	64.7	68.2	▲ 3.5
Appropriateness of Technical Data Requests	70.5	74.3	▲ 3.8
Timeliness of Payment	69.2	73.6	▲ 4.4

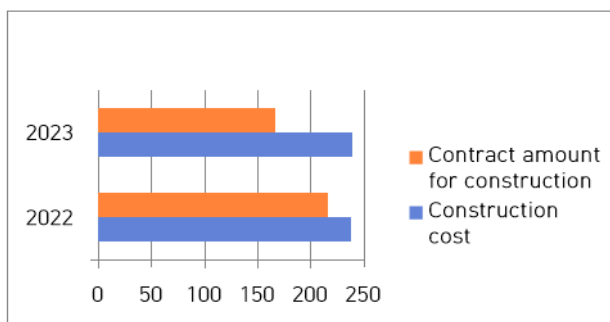
**Figure 1:** Key Indicators of Fair Trade Perception in Construction Subcontracting (2023–2024)

According to the 2023 *Construction Project Contract Statistics* published by Statistics Korea, the total value of construction work in South Korea reached KRW 359 trillion, reflecting a 4.7% increase (KRW 16 trillion) from the previous year. However, the total value of signed construction contracts declined by 12.1% (KRW 41 trillion)

to KRW 298 trillion. Among these, the building construction sector saw a particularly sharp decrease of 22.9%.

This contraction in construction budgets has intensified cost pressures across projects, leading to the prioritization of visible outputs while treating safety management costs as expendable. Safety expenditures are often the first to be cut, as they are structurally regarded as “non-productive costs” with no directly visible performance outcomes. This tendency is further exacerbated within multi-tiered subcontracting systems.

As a result, despite regulatory mandates regarding the inclusion of safety expenditures, the actual allocation for deploying safety personnel, providing training, and distributing protective equipment continues to shrink in practice. This persistent underfunding represents a fundamental obstacle to achieving meaningful safety outcomes at construction sites.



**Figure 2:** 2023 Construction Industry Survey Results – Project Performance Section (Statistics Korea)

### 3. Research Methods and Materials

#### 3.1. Analysis of Existing Institutional Frameworks and Cooperative Models

##### 3.1.1. Mandatory Estimation and Contractual Specification of Occupational Safety and Health Management Costs

A key institutional framework designed to ensure the allocation of safety manager expenses in the construction industry is the Ministry of Employment and Labor’s “Guidelines for the Estimation and Use of Occupational Safety and Health Management Costs in the Construction Industry” (Notification No. 2025-11). This regulation requires that occupational safety and health management costs be explicitly stated as a separate item within construction contracts. The objective is to prevent the

omission of safety-related expenditures and to establish a clear legal foundation for their inclusion.

This system functions as a legal and institutional basis that promotes greater transparency and systematic management of safety budgets in field operations. It encourages practical compliance with safety cost planning and execution, thereby enhancing both regulatory oversight and on-site accountability.

##### 3.1.2. Subcontract Price Indexation System

Implemented under the revised Subcontracting Act in 2023, the subcontract price indexation system allows for automatic adjustments to contract amounts when key input costs—such as raw material prices—fluctuate beyond a specified threshold. This mechanism is designed to alleviate the financial burden on subcontractors by ensuring that significant cost increases are reflected in contract compensation.

Although the system does not directly target safety-related expenditures, it provides a structural opportunity for occupational safety and health management costs to be more reasonably incorporated into overall construction budgets as they rise. As such, the indexation system serves as an important safeguard, enabling subcontractors to maintain a minimum level of safety investment even amid economic uncertainty on construction sites.

##### 3.1.3. Hyundai Engineering & Construction’s ‘50% Advance Payment of Safety Management Costs’ Cooperative Model

A representative example of a company-led cooperative model is that of Hyundai Engineering & Construction (Hyundai E&C). Since 2021, Hyundai E&C has implemented a policy of prepaying 50% of the safety management costs to its subcontracting partners at the project initiation stage, thereby encouraging the early recruitment and deployment of safety managers. This model serves as a practical initiative that enables small and medium-sized subcontractors, which often face liquidity constraints, to promptly commence safety management activities. It simultaneously facilitates the guarantee of safety-related costs and the improvement of safety standards on construction sites.

The model also encompasses key components such as safety manager recruitment, wage support, and safety training programs, making it effective in securing the actual costs associated with safety personnel. In addition, certain local governments and public institutions have introduced institutional incentives by incorporating subcontractors’ records of safety cost execution and safety personnel deployment into their evaluation criteria. This trend aligns

with the growing emphasis on ESG (Environmental, Social, and Governance) management, where safety is increasingly regarded not merely as a cost but as a critical indicator of corporate reliability and sustainability.

Collectively, the existing systems and cooperative models currently in place encourage the allocation and execution of safety management costs through diverse approaches. By combining stronger institutional foundations with voluntary corporate participation, these mechanisms demonstrate tangible potential for improving safety outcomes. The following section examines how these systems operate in practice, as well as the limitations they face, in order to propose directions for further improvement.

### 3.2. Limitations of Existing Systems and Directions for Improvement

While the current institutional frameworks and cooperative models provide a foundation for securing safety management costs, they exhibit several limitations in terms of enforcement and scalability.

First, although the legal requirement to specify occupational safety and health management costs in contracts is clearly stipulated, weak monitoring and enforcement mechanisms have rendered it largely a formality in many cases. This issue is particularly pronounced among small and medium-sized subcontractors, where insufficient understanding of the regulations and a lack of administrative support often result in omissions or underestimations of safety-related costs.

Second, the subcontract price indexation system permits automatic adjustments for cost fluctuations in raw materials or labor; however, it does not explicitly include safety management costs as a category. The lack of clarity in the adjustment formula, discrepancies in interpretation between contracting parties, and limited adoption of the system within the private sector all diminish its effectiveness.

Third, although cooperative models led by large corporations demonstrate successful implementation, they remain voluntary and therefore have limited potential for widespread industry adoption. Small-scale subcontractors and private construction projects often face financial and administrative constraints, making it structurally challenging to adopt similar initiatives.

To overcome these limitations, it is essential to strengthen monitoring mechanisms and establish tangible enforcement measures for ensuring compliance. Furthermore, safety management costs should be explicitly incorporated into the indexation system, and policy interventions should encourage its application across both public and private projects. Institutionalizing cooperative models and providing combined administrative and financial support for small and medium-sized

subcontractors would also help to broaden their implementation and ensure more equitable access to safety resources.

### 3.3. Proposal for a New Cooperative Model: Safety Cost Auto-Linkage and Guarantee Platform

#### 3.3.1. Introduction

Considering the structural challenges of the construction industry and the limitations of current regulatory frameworks, there is a pressing need to develop a new system that can effectively guarantee the costs associated with safety personnel. This study proposes a “*Safety Cost Auto-Linkage and Guarantee Platform*”. The platform is designed to automatically calculate safety management costs during the contract stage and integrate them into contractual documents. During the execution phase, it provides a comprehensive system for real-time tracking of expenditure records, settlement management, and monitoring of safety personnel deployment.

Although the concept of an “auto-linkage system” has not yet been codified into law, it is emerging as a potential policy solution in response to the growing adoption of smart safety equipment on construction sites and the need for more flexible applications of safety cost regulations. In particular, recent changes such as the increase in safety cost rates, the expansion of allowable expenditure categories, and the enforcement of the Serious Accidents Punishment Act highlight the necessity of a digital platform capable of linking regulations and on-site conditions in real time.

#### 3.3.2. Key Features

First, integrated platform management. The platform analyzes and integrates data such as project costs, safety management expenses, indirect cost ratios, and construction schedules in real time, linking them directly to on-site information. This enables project owners to establish effective safety budget allocation standards from the initial contract stage, while subcontractors can efficiently adjust their budgets and resources in response to changing conditions.

Second, automated safety cost linkage in contracts. From the bidding announcement and contract execution stages, safety management costs are automatically calculated and inserted as mandatory items in standard contracts. In the event of changes—such as schedule extensions, increased risk levels, or regulatory amendments—these costs are automatically adjusted, allowing immediate responses to evolving site conditions.

Third, certification of safety cost utilization. For the disbursed safety management costs, subcontractors are

required to upload details of the deployed safety personnel, activity logs, and training completion records to the system. The primary contractor reviews these submissions and grants certification marks, thereby structurally preventing false claims or misuse of safety funds.

Fourth, an enhanced incentive structure. Companies that actively participate in the platform and demonstrate exemplary safety cost management are granted advantages such as additional points in public tenders, priority in safety ratings, and improved evaluations in ESG (Environmental, Social, and Governance) assessments. This mechanism encourages voluntary participation and promotes a paradigm shift toward safety across the industry.

Fifth, linkage with education and technical support. Within the automated safety cost framework, the platform includes occupational safety training programs and financial support for the introduction of smart safety equipment as supplementary items. This allows small and medium-sized subcontractors to secure necessary funding for training and equipment procurement, which might otherwise pose a significant financial burden.

### 3.3.3. Expected Outcomes

First, the platform ensures the substantive guarantee of safety management costs. By automatically calculating safety budgets from the bidding stage and integrating them into contracts, sufficient safety funding is secured for subcontractors from the outset. This approach prevents ambiguous cost-shifting and budget reductions in advance.

Second, transparency and accountability are strengthened. As all records of safety cost disbursements and certifications are stored within the platform, real-time monitoring and post-audit tracking of payment histories become possible. This mechanism prevents inefficiencies such as unpaid safety costs, false claims, or duplicate invoicing, while also clarifying responsibilities between primary and subcontractors.

Third, it provides practical support for small and medium-sized subcontractors. For subcontractors with limited access to administrative systems or lacking professional expertise, the platform offers standardized safety management processes. Additionally, public-sector subsidies for training and safety equipment are provided, systematically enhancing their safety management capabilities.

Fourth, it contributes to improving safety standards across the entire industry. By promptly reflecting regulatory amendments and technological advancements through the platform, industry-wide safety trends can be quickly adopted and applied under consistent standards. This ultimately has a positive impact on preventing serious accidents and fostering a robust safety culture.

In this way, the *Safety Cost Auto-Linkage and Guarantee Platform* enables practical, site-oriented management of safety budgets and offers a digital solution to the systemic issue of cost-shifting inherent in subcontracting structures. Ultimately, it contributes to the prevention of major industrial accidents, the qualitative enhancement of occupational safety standards, and serves as a key foundation for the sustainable development of the construction industry.

## 4. Results and Discussion

This study identified that repeated cost-cutting practices within the subcontracting structure of the construction industry directly affect occupational safety and health management costs (OSHMC), particularly the deployment and training of safety managers. The structural cost reduction aimed at securing profit in multi-tier subcontracting systems often leads to the perception of essential safety management items as “invisible costs,” which in turn becomes a systemic problem that is closely linked to an increase in accident rates.

Existing legal and institutional measures, such as the “*Guidelines for the Estimation and Use of Occupational Safety and Health Management Costs in the Construction Industry*,” the subcontract price indexation system, and partial prepayment models initiated by major construction companies, have attempted to guarantee safety management costs based on this awareness. However, these measures still face limitations in terms of legal enforceability, effectiveness, and accessibility for small and medium-sized subcontractors. In practice, omissions, underestimations, and superficial contract documentation of safety costs are still frequently observed, with many cases failing to ensure the actual deployment and operation of safety managers.

To address these structural challenges, this study proposed the “*Safety Cost Auto-Linkage and Guarantee Platform*.” This platform automatically calculates and incorporates safety management costs from the initial contracting stage and ensures transparency and efficiency throughout the entire process by tracking and certifying expenditures in real time during execution. Moreover, by offering incentives to companies that comply with safety cost utilization and linking the platform with education and technical support programs, this model presents a practical pathway for improving safety management standards across the construction industry.

The proposed platform is not merely a technical solution but a structural transformation that redefines safety management costs as both an *investment* and a *shared responsibility*. By leveraging digital technologies and administrative systems, it provides a realistic operational



foundation for small and medium-sized enterprises (SMEs), thereby contributing to improved equity and sustainability in construction safety management.

Future research should focus on pilot implementation and empirical evaluation of this model to assess its effectiveness and institutional feasibility. Furthermore, strategies for its expansion to private projects should be explored, and collaborative efforts among various stakeholders will be essential for developing concrete execution plans.

## 5. Conclusions

This study examined how the subcontracting structure of the construction industry, characterized by multi-tiered cost reductions, directly affects occupational safety and health management costs (OSHMC) and the deployment of safety personnel. It was found that the systemic drive for profit within this structure often leads to the perception of essential safety expenses as non-essential or “invisible costs,” resulting in reduced safety measures and an increased risk of workplace accidents.

While current legal and institutional measures—such as the *Guidelines for the Estimation and Use of Occupational Safety and Health Management Costs in the Construction Industry*, the subcontract price indexation system, and cooperative initiatives like Hyundai Engineering & Construction’s advance payment model—have made meaningful attempts to guarantee safety budgets, these mechanisms remain limited in legal enforceability, field-level implementation, and accessibility for small and medium-sized subcontractors. As a result, omissions, underestimations, and superficial inclusion of safety costs persist, and the actual deployment of safety managers remains insufficient.

To address these challenges, this study proposed the *Safety Cost Auto-Linkage and Guarantee Platform*, a digital and integrated approach to ensure transparency and accountability throughout all phases of project execution. By automating the calculation and allocation of safety costs from the contracting stage and incorporating real-time monitoring, certification, and incentive mechanisms, this platform can effectively prevent cost-shifting and ensure adequate safety funding. It also provides practical support for smaller subcontractors by linking financial assistance with safety education and the adoption of smart safety equipment, thereby raising overall safety standards across the industry.

Ultimately, the proposed platform is not just a technical solution but a structural innovation that reframes safety management costs as an investment and shared responsibility rather than a discretionary expense. Through digitalization and policy integration, it offers a sustainable

pathway toward improving workplace safety, preventing serious industrial accidents, and fostering a robust safety culture. Future research should focus on pilot implementations and empirical evaluations of this platform, explore its applicability to both public and private projects, and develop concrete strategies in collaboration with diverse industry stakeholders to achieve broader adoption and long-term effectiveness.

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