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Study on the Improvement of Risk Assessment through Strengthening the On-site Operability of the Pre-work Safety Inspection Meeting (TBM) (Focusing on small and medium-sized construction sites)

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Abstract

Purpose: This study aims to improve the quality of risk assessment by strengthening the on-site operation of TBM (Pre-work Safety Inspection Meeting) at small and medium-sized construction sites. The purpose is to empirically analyze the effects of TBM system improvement on worker participation, risk factor awareness, and on-site inspection culture, and to derive effective settlement strategies. **Research design, data and methodology:** In-depth interviews were conducted using FGI (Focus Group Interview) with 30 managers and experienced workers at two construction sites (Company A and Company B) with a budget of less than 80 billion won. Discussions were induced on a total of eight questions focusing on differences before and after TBM improvement, risk assessment techniques, worker participation methods, and improvement ideas. **Results:** TBM participation rate increased from 50% to over 95%, and a worker-centered risk factor observation and confirmation culture was established. The recognition rate of priority grades before work increased, and risk assessment execution was improved through reflection on unintentional accidents and self-inspection among colleagues. **Conclusions:** TBM system improvement brought about positive results in all areas of risk assessment. In the future, quantitative effect analysis, reflection of psychological factors, and review of applicability to various scales of sites are necessary. Compensation, education, and publicity linkage strategies to induce worker participation should also be implemented.

Keywords : Industrial Safety and Health Act, legal responsibility, preventive measures, accident investigation procedures, legal education

JEL Classification Code : K23, L52, L74

1. Introduction

Industrial accidents in the construction industry continue to increase every year compared to other

industries, accounting for 42.6% of the total in 2020, up from 33.9% in 2008, as shown in Figure. 1.

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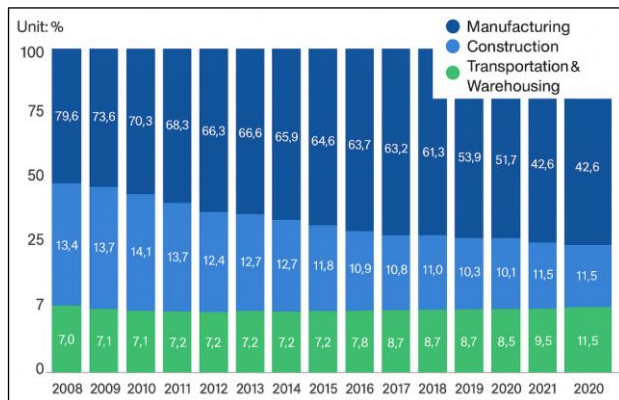


Figure 1: Changes in industrial accidents by industry(08~20)

Additionally, since 2016, it has surpassed manufacturing as the industry with the most industrial accidents. In the construction industry, where accident rates are high, it is recognized that special measures are necessary, and with the recent enforcement of the Serious Accident Punishment Act, each company is required to strengthen its safety management system. Perhaps due to such efforts, the accident rate has been decreasing since 2022, as shown in Figure 2.

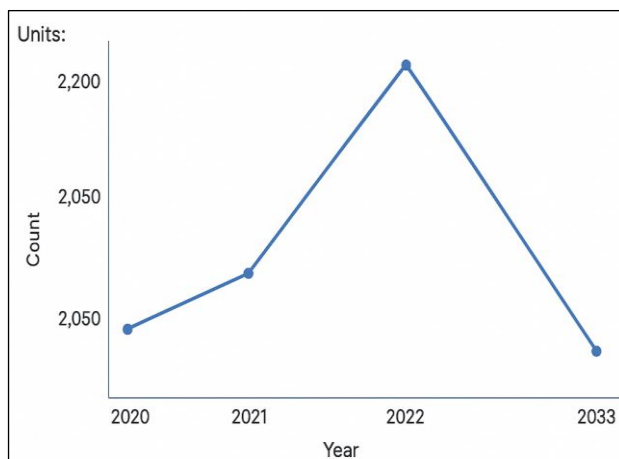


Figure 2: KOSIS National Statistical Portal Number of Deaths 2020-2023

However, this figure is based on large-scale construction sites where safety and health management systems can be established and sufficient investment in safety and health management is possible. Small-scale construction sites in particular still have a high risk of accidents due to a lack of safety management personnel, lack of education, and an increase in foreign workers. The pre-work safety meeting (TBM) is an important system

that can function as a practical accident prevention measure at these sites, but it has limitations such as being operated formally in many sites or having a low participation rate among all workers.

The purpose of this study is to improve the TBM system in small and medium-sized construction sites so that it can be practically operated on site and to empirically examine how much the risk assessment can be improved through this.

The core research questions are: First, what are the TBM system improvement measures that contribute to the substantiation of risk assessment? Second, how does the level of risk assessment change after the system improvement? Third, what are additional strategies to promote the effectiveness of these institutional reforms? To answer these questions, this study utilized the FGI technique to collect opinions from field experts and analyzed the relationship between the field operability of TBM and the effectiveness of risk assessment.

TBM is a safety meeting originally held before starting work at a construction site. As shown in Figure 3, Figure 4, it is a system that aims to prevent accidents by sharing work plans and recognizing risk factors through communication among workers by gathering in a circle.



Figure 3: Workers are working on the TBM.



Figure 4: Workers are working on the TBM.

The core of TBM is ‘worker participation’, and its importance is emphasized in that it enables the identification of actual risk factors and discussion of preventive measures on site. However, in the vast majority of sites, these TBMs are simply gathered in a designated meeting place, do light morning exercises, and then disperse after shouting commands such as “Okay, okay, okay,” etc., thus performing only formalities.

Risk assessment is a system specified in Article 36 of the Industrial Safety and Health Act, and employers are responsible for identifying hazardous and dangerous factors and establishing and implementing measures to reduce them. However, in the field, evaluations are mostly conducted by managers and supervisors, and worker participation is often done formally.

during work at industrial sites and establish safety measures.

- 2) TBM(Tool Box Meeting) : It is also called a pre-work safety meeting, and refers to a time to identify risk factors in advance and share safety measures before the work.
- 3) Hazardous factors : It can be explained by physical risk factors and pathological harmful factors.
- 4) FGI(Focus group Interview) : This is called a standard group interview method, and 25 to 30 target people were asked to answer questions about the problems and areas for improvement in this study.



Figure 5: Risk Assessment Reduction Roadmap Infographic 1

The need for linking TBM and risk assessment has been repeatedly raised in several previous studies, and in particular, it has been analyzed that worker-centered TBM plays an important role in securing the executable power of risk assessment. Based on this theoretical foundation, this study aims to present a plan to improve the TBM operation method in actual construction sites and confirm its effectiveness, thereby increasing the effectiveness of the system.

2. Literature Review

2.1. Definition of Terms

The definitions of terms used in this study are as follows.

- 1) Risk Assessment : It refers to a series of processes to identify in advance the hazards that may occur

2.2. Design of an optimal safety manual for small-scale construction sites based on quantitative risk assessment

Park Jun-ho (2014) presented a practical disaster prevention plan for small-scale construction sites using a risk assessment technique based on quantitative analysis. It was pointed out that the existing risk assessment system has limitations in field application due to its dependence on subjective interpretation and qualitative judgment, and as a way to improve this, an objective and scientific approach utilizing quantitative data was emphasized. The study derived risk levels for each type of work by utilizing multivariate regression analysis, factor analysis, and AHP (analytic hierarchy process), and based on these results, developed a practical safety work manual including administrative and technical measures. Afterwards, the effectiveness of the manual was verified by evaluating the suitability, usability, and satisfaction of the manual with a group of experts. This study demonstrates that a manual based on quantitative risk assessment can be utilized as a practical safety management tool centered on the field, and suggests that its effectiveness can be further enhanced when considering its connection with TBM (pre-work safety meeting). As a result, this study is evaluated as a case that secures the objectivity and effectiveness of risk assessment while establishing a foundation for improving the efficiency of safety management at small-scale construction sites through selection and concentration. Therefore, this study can be used as a theoretical basis for the organic linkage between TBM and risk assessment, and can make a practical contribution to the establishment of a safety management system tailored to construction sites in the future.

2.3. Ministry of Employment and Labor's TBM Guidelines

The Ministry of Employment and Labor (2023) emphasized the establishment of a 'self-discipline prevention system' with 'risk assessment' and 'pre-work safety inspection meeting (TBM)' as its core axes as an effective practical measure to reduce major accidents. This guide, based on the "Roadmap for Reducing Major Accidents" announced by the government in November 2022, suggests that a safe workplace can be created by having labor and management identify and eliminate risk factors in the field themselves and effectively communicate risks and response measures to workers through repeated TBM.

In particular, it is emphasized that for TBM to operate successfully, thorough prior preparation by managers and supervisors is necessary, and the key to this preparation is 'accurate knowledge and sharing of risk assessment results' for the relevant work. TBM is a short meeting-style activity that takes place about 10 minutes before work begins, but it is not a simple briefing; it serves as an important practical means of sharing risk factors among workers, reconfirming safety rules, and spreading a positive safety culture. In addition, TBM should be structured as a 'safety dialogue' centered on the voluntary participation and mutual discussion of workers, rather than a simple transmission, and should be structured as a process of identifying and discussing countermeasures for hazardous and risk factors that were not previously identified, as well as the results of risk assessments derived in advance. These activities are systematized in the "Stop – Look – Assess – Manage (SLAM)" manner, and workers are encouraged to check their own safety status, wear necessary protective gear, identify abnormal signs, and prepare risk response measures in advance.

Ultimately, the Ministry of Employment and Labor asserts that it is important to promote safety awareness among workers through the organic linkage of risk assessment and TBM through this guide and to establish a practical, field-centered prevention system. This can be used as a practical theoretical basis for establishing a foundation for future on-site safety culture and designing an effective implementation system to prevent major accidents.

3. Main Body

3.1. TBM Concept and Characteristics

TBM is a term that originated from the construction industry. It refers to an activity in which workers gather

around a supervisor at a work site with a tool box nearby before starting work to mutually confirm and discuss the content and safety of the work. The Tool Box Meeting (TBM) conducted before starting work is very important for preventing safety accidents, and is very effective in confirming safe work methods, thoroughly observing safety rules and work sequences, and continuously raising safety awareness. TBM consists of an introduction stage where workers greet each other, an inspection stage where workers check their health, clothing, protective gear, and hand tools, a work instruction stage where each person is instructed on the content and duties of their work, a risk prediction stage where risk factors for the work to be done that day are identified and potential safety accidents are predicted and announced, and a confirmation stage where the greatest risk factors are reaffirmed, countermeasures are determined, and these are confirmed as common goals for the team.

There are some things that must be kept in mind when performing TBM. First, the near-miss accident experience and anticipated risks related to the work must be discussed. Second, when performing the work based on this, the related risks must be predicted and safe work must be performed. Third, the manager and supervisor must create an atmosphere in which the entire team participates and each individual actively speaks. Fourth, all workers must participate in the discussion so that no one is left out. Fifth, the results of the discussion must be summarized and a common behavioral goal for all workers must be set. TBM is usually best done 10 minutes before work in the morning, and as a rule, it should not exceed 30 minutes because longer time can interfere with concentration. Since tension can be relieved after lunch, ideal results can be expected if TBM is performed once more after the meal. TBM is best done with no more than 10 people to suit small groups, and 5-7 people are considered optimal. The meeting place is best near the work site, and it proceeds by forming a circle. The important thing to note here is that everyone should actively and autonomously participate, think for themselves, and act on their own, rather than one-sided orders or instructions from managers and supervisors.

The reason for carrying out these TBMs is not because workers lack knowledge, but because they often forget even the most basic safety sense when they are absorbed in their work, so we want to remind them of this once again. German psychologist Ebbinghaus reported that 56% of the knowledge learned was forgotten after an hour, 66% after a day, and 79% after a month. In order to prevent this forgetting phenomenon, a conscious effort is needed to transfer information stored in short-term memory to long-term memory, and this is called rehearsal. TBM is very effective in identifying possible risks in advance, deriving

safe working methods, and preventing human errors due to forgetting.

3.2. Risk Assessment Concepts and Characteristics

Risk assessment refers to ‘a series of processes to identify workplace hazards and risk factors, determine the likelihood and severity of disease or injury, estimate them, and establish and implement reduction measures.’ The risk assessment consists of two parts. First, the employer must identify hazards and risks caused by machinery, equipment, structures, gas, heavy equipment, raw materials, dust, and workers’ work behavior or other work, and evaluate whether the level of risk that may lead to illness or injury is within an acceptable range. Based on the results, the employer must take measures in accordance with this Act and orders issued under this Act, and take additional measures if necessary to prevent risks or health damage to workers. Second, employers must involve workers at the relevant workplace in the risk assessment according to the standards set forth and announced by the Minister of Employment and Labor. In other words, as society gradually develops, potential risks increase and the possibility of industrial accidents increases, so risk assessments must be conducted in advance to prevent and respond to industrial accidents, and activities to identify the causes of risks and manage those factors must be carried out simultaneously.

The use of equipment, machinery, tools, etc. required for on-site work, equipment with a possibility of exposure when working in a certain work environment, machine defects and unstable working conditions, worker errors, etc., can be the cause of diseases and accidents, and create the possibility of diseases and accidents. In addition, since changing the method of working procedures for equipment and machinery can control the level of risk exposure, it can be said that dividing priorities and implementing improvements is a key task of risk assessment.

The concept of risk assessment includes the discovery of hazardous risk factors, risk estimation, risk determination, and measures to reduce risk. Therefore, the obligation to conduct a risk assessment should be interpreted as an obligation to carry out measures to reduce risk assessment.

Overseas, the EU adopted Council Directive 89/391/EEC in 1989 to secure and improve safety and health in member countries, devised the Guide on risk assessment at work (1996), and announced ‘OIRA’ in 2011 as a risk assessment support system to secure safety in small and medium-sized businesses.

3.3. Risk Assessment Status Survey

The results of a survey on awareness of risk assessment conducted on 191 workers who participated in online and offline surveys over a period of approximately two months are summarized and organized in Table 1.

Table 1: Regularity of risk assessment

	Response	%
I do it every year	107	56.0
I've never done it (or I don't know)	57	29.8
I do it irregularly.	16	8.4
I did it only once.	11	5.8
total	191	100.0

When asked whether they had ever conducted a risk assessment, 56% responded that they ‘conducted it regularly every year,’ while about 30% responded that they ‘never did it or did not know.’ When asked why they had never conducted a risk assessment, about half of the respondents said, “Because I didn’t know much about the risk assessment system,” and about a quarter said, “Because neither workers nor employers knew much about whether risk assessments should be conducted.” This suggests that both workers and employers need to raise awareness of the risk assessment system.

Table 2: Why I've Never Done a Risk Assessment

	Response	%
I don't know about the risk assessment system	26	48.1
It is unclear whether both workers and employers are required to conduct risk assessments.	13	24.1
There is no agreement between labor and	7	13.0

management on how to perform work.		
The workers demanded it, but the company did not implement it.	5	9.3
etc	3	5.6
total	54	100.0

3.4. What it Suggests

When summarizing the results of the above risk assessment status analysis, the current risk assessment itself is one of the new safety systems in most construction sites, and the workers who are actually involved in the accident are hardly participating. However, the main cause of accidents such as near-misses and falls that occur at construction sites is a problem with mental and psychological strategies that fail to pay proper attention to safety due to excessive focus on work, and it can be estimated that mental factors such as excessive work, job stress, and workplace bullying, which are currently almost eliminated, have a significant negative impact on a stable mental and psychological state suitable for safe work. Therefore, risk assessments performed in the construction industry in the future should first make the system as familiar as possible and shorten the application period in daily work sites as much as possible, and risk assessments need to be applied in an environment where psychological bonds and safety-related interactions occur among workers. Therefore, it can be assumed that the TBM focused on in this study is a very suitable means for establishing safety assessments in the construction industry.

3.4. Research Methods.

This study improved the existing popular TBM method of gathering at a safety inspection center and then holding a small group meeting after doing morning exercises to a TBM method where workers do not move to the safety inspection center but go straight to each worksite location, directly inspect the site under the direction of a manager or supervisor, and have the work supervisor directly do stretching, find risk factors in the site, and communicate precautions. The results were then confirmed with the managers and work supervisors (workers) of each of Companies A and B.

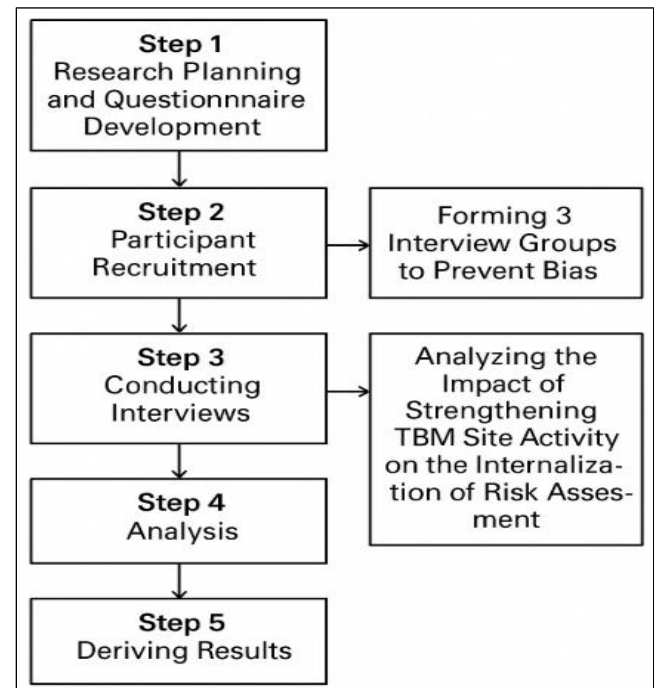


Figure 6: Design of the research model

In order to increase reliability and obtain quantitative results, the FGI (Focus Group Interview) technique was applied and 30 people in total were interviewed: 20 general and subcontracting managers and supervisors from Company A and Company B, and 10 workers with more than 10 years of experience. The interview covered a variety of topics, including TBM's existing operating methods, changes following the institutional reform, risk assessment practices, and worker participation. The names of the participants and the names of their respective agencies have been anonymized, and the composition has been balanced by considering age groups, occupations, and experience.

The FGI questions were structured around the following topics: ① How is worker participation applied to risk assessment after system improvement? ② What are the successful TBM system improvement items? ③ What are the improvement measures that need to be supplemented? ④ What are the risk assessment techniques used in the field and their problems? ⑤ What are the ways to induce worker participation? ⑥ What is the impact of TBM on risk assessment? ⑦ What are the key means for deriving potential risk factors? ⑧ What are other ideas for improving the TBM system?

Table 3: FGI Questionnaire Sample

No	Question content
1	How do you incorporate worker participation into risk assessments after

	system improvements in your field?
2	Please feel free to tell us what you think is good about the current TBM system improvement plan.
3	Please tell us about any parts of the current TBM system improvement plan that you think need improvement or are incorrect.
4	Please tell us freely about the risk assessment techniques and issues you are using in your field.
5	How can workers participate in risk assessments?
6	How do you think TBM will impact risk assessment?
7	Potential hazards. What do you think is the most important way to identify hazards?

Thirty people who agreed to the FGI were selected from among the managers and supervisors of the general contractors and subcontractors, and workers with more than 10 years of experience at Companies A and B, and 10 people each were selected to participate in three focus groups. To ensure smooth progress of the interview, one interview expert from an FGI specialized agency assisted the researcher in participating in the FGI, and audio and video recordings were conducted with the consent of the participants. To ensure smooth group interviews, a conference room suitable for all participants, an interviewer, and an assistant was reserved and prepared, and the interview time was announced to each group. Before the meeting began, the researcher and the interviewer's assistant conducted a pre-meeting to prepare for the group interview so that it could proceed in a comfortable atmosphere. Before starting the interview, a consent procedure related to the study was conducted, and the seating arrangement was centered around the moderator so that all interview participants faced the moderator, in an attempt to increase focus and intimacy between the moderator and the participants.

The assistant recorded and transcribed the participants' expressions, behaviors, and emotional responses from the facilitator's perspective. The interview was conducted in a way that allowed participants to freely express their opinions in response to the facilitator's questions, and was conducted naturally so that other participants could agree or disagree with them. Based on the recorded field notes and recordings of the interviews, the interview content for each group was organized into a draft of field notes, and after review, this draft was revised according to the reviewer's recommendations and finally completed as research data.

4. Conclusion

4.1. Analysis and Results

Analysis of data collected through FGI showed that improvements to the TBM system had a positive effect on the practical implementation of risk assessment. First, after the system improvement, the participation rate of TBM increased to over 90% in all groups, and this result confirmed that the previous simple delivery-oriented meetings had changed to a format in which workers actively participated. Participants responded that improved TBM operation methods make a substantial contribution to ensuring safety by recognizing risk factors in advance before work and conducting repeated verification activities with colleagues.

In particular, changes were noticeable in the following areas:

- ① Increased participation rate: The existing TBM participation rate was around 50%, but after the system was improved, it increased to over 95%.
- ② Raising risk awareness: Prior awareness of the priority levels of risk assessment prior to starting work has improved, which has led to a strengthened attitude toward accident prevention.
- ③ Improved risk factor observation ability: A culture has been established in which workers directly observe on-site conditions, identify risk factors, and reflect them in the next TBM.
- ④ Activation of peer inspection: The process of workers autonomously checking whether they are wearing personal protective equipment (PPE) and the condition of tools has been regularized.

4.2. Conclusion and Suggestions

This study analyzed the impact of improving the TBM system on the substantiation of risk assessment, focusing on small and medium-sized construction sites. According to the FGI results, improved performance was achieved in all aspects including TBM participation rate, risk factor awareness, and self-inspection culture, suggesting that it is functioning as a key mechanism to increase the effectiveness of risk assessment. However, rather than simply expecting voluntary participation from workers, it is expected that greater effectiveness will be achieved if measures such as reward systems, education reinforcement, and promotion linkages are also presented to encourage autonomous participation from workers.

This can also be utilized as a practical strategy for establishing TBM. In addition, including factors that are currently overlooked in risk assessments, such as mental stress, fatigue, and communication problems, in conjunction with TBM was suggested as an important direction for future system development.

4.3. Limitations of the Study and Future Research.

This study targeted specific small and medium-sized construction sites, such as Company A and Company B, and has limited applicability to large-scale plant or civil engineering sites. In addition, the number of participants in the FGI survey was relatively limited at 30, and it did not cover causal analysis with numerical safety. Future research is needed to quantitatively analyze how much the improvement of the TBM system actually contributes to reducing industrial accidents at various types of construction sites, and the evaluation framework needs to be improved so that mental health factors and language barriers can be reflected as sophisticated indicators.

References

- Lee, S.-Y., Yoo, J.-H., & Lee, K.-H. (2021). A study on the change of in-flight service according to travelers' risk perception in the COVID-19 pandemic situation: Using the FGI technique. *Hotel Management Research*, 30(7), 183–200.
- Lee, S.-w., Han, I.-i., Jang, A.-s., & Jeong, J.-h. (2020). *A study on the current status of risk assessment and activation measures*. Democratic Labor Institute.
- Ministry of Employment and Labor. (2017). *Risk assessment interpretation guidelines*.
- Ministry of Employment and Labor. (2022). *Industrial accident status*.
- Moon, S.-h. (2004). Factor analysis of industrial accident occurrence. *Social Welfare Policy*, 20, 155–169.
- Park, J.-h. (2014, February). *Optimal manual design for safety work at small-scale construction sites based on quantitative risk assessment*.