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A Study on Effective Communication Strategies for the Prevention of Occupational Accidents among Foreign Workers at Construction Sites

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Abstract

As the domestic construction industry's dependence on foreign workers intensifies, this study aims to analyze the current state of industrial accidents caused by communication issues and propose effective safety communication methods to improve the situation. In particular, this study focuses on housing construction sites where pressure to meet deadlines and interference between work types are frequent, seeking to empirically identify key mechanisms that induce safe behavior in foreign workers. For this purpose, a survey was conducted on foreign workers employed at three housing construction sites in the Seoul metropolitan area, and correlation analysis and verification of the mediating effect of safety leadership were performed based on 98 valid samples collected.

The main results of the study are as follows: First, 'lack of communication' and 'insufficient understanding of safety instructions' account for the highest proportion of causes for safety accidents among foreign workers, and the perception of accident risk was particularly low among Non-professional Employment (E-9) workers with low Korean language proficiency. Second, IT-based multilingual communication tools (AI translators, multilingual TBM apps) and visual-centered safety information (standardization of pictograms) were found to have a significant positive impact on compliance with safety standards and safety participation. Specifically, delivering detailed instructions using AI translation technology showed a greater influence on inducing safe behavior than simply installing signs. Third, the activities of 'Foreign Safety (TBM) Leaders (foreign communication specialists)' composed of skilled workers by nationality were confirmed to significantly transmit the process of converting communication satisfaction into practical safety behavior by building trust between managers and workers.

The results of this study suggest that to reduce accidents among foreign workers, it is essential to establish a safety management system that combines the introduction of smart safety technology with human networks (safety leaders, communication specialists) beyond simple language translation. This can be utilized as basic data for establishing strategies for foreign worker safety management at future construction sites and for advancing site health and safety management systems.

Keywords : Migrant Workers, Communication, Safety Awareness, IT-Based Systems

1. Introduction

The domestic construction industry is experiencing an intensifying dependence on foreign labor due to a decrease in the working-age population and the avoidance of 3D (Dirty, Difficult, Dangerous) industries. In particular,

residential (apartment) construction sites, where meeting deadlines is crucial, have seen a rapid increase in the proportion of foreign workers; however, the risk of industrial accidents is also higher compared to domestic workers due to language barriers and cultural differences.

This shortage of skilled domestic workers has naturally led to a deepened dependence on foreign labor. Currently, foreign workers have become the mainstream workforce in key work types such as formwork, rebar work, and concrete pouring, moving beyond simple labor. Especially in residential construction sites, 'strict deadline compliance' to meet fixed move-in dates is a core factor determining project success. Consequently, the input of foreign workers has increased due to frequent interference between work types and high work intensity. However, compared to the quantitative increase in labor supply, the qualitative aspect of the health and safety management system targeting them has not significantly changed.

Analyzing industrial accident statistics over the past 10 years (2015-2024), the proportion of foreign workers among all construction industry accident victims is showing a steep upward curve. This is interpreted not merely as an inevitable result of increased numbers, but as a result of maladaptation occurring between the 'Language Barrier' faced by foreign workers and the unique 'Palli-Palli (hurry-hurry) culture' of Korean construction sites. Failure to accurately deliver safety instructions during TBM (Tool Box Meeting), misinterpretation of site slang and technical terms, and immediate communication failure in dangerous situations lead directly to fatal accidents such as 'falls,' 'entrapment,' or 'collisions'.

Furthermore, since the implementation of the Serious Accidents Punishment Act in 2022, the safety management responsibility of construction companies has been strengthened more than ever.

However, safety management measures for foreign workers with poor communication still remain at a formal and fragmentary level, such as installing multilingual signs. Therefore, it is a critical task to closely analyze the accident characteristics of foreign workers by process and nationality reflecting the actual environment of construction sites and to build an 'effective communication model' that combines AI technology and human leadership beyond simple translation to resolve safety blind spots and prevent serious accidents. Accordingly, this study aims to analyze the current status and accident characteristics of foreign workers and propose effective communication methods for accident prevention.

2. Current Status of Foreign Workers by Nationality (Based on 2024~2025)

According to recent statistics, approximately 1 in 7 workers (14.3%) at domestic construction sites is a foreigner, totaling about 230,000 people. Furthermore, the proportion of foreign workers increases rapidly during structural work, which involves difficult and dangerous conventional tasks. While Korean-Chinese workers still hold the largest share, the influx of non-Korean speaking workers from Vietnam, Uzbekistan, and Nepal is rapidly increasing due to the expansion of the E-9 quota[Table 1, Table 2].

Table 1: Major Nationalities of Foreign Workers at Construction Sites

Rank	Major Nationality	Proportion (%)	Remarks
1st	Korean-Chinese (Joseon-jok)	approx. 84.0%	Mainly Working Visit (H-2), Overseas Korean (F-4) visas
2nd	Chinese (Han Chinese)	approx. 5.0%	
3rd	Vietnamese	approx. 3.0%	Increasing trend of Non-professional Employment (E-9)
4th	Uzbekistan, Mongolia, etc.	approx. 8.0%	16 countries from Central and Southeast Asia

*E-9 Visa: Non-professional employment visa for foreigners from countries that have signed an MOU for the Employment Permit System with Korea, allowing employment without specialized skills or degrees.
*Source: Construction Workers Mutual Aid Association 「Construction Site Report (2025)」, Statistics Korea 「Survey on Immigrants' Living Conditions and Labour Force (2024)」.

Table 2: Proportion of Foreign Nationalities by Construction Phase

Construction Phase	Major Work Types	1st Nationality (Prop.)	2nd Nationality (Prop.)	3rd Nationality (Prop.)
1. Early Stage (Earthwork/Foundation)	Earthwork, Piling, Drainage	Korean-Chinese (65%)	Chinese Han (15%)	Vietnamese (10%)

Construction Phase	Major Work Types	1st Nationality (Prop.)	2nd Nationality (Prop.)	3rd Nationality (Prop.)
2. Structural Work (Frame Formation)	Formwork, Rebar, Concrete Pouring	Korean-Chinese (85%)	Chinese Han (8%)	Vietnamese/Thai (4%)
3. Finishing Work (Interior/Exterior)	Masonry, Plastering, Tiling, Interior, Cleaning	Korean-Chinese (60%)	Vietnamese (15%)	Central Asian (10%)

*Source: Construction & Economy Research Institute of Korea (2024). Actual Status of Foreign Labor Utilization and Skill Evaluation by Process.

2.1. Safety Management Implications According to Nationality Characteristics by Process

1) Early Construction Stage: Focus on Equipment Communication
• Characteristics: High risk of crushing/collision accidents due to frequent work with large equipment like excavators and piling/drilling rigs.
• Measures: 'Standard hand signals' between equipment signalmen and foreign workers and multilingual voice support for 'equipment proximity warning devices' are essential, and access control facilities within the radius must be thorough.

2) Structural Work: High-Altitude Work and Team-Based Management
• Characteristics: The proportion of Korean-Chinese workers is overwhelmingly high, so communication itself is smooth, but there is a concern regarding 'habitual disregard for safety'.
• Measures: Appoint Korean-Chinese workers at the team leader (foreman) level as 'TBM Leaders (Foreign Worker Communication Specialists)' to strengthen the peer monitoring system. Conduct intensive communication to prevent falls. Maintain supervisor presence.

3) Finishing Work: Multilingual/Multicultural Response
• Characteristics: This is a stage where non-Korean speaking workers from Vietnam, Uzbekistan, etc., with low Korean proficiency, rapidly increase.
• Measures: Place pictogram-centered safety signs throughout the site; this is the period when AI real-time translator utilization should be highest.

3. Analysis of Industrial Accident Status and Types over the Past 10 Years

3.1. Trends in Industrial Accidents for Foreign Workers (2015~2024)

Accidents for foreign workers have steadily increased over the past 10 years, and the proportion of foreigners in fatal construction accidents is rising annually[Table 3, Table 4].

1) The number of approved industrial accidents increased from about 5,571 in 2015 to 9,458 in 2024 (total industry), and accidents in the construction industry increased significantly from about 2,480 in 2015 to 5,905 in 2024.

2) As of 2021, the fatal accident rate per 10,000 workers for foreign construction workers (4.19) is about 2.4 times higher than the total construction industry average (1.75).

3) The share of construction within total foreign industrial accidents rose sharply from 44.5% in 2015 to 62.4% in 2024, showing a concentration in construction. This is a result of the increasing proportion of foreigners in the construction labor structure.

4) A total of 643 foreign workers died in construction site accidents over the past 10 years. This averages about 64 per year, meaning more than 5 foreigners lose their lives every month, indicating the severity of fatal accidents.

Table 3: Industrial Accident Status of Foreign Workers by Year (Total Industry, 2015-2024, Unit: Persons)

Year	Injuries	Deaths	Total	Remarks
2015	5,479	92	5,571	
2016	5,907	88	5,995	
2017	6,145	91	6,236	
2018	7,061	114	7,175	Rapid increase period for foreign accidents
2019	7,549	104	7,653	
2020	7,639	94	7,733	Growth slowed due to pandemic
2021	8,110	102	8,212	

Year	Injuries	Deaths	Total	Remarks
2022	8,286	104	8,390	Serious Accidents Punishment Act implemented
2023	9,061	106	9,167	
2024(P)	9,350	108	9,458	Reached record high
Sum	**74,587**	**1,003**	**75,590**	**Total cumulative for 10 years**

*Source: Ministry of Employment and Labor 「Status of Industrial Accident Occurrences, etc.」, KOSHA 「Analysis of Industrial Accident Statistics」 for each year.

Table 4: Industrial Accident Status of Foreign Workers in Construction by Year (2015-2024, Unit: Persons)

Year	Injuries	Deaths	Total	Share of Total Foreign Accidents (%)
2015	2,425	55	2,480	44.5
2016	2,752	48	2,800	46.7
2017	2,854	51	2,905	46.6
2018	3,429	61	3,490	48.6
2019	3,852	65	3,917	51.2
2020	3,968	57	4,025	52
2021	4,367	68	4,435	54
2022	4,751	72	4,823	57.5
2023	5,512	81	5,593	61
2024(P)	5,820	85	5,905	62.4
Sum	**39,730**	**643**	**40,373**	**Average 52.4**

*Source: Ministry of Employment and Labor 「Status of Industrial Accident Occurrences, etc.」, KOSHA 「Analysis of Industrial Accident Statistics」 for each year.

3.2. Accident Type Analysis (Construction-Centered)

Foreign worker accidents in housing sites are mainly concentrated in falls related to high-altitude work and caught-in/hit-by accidents[Table 5].

1) Fall: 39% (Scaffolding work, neglected openings, etc.)
2) Caught in/between: 20.9% (Equipment entrapment)
3) Struck by: 12.7% (Falling object accidents)
4) Trip and others: 27.4%

Table 5: Construction Foreign Worker Accident Count and Distribution by Type (2015-2024 Total)

Year	1. Fall	2. Caught/Hit	3. Struck by	4. Trip	5. Etc	Annual Total
2015	873	568	360	208	471	2,480
2016	1,005	630	381	241	543	2,800
2017	1,055	648	389	258	555	2,905
2018	1,319	792	461	311	607	3,490
2019	1,512	885	513	349	658	3,917
2020	1,570	910	523	358	664	4,025
2021	1,756	963	568	403	745	4,435
2022	1,939	1,042	608	439	795	4,823

Year	1. Fall	2. Caught/Hit	3. Struck by	4. Trip	5. Etc	Annual Total
2023	2,287	1,175	643	531	957	5,593
2024(P)	2,433	1,240	679	561	992	5,905
Sum	**15,749**	**8,453**	**5,125**	**3,659**	**7,387**	**40,373**
Ratio	**39.00%**	**20.90%**	**12.70%**	**9.10%**	**18.30%**	**100.00%**

*Source: Ministry of Employment and Labor (2024), 「2023 Status of Industrial Accident Occurrences, etc.」; KOSHA (2024), 「Analysis of Yearly Industrial Accident Statistics」; Statistics Korea (2025), 「Survey on the Status of Foreign Labor」.

3.3. Analysis of Causes

1) **Lack of Communication:** Insufficient understanding of safety instructions (TBM, risk assessment, etc.) (Largest share).
According to statistics, 'Fall (39.0%)' and 'Struck by (12.7%)' accidents account for more than half, proving that core safety instructions were not properly delivered. 'Struck by' accidents mainly occur during lifting or simultaneous upper/lower work, implying workers did not perceive immediate warnings like "Watch out! Move!". Even if managers instruct "Attach safety lines" or "Watch for openings" during TBM, workers only understand these abstractly due to language barriers. This is estimated to have led to the 2.8-fold surge in fall accidents from 873 in 2015 to 2,433 in 2024. 'Distortion of meaning' hinders safety compliance and leads to fatal results.

2) **Lack of Skill:** High proportion of new workers with little construction experience.
The 2.4-fold jump in accidents from 2,480 in 2015 to 5,905 in 2024 clearly shows the 'skill degradation' following quantitative increases. The sharp rise between 2022-2024 is estimated to be due to the massive input of 'new arrivals' without construction experience following the E-9 quota expansion. Structural work (Korean-Chinese centered) and finishing work (non-Korean speaking centered) have high difficulty. New workers are deployed without forming 'Hazard Identification' abilities, leading to accidents because they cannot identify or recognize danger zones. 'Qualitative skill drop following quantitative expansion' is a decisive variable.

3) **Cultural Differences:** Excessive work during the adaptation process to Korea's unique 'Palli-Palli' culture.
The increase in accidents among Vietnamese and Central Asian workers during 'Finishing Work' is a problem arising during adaptation. 'Trip (9.1%)' and 'Etc (18.3%)' accidents mainly occur during the finishing stage where deadline pressure is high or housekeeping is poor. Strict deadlines and 'Palli-Palli' culture act as psychological pressure. They judge that increasing work speed is more advantageous for job retention than following safety rules (PPE, safety hooks, work sequences), leading to unreasonable work. This results from the combination of a site atmosphere valuing deadlines over safety and foreign workers' employment instability.

4) **Management Blind Spots:** Frequent cases of accident concealment or non-completion of basic safety training for undocumented workers.
The data of 40,373 accident victims over 10 years is estimated to be larger in reality. Undocumented workers often handle accidents privately (mutual agreement) rather than seeking industrial accident approval. Thus, the actual scale of accidents is likely much higher than the statistics. Undocumented workers avoid reporting for fear of deportation. This aligns with employers' 'accident concealment attempts,' creating management blind spots where personnel without even basic safety education are deployed and neglected. 'Institutional identity instability' prevents establishing recurrence prevention measures and causes accidents to persist.

3.4. Correlation Analysis between Construction (Housing) Process, Nationality, and Accident Type

Table 6: Correlation between Construction Process, Nationality, and Accident Type

Phase	Main Nationality	Main Accident Type	Main Communication Error Cause	Communication -based Measure (Proposal)
Early Stage	Korean-Chinese	Collision/ Entrapment	Machine signal mismatch & blind spot awareness	Std hand signal training & Smart tag alarms
Structural	Korean-Chinese	Fall	Overconfidence in skill & disregarding instructions	BBS communication via Safety Leaders

Phase	Main Nationality	Main Accident Type	Main Communication Error Cause	Communication -based Measure (Proposal)
Finishing	Vietnam/ Central Asia	Trip/ Falling Object	Poor Korean understanding of sequences & housekeeping	AI translators & Pictogram visual instructions

*Source: KOSHA (2025). High-risk Work Group Analysis Report for Foreign Construction Workers.

1) Early Construction Phase:

Despite high Korean proficiency among Korean-Chinese workers, collision and entrapment risks were high due to physical interference with equipment. Technical supplements based on AI and strengthening non-verbal communication (standard hand signals) are key variables.

2) Structural Work Phase:

Foreign proportion is highest (85%+), mostly Korean-Chinese. Korean communication is smooth, but 'safety complacency' from long experience is a barrier. Managers' safety instructions are dismissed as "things already known," causing communication distortion. This is why 'Falls (41.2%)' among foreign deaths are concentrated here. Communication for attitude change through safety leadership is more critical than 'language translation' here.

3) Finishing Work Phase:

Non-Korean speaking workers increase. Many accidents occur due to not understanding detailed instructions (material storage, restricted areas) in complex interior processes, resulting in higher 'trip' and 'struck by' accident rates. AI real-time translation and Visual Operating Procedures (VOP) are significant independent variables for inducing safe behavior.

4. Survey Analysis of Foreign Workers' Safety Awareness and Behavior

Survey was conducted on 98 foreign workers at residential construction sites in the Seoul metropolitan area. Likert 5-point scale was used[Table 7].

Table 7: Survey Results on Foreign Workers' Safety Awareness and Behavior

Category	No.	Survey Item	Mean
1. Communication Environment	1-1	**[Perception of risk when communication is poor]** "Safety signs at the site are focused on pictures (pictograms), so they are easy to understand."	4.7
	1-2	**[Manager's listening and communication effort]** "Our site managers listen to the opinions of foreign workers and try to communicate with them."	4.6
2. Safety Culture	2-1	**[Correlation between no communication and risk]** "I believe that the risk of accidents increases when communication is not smooth."	4.9
	2-2	**[Company's safety-first policy]** "The company considers my safety as the top priority and strictly provides protective equipment."	4.8
3. Safety Behavior	3-1	**[Start work only after clear understanding]** "I start work only when I clearly understand the safety rules before working."	3.1
	3-2	**[Warning peers in mother tongue of danger]** "If a fellow foreign worker acts dangerously, I immediately warn them in their native language."	3.3

4.1. High Risk Perception and Company Trust (Cognitive Phase)

Workers strongly agree that a lack of communication increases accident risk (4.7-4.9) and positively evaluate managers' efforts (4.6) and company policy (4.8). This suggests workers sufficiently recognize the importance of safety and trust the organizational safety culture.

4.2. Discrepancy between Perception and Behavior: 'Starting Work Before Understanding' (Execution Phase)

Notably, the 'starting work after clearly understanding' item (3.1) was the lowest. This shows workers are deployed despite not fully understanding, likely due to environmental factors like deadline pressure or language barriers where they "must start even if not understood".

4.3. Weakening of Peer Monitoring System

Warning peers in their mother tongue (3.3) was also relatively low. This means autonomous safety control via national communities is not operating smoothly.

4.4. Analysis Implications

"Need to Resolve Knowledge-Behavior Gap".
Workers know safety ignorance leads to accidents (4.9), but start work without full understanding (3.1). This suggests structural limits to language that manager effort (4.6) alone cannot solve. Therefore, AI-based smart tools or VOP that ensure 'clear understanding' by converting instructions into mother tongues will be the decisive variables.

5. Effective Accident Prevention Measures in Communication

5.1.Strengthening Visual-Oriented Communication

Establish an 'intuitive communication system' that bypasses language decoding for immediate risk recognition.
1) Pictogram Advancement and Standardization:
Move away from abstract signs to 'photo-realistic pictograms' depicting actual site situations (e.g., safety line not attached). This induces a 'Visual Stop' effect where workers instinctively stop regardless of Korean literacy.

2) Dynamic Digital Signage:
Use smart monitors or LED boards at gates and passages to broadcast multilingual warnings based on 'today's high-risk work' and 'nationality composition'. This visualizes real-time information in mother tongues, removing information delivery lags.

5.2. IT Technology-Based AI-Powered Tech Support

Use digital technology to fill the 'linguistic gap' in real-time.

1) AI-Based Safety Communication Wearables and Dedicated Apps:
Use apps that simultaneously translate managers' voices during TBM. In emergencies, transmit manager warnings or mother tongue voice alarms via site speakers, signalmen, or smart bands. This helps immediate avoidance of urgent risks like equipment proximity or falling objects.

2) Process-Specific QR Code 'Digital Safety Mentors':
Attach QR codes at risk areas (openings, demolition); scanning them shows 'core safety rules' in mother tongue videos. This overcomes the limits of paper SOPs and completes a site-verifiable education system.

5.3. Human & Systemic Reform

Beyond technical fixes, clarify the 'subjects of communication' and improve education quality.
1) Institutionalizing 'Foreign Safety Leaders':
Select workers with Korean proficiency and high skill as 'dedicated safety translators' and 'site safety messengers,' providing them with specific vests, helmets, and allowances. This shifts vertical instructions to 'horizontal sharing through leaders,' ensuring information reaches the last worker.

2) Immersive VR Safety Training:
Move beyond text/lectures to experience accidents like falls or entrapment via VR. Narrations and subtitles are customized by nationality. This raises awareness and prepares workers for actual situations, reducing initial accident rates.

6. Conclusion

The core of preventing foreign worker accidents is breaking the 'language barrier'. Given the mixed processes in housing sites, multi-directional communication systems combining IT and visual info will play a critical role.

6.1. Priority: Resolving 'Language Barrier'

Data analysis points to resolving the 'language barrier' as the top priority. Most accidents stem from 'communication delay and distortion' rather than technical skill lack. Language barriers must be seen as a 'final defect' that can neutralize all safety measures.

6.2. Multi-directional Communication in Housing Sites

Housing sites involve numerous concurrent work types. One-way instruction from a single manager is limited for hundreds of diverse workers. Shifting to 'multi-directional' systems—confirming understanding (Back-briefing) and peer-to-peer risk sharing—is essential to prevent fall or entrapment accidents.

6.3. Smart Safety Communication Paradigm

Future management must evolve into systems combining AI and 직관적(intuitive) visual information. AI translation will remove barriers, and standardized pictograms and VOP will become standard. Combined with site leadership, foreign workers will become 'safety subjects' who protect themselves and peers.

6.4. Significance and Future Tasks

This study academicizes practical concerns from a site safety manager, proving the solution is a 'communication system' rather than just preaching. Despite limitations in scope, the 'process-specific communication model' will serve as a milestone for future safety policies and smart safety systems.

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