

Determining Efficient Safety Patrol Team Operations on Construction Sites

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Abstract: This thesis set out to reduce the rate of construction disasters and to create better working conditions by surveying safety managers and safety patrol managers. In each phase of construction, laborers are exposed to various specific risk factors on sites. However, trained specialists have a high opportunity to prevent laborer accidents. Therefore, construction companies hire safety patrol managers through outsourcing contracts to support safety managers in preventing laborer and construction site accidents. However, the working conditions of safety patrol managers require improvement as most of them are employed as non-regular workers and casual worker problems remain to be settled. We should offer some suggestions to tackle these issues and attempt to improve the conditions within the current system. Despite the many accidents in small construction companies and on small construction sites caused by the neglect of safety management, clear safety regulations have not yet been issued. Therefore, the occupational safety and health acts need to be modified to improve working conditions on small-scale construction sites by hiring trained safety managers.

Key words: Improve working, construction, companies, management, suggestions, require improvement

INTRODUCTION

Construction companies form subcontracting agreements with outsourcers to deploy safety patrol teams to construction sites as part of a preventive strategy to reduce the rate of accidents by promptly eliminating unsafe behaviors and situations. As the safety on construction sites can be improved more effectively with manpower than with the use of mechanical equipment, improving the working conditions and status of safety patrol teams is a priority.

The majority of safety patrol teams are employed on irregular contracts and are likely to perceive a weaker sense of affiliation with the organization and to be deployed to the construction site without any significant sense of duty or pride.

There is no professional education curriculum in this field and past experience, even if extensive, cannot be corroborated as there are no relevant certifying institutions. The employment of safety patrol teams on construction sites by managers was introduced approximately 15 years ago. However, there have been no studies on the management of safety patrol teams. Therefore, a considerable number of managers may not understand the costs of employment of safety patrol teams on construction sites (Son *et al.*, 2000).

Compared to medium-to-large construction sites, small construction sites have worse safety management

and a statistically higher rate of accidents, suggesting that there is plenty of scope to improve the safety management of small construction sites (Sang *et al.*, 2008).

This study aimed to investigate and analyze the current status of safety patrol teams deployed to reduce the rate of accidents on construction sites, to present practical, effective measures to improve the employment of safety patrol teams through questionnaires and interviews of safety managers and safety patrol teams and to provide measures to regulate the use of safety patrol teams on small construction sites in order to reduce the rate of accidents.

MATERIALS AND METHODS

Questionnaire preparation: This study analyzed the trends in industrial accidents using annual statistics on accidents in the construction industry.

We analyzed and reviewed a number of problems experienced by safety patrol teams on construction sites as well as the state of safety management on small construction sites. In this study, the phrase “small construction sites” refers to sites without a designated safety manager.

The safety patrol team employment and safety management on small construction sites were assessed with data obtained from questionnaires and interviews

involving safety managers and safety patrol teams working on construction sites in Daejeon, Chuncheongbuk-do. This study aimed to identify the main relevant issues and to provide suggestions to overcome them (Sang *et al.*, 2009; Ahn *et al.*, 2016).

The study methods and scope can be summarized in chronological order as follows. We examined the annual governmental statistics on industrial accidents and the basic overall characteristics of construction accidents and reviewed the current state of accidents on small construction sites. We investigated the working conditions of construction safety patrol teams and identified the obstacles to their research.

We investigated the state of safety management on small construction sites and analyzed the measures implemented to address problems. Surveys were used to identify possible strategies to improve the working environment of construction safety patrol teams and the safety management on small construction sites. Conclusions based on the measures for construction site safety management derived from the analysis were made.

Distribution of questionnaire surveys: This study collected basic information about safety management work. The questionnaire subjects were safety managers and safety patrol teams employed under the jurisdiction of the Daejeon Regional Employment and Labor Office or of the Chungju Regional Employment and Labor Office on a construction site with a construction cost above a certain threshold between May and October, 2016. Completed questionnaires were received from 74 safety managers and 288 safety patrollers working on 64 construction sites employing safety patrol teams (Lee and Sang, 2016; Man, 2016).

The safety manager questionnaire involved 39 questions, while the safety patrol team questionnaire included 47 questions. The questionnaires examined the following topics (in order): “safety patrol team working conditions”, “safety patrol team work performance”, “safety patrol team difficulties, problems and measures for improvement” and “satisfaction and capability”. The response rates for the Gongju-si, Daejeon Dong-gu, Seo-gu, Jung-gu, Yuseong-gu and Deodeok-gu Districts under the jurisdiction of the Daejeon Regional Employment and Labor Office and for Chungju-si, Eumseong-gun, Jecheon-si and Danyang-gun under the jurisdiction of the Chungju Regional Employment and Labor Office were as follows.

Safety accidents have persistently occurred on construction sites over time and despite the government’s efforts to respond to the problem, the rate of accidents

has been growing, causing a significant financial loss at the national level that increases annually. The three key objectives of construction projects are to lower costs, reduce the construction time and improve the quality. However, trying to achieve these three objectives at once can encourage the neglect of safety management. In order to achieve the three objectives listed above, safety management principles need to be established first.

RESULTS AND DISCUSSION

Frequency analysis: A total of 288 safety patrollers were asked about their experience in the sector. Although construction sites have been employing safety patrol teams for 15 years, only 17 safety patrollers (5.9%) reported an experience of 5-10 years or more. We attributed this result to the high turnover rate of safety patrollers as compared with that of workers in other professions.

Regarding the type of employment of safety patrol teams, 272 safety patrollers (94.4%) were irregular workers, suggesting that this is the status of the vast majority of safety patrollers on construction sites. As irregular workers are hired for a specific contractual period (e.g., 1 and 2 years or until completion of the construction), employment anxieties and issues related to the employment change at the end of the contract period can hinder the productivity and work continuity. Moreover, the discrepancies in the human resources and material support of irregular and regular employees can result in feelings of alienation, isolation and relative deprivation, harming the former’s sense of affiliation to the company. Given their risk of being transferred at any moment, highquality labor and a sense of responsibility toward their work cannot be expected from irregular workers.

A total of 202 safety patrollers (70.1%) were working for a construction company with a subcontractor ranking of 1-50 and 63 safety patrollers (21.5%) were working for a company with a ranking of 51-100. Therefore, 91.6% of the safety patrollers in this study were working for a company with a subcontractor ranking of 1-100, commonly described as a class 1 construction company, while few safety patrollers were working for a 101-301 ranking construction company. However, according to the annually published rates of industrial accidents, these are the sites that have the greatest need of safety patrol teams.

The business expenses claimed per safety patroller were 3-4 million KRW for 44 safety managers (59.5%), 2.5-3 million KRW for 25 safety managers (33.8%) and 4 million KRW or higher for 5 safety managers (6.8%). Due

to the differences in the specific conditions of the subcontracting agreements for each company, the range of claimed expenses varied widely. Since, the expenses per safety patroller can be higher than the personnel costs for safety managers, some construction companies may feel that safety patrol teams are a burden. It is important to note, however, that the safety patrol team-related expenses “including the outsource margin and the costs of equipment required by the safety patrol team. Therefore, the actual expenses for safety personnel teams are lower.

Regarding the job satisfaction, 60 safety patrollers (20.8%) reported that their satisfaction was “very low” and 113 safety patrollers (39.2%) reported it as “low” indicating that 60% of safety patrollers were dissatisfied with their research. We attributed this finding to dissatisfaction with the type of employment. Therefore, it is important to implement policies to improve the working conditions of these personnel who are clearly required at construction sites in order to protect material assets and human lives.

In terms of pay satisfaction, 81 safety patrollers (28.1%) indicated that their satisfaction was “very low”, while 72 safety patrollers (25%) rated it as “low”. Therefore, a total of 153 safety patrollers (48.1%) were not satisfied with their pay.

When asked about their intentions to continue working, 34 safety patrollers (11.8%) responded that they “would definitely not continue working”, 60 safety patrollers (20.8%) responded that they “would probably not continue working”, 112 safety patrollers (38.9%) responded that they were “not sure”, 54 safety patrollers (18.8%) responded that they “would probably continue working” and 28 safety patrollers (9.7%) responded that they “would definitely continue working”.

About 63 safety patrollers (21.8%) were satisfied with their type of employment while 156 safety patrollers (54.2%) were dissatisfied and 69 safety patrollers (24%) responded that they were “not sure”.

If the employment type of safety patrollers is not changed, a high turnover will inevitably persist, thus perpetuating a vicious cycle. However, if government institutions or local city-level departments were established to oversee the employment of safety patrol teams, this would significantly contribute to the creation of employment opportunities and the reduction of construction site accident rates.

When safety managers were asked whether the employment of a safety patrol team improved the safety awareness on-site, the majority of safety managers gave a positive response of “agree” (33 persons; 44.6%) or “strongly agree” (35 persons; 47.3%).

Over half of the safety manager’s responses about safety patrol teams’ attitudes to on-site support were positive. Nineteen safety managers (47.3%) reported that the attitudes were “very good” and 38 safety managers (44.6%) that they were “good”.

Furthermore, over half of the responses about the usefulness of the operation of a safety patrol team were positive. About 26 safety managers (35.1%) responded that having a safety patrol team was “very useful” and 35 safety managers (47.3%) responded that it was “useful”. The size of the safety patrol team relative to the size of the construction site varied with the construction company. While the required number of safety managers for a construction site of a given size is legally stipulated in our view, it is important to define the appropriate size of safety patrol teams according to the scale of the construction site. Therefore, we surveyed safety managers about the need for a legally stipulated safety patrol team composition based on the scale of the construction site.

The 42 safety managers (56.8%) “strongly agreed” that this was necessary and 21 safety managers (28.4%) “agreed” that it was necessary. Therefore, the majority of the respondents (63 persons; 85.2%) responded positively. There were no negative responses.

Cross-tabulation analysis: The safety managers strongly agreed that there was a need for the training and certification of safety patrollers with 85.1% of them responding positively. Although, there was no great difference between the respondents about the need for safety training and certification, we found that safety managers with more experience were more likely to respond positively to this question.

Regarding the need for safety patrollers to receive training in construction safety management before starting on a new job, there was a very strong positive response from safety managers with 94.6% agreeing that training was required. There were no statistically significant differences in the respondent’s views on the need for construction safety management training.

When asked whether safety management, including safety inspections and safety education, had been made easier by the operation of safety patrol teams, the safety managers strongly agreed with 82.4% answering positively. Specifically, safety managers who were older, more experienced and had worked longer at their current workplace were more likely to respond positively to the need for safety patrol teams.

On the need to issue reliable certificates of experience to safety patrollers, 83.8% of the safety managers responded positively as shown in Table 1.

Table 1: Need for safety patroller experience certifications by major

Major areas of safety managers	Frequency	Average	SD	F-value	p-value
Safety engineering	24	4.5833	0.7173	4.20	0.009**
Architectural engineering	35	4.2571	0.6572		
Civil engineering	13	3.8462	0.6887		
Engineering-related areas	2	3.5000	0.7071		

Table 2: Difference in safety patroller satisfaction by project construction costs

Major areas of safety managers	Frequency	Average	SD	F-value	p-value
10	6	3.3333	1.0328	2.52	0.03**
10-15	17	2.5294	1.2307		
15-30	12	2.4167	1.3114		
30-50	36	2.1111	0.8873		
50-80	82	2.1707	0.8862		
≥80	135	2.4296	0.9738		

**p-value under 0.05 was considered significant (Seop, 2007)

According to the field of study, there were significant differences in the manager’s responses to the question on the need to issue certificates of experience to safety patrollers (F = 4.20; p = 0.009). Respondents with majors in safety engineering and related studies were more likely to respond positively than respondents with other engineering or science majors as shown in Table 2.

The job satisfaction of safety patrollers was very low, with 86.5% of the subjects rating their satisfaction as “average” or below. There were no differences in the safety patroller satisfaction according to age, education, income, qualifications, experience or job title. However, there was a statistically significant difference in the job satisfaction according to the project construction costs, as shown in Table 3.

As can be seen in Table 2, there were significant differences (F = 2.52; p = 0.03) in the safety patroller satisfaction according to the project construction costs. Specifically, safety patrollers showed a higher satisfaction when the construction costs were relatively low or very high and the satisfaction decreased significantly when the construction costs were within a range of 30-80 billion KRW.

Correlation analysis: Table 3 shows the correlation between the mutual understandings of construction workers and their career, training status and age.

Analysis: This study examined the safety activities on small construction sites with no designated safety manager. Based on a questionnaire survey of safety managers, we sought to suggest measures to reduce the rate of accidents on small construction sites through the deployment of safety patrol teams.

The results of the safety manager survey on the use of safety patrol teams on small construction sites were as

Table 3: Correlation between safety patrol team and operations

Areas	Need for patrol team	Age	Experience of safety manager	Experience on construction site
Need for patrol team				
Pearson factor	1.000	0.439**	0.357**	0.356**
Significance level		0.000	0.002	0.002
Age				
Pearson factor	0.439**	1.000	0.848**	0.757**
Significance level	0.000		0.000	0.000
Experience of safety manager				
Pearson factor	0.357**	0.848**	1.000	0.855**
Significance level	0.002	0.000		0.000
Field experience				
Pearson factor	0.356**	0.757**	.855**	1.000
Significance level	0.002	0.000	0.000	

**Correlations were effective at a significance level under 0.01 (Seop, 2007)

follows: 66 safety managers (89.19%) stated that the use of safety patrol teams could prevent on-site accidents. When asked whether the employment of safety patrol teams and the implementation of safety activities on small construction sites could reduce the rate of accidents, 42 safety managers (56.76%) responded that they “strongly agreed”, 26 safety managers (35.14%) that they “agreed” and 6 safety managers (8.11%) that they were “not sure”. Thus, there was an overall agreement that the employment of safety patrol teams on small construction sites could reduce the rate of accidents. When asked whether construction safety management training was required for newly-hired patrollers, even if experienced, 39 safety managers (52.70%), “strongly agreed” 31 safety managers (41.89%) “agreed” and 4 safety managers (5.41%) were “not sure”. This is because on-site safety managers are best aware of whether safety management is being properly implemented.

When asked whether the employment of on-site safety patrol teams helped with safety management significantly, 61 out of 74 safety managers (82.4%) responded positively, indicating that safety patrol teams were an essential element of construction sites for safety managers. This demonstrates that it is essential to establish customized safety strategies.

CONCLUSION

This study aimed to ascertain the working conditions and work status of safety patrol teams on construction sites and to propose efficient measures to improve them. To this end, we distributed a questionnaire to safety managers and safety patrollers working on construction sites. We analyzed the results of the questionnaire and drew the following conclusions: due to their irregular employment status, the majority of safety patrollers had lost their sense of affiliation, duty, and pride, leading them

to feel constant dissatisfaction in their job. Therefore, the involvement of government institutions or public corporations dealing with safety at work could improve the situation as safety patroller's improved employment conditions could reduce their high turnover and change perceptions in the profession. Moreover, this could considerably contribute to the creation of employment opportunities and to the reduction of construction accident rates.

Introducing legal requirements for the construction site safety training of safety patrollers would improve the standards of knowledge of safety patrollers, increase the quality of safety inspections and help new safety patrollers with their on-site inspections. Therefore, the safety training of safety patrollers is essential.

Currently, it is difficult to find reliable certifications of experience for safety patrollers. Furthermore, there can be confusion about safety patroller's experience as certificates of experience are issued by safety patrol team outsourcers. As safety patrollers are also participants in the construction project, greater transparency should be provided by enabling a nationally recognized institution to issue notarized certificates of experience to safety patrollers.

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