

ANALYSIS ON CHARACTERISTICS OF FALL ACCIDENTS IN CONSTRUCTION INDUSTRY

Tetsuo Hojo¹ and Katsutoshi Ohdo²

¹*Institute of Technologists, 333 Maeya, Gyoda, Saitama, 361-0038, Japan*

²*National Institute of Occupational Safety and Health, 1-4-6 Umezono, Kiyose,
Tokyo 204-0024, Japan*

Falling accidents are a serious problem in the construction industry in Japan, it is important to analyse the factor to take steps to meet the situation. In this study, firstly the injury accident reports by Labour Standard Office in Japan were investigated. Next, the details of the work of the fall accidents was analysed based on the result of the investigation. It was found that the fall accidents from elevation in construction industry were mainly happened in wooden house constructions and building constructions, and that fall from scaffolds were the most frequent fall accidents in both constructions. In order to investigate the details of the cause of the disaster in these two construction works, fall accidents from elevation according to the places and the height, where workers fell, were analysed. From the results of this analysis, characteristics of the cause of disaster were clarified by the type of construction works and by the seriousness of the accidents.

Introduction

Falling accidents are a serious problem in the construction industry in Japan. Approximately 40% of fatal construction accidents are caused by falls. Therefore, MHLW (the Ministry of Health, Labour and Welfare, Japan) has introduced and strictly enforces countermeasures to reduce falls from scaffolds with various safety guidelines, e.g., the Guideline for Advanced Guardrail Installation Method for work requiring scaffold erection. These countermeasures have resulted in a reduction in fatalities caused by workers falling.

However, the rate of fatal accidental falls is still high in the construction industry, and possible countermeasures became the main issue of the 11th Labour Accidents Prevention Plan in Japan. Therefore, in this study, the injury accident reports by Labour Standard Office in Japan were investigated. More than 1800 reports were checked and classified into the places, where workers fell. From the results of the investigation, the measure for decrease fall risk was examined.

Investigation of Accidents Report

Labour accidents, in which workers were killed or injured with more than three days' rest, were reported by Labour Standard Office in Japan. This data-base is open to the public on the WEB site of the Ministry of Health, Labour and Welfare. In this study, these injury accident reports were investigated.

Figure 1 shows the classification of main causes of the labour accidents in 2007 in Japan. 131,478 workers were killed or injured with more than three days' rest, and 35% of accidents were

caused by workers' fall. Fall accidents were classified as "fall on same level" (18%, 23,649 workers) and "fall from elevation" (17%, 23,064 workers). In This study, the measure for decrease "fall from elevation" was examined.

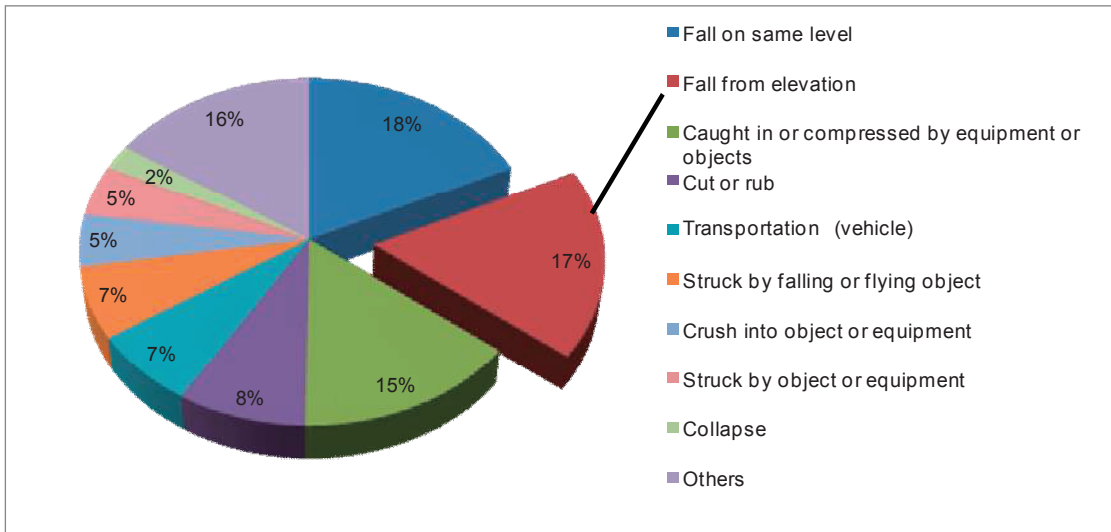


Figure 1. Classification of main causes of the labour accidents in 2007 in Japan

Figure 2 shows the classification of the fall accidents from elevation according to industries. 31% of the fall accidents from elevation (7141 workers) were happened in construction industry. In this study, 1,824 fall accidents from elevation in construction industry were extracted from 7,141 accidents (see Figure 2), and the injury accident reports were investigated in detail.

Figure 3 shows the classification of the fall accidents from elevation in construction industry according to construction objects. Mainly, the fall accidents from elevation were happened in wooden house constructions (22%, 403 workers) and building constructions (21%, 384 workers), as shown in Figure 3.

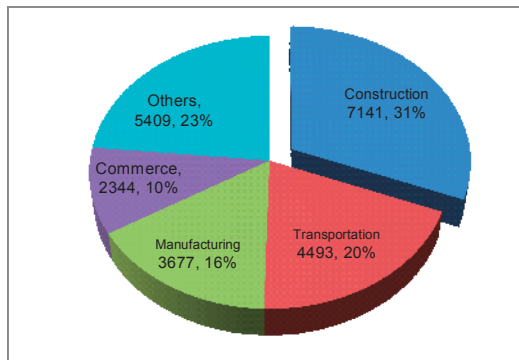


Figure 2. Fall accidents from elevation according to industries

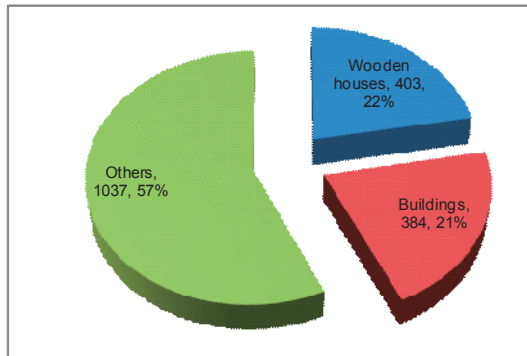


Figure 3. Fall accidents from elevation according to construction objects

Characteristics of Fall Accidents

Fall accidents from elevation according to the places

Figure 4 shows the classification of casualties of fall accidents from elevation in wooden house constructions according to the places, where workers fell, and Figure 5 shows that of in building constructions.

In both constructions, fall from scaffolds were the most frequent fall accidents, and stepladders were the next. Approximately 40 % of the fall accidents were happened from these two places. The cause in the third place or less is different according to construction. Fall from the roof is 14% more in the wooden construction. On the other hand, fall from the construction machineries accounted for 6% in building constructions. It is because there are a lot of work on the inclining roof in wooden construction, and a lot of work to use machineries in building constructions.

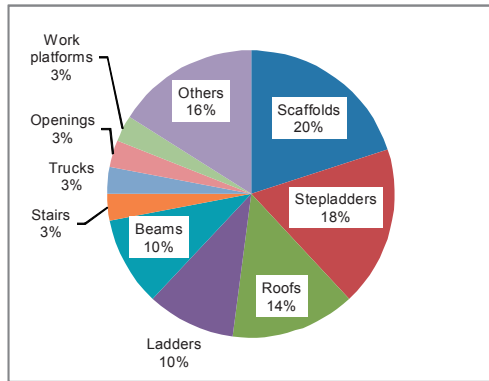


Figure 4. Casualties according to the places in wooden house constructions

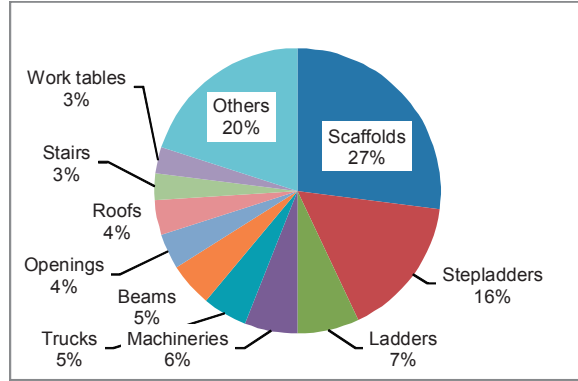


Figure 5. Casualties according to the places in building constructions

Figure 6 shows the classification of fatalities of fall accidents from elevation in wooden house constructions according to the places, where workers fell, and Figure 7 shows that of in building constructions. In building constructions, fall from scaffolds accounts for 36%, being at the first place as well as casualties. On the other hand, in wooden house constructions, fall from beams occurred most, accounting for 27%, but, fall from scaffolds accounts for 18%, in 3rd place. This is because it is hard to take fall protection measures in the work on beams, and when happened it is likely to become a serious accident. Fall from roofs is in 2nd place in both constructions.

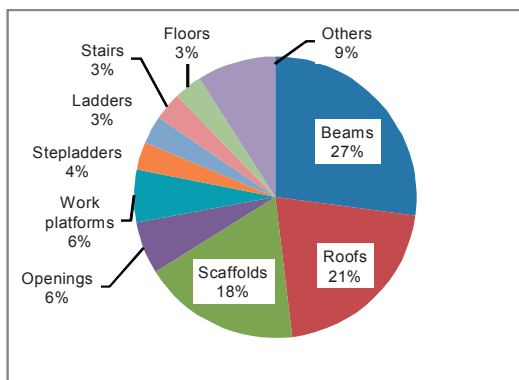


Figure 6. Fatalities according to the places in wooden house constructions

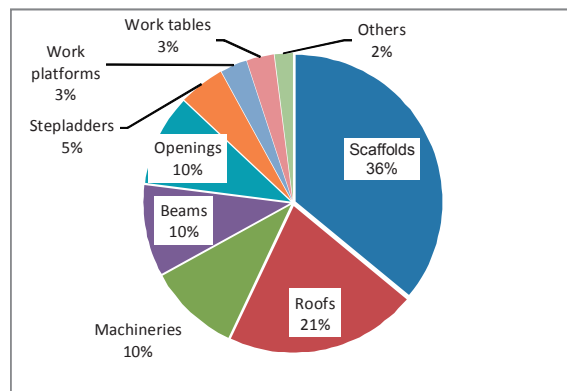


Figure 7. Fatalities according to the places in building constructions

Fall accidents from elevation according to the height

Figure 8 shows the classification of casualties of fall accidents from elevation in wooden house constructions according to the height, where workers fell, and Figure 9 shows that of in building constructions. As for the height data, nearly half was unknown, but it is analysed within the obtained data.

In wooden house construction, "1-2m" and "2-3m" have occurred most, accounting for 18%, respectively. Fall from a comparatively low place stands out. In building constructions, "1-2m" occurred most, accounting for 15%. "5m or more" occupies by as much as 10%, and it is thought that it is because there are a lot of works in a high place compared with wooden house construction.

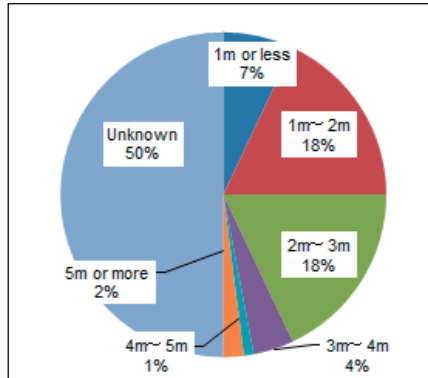


Figure 8. Casualties according to the height in wooden house constructions

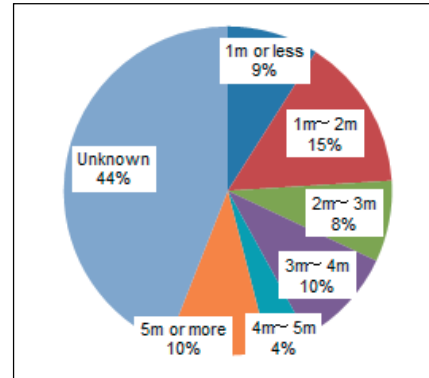


Figure 9. Casualties according to the height in building constructions

Figure 10 shows the classification of fatalities of fall accidents from elevation in wooden house constructions according to the height, where workers fell, and Figure 11 shows that of in building constructions. It differs from casualties, "5m or more" occupied a lot, and it reached 56%, more than half, especially in the building construction work.

This result suggests the possibility that severity is increased when it is crashed, when the height of the work becomes higher. However, since the frequency of occurrence of disaster casualties is higher crash from low areas, the measures can not be ignored.

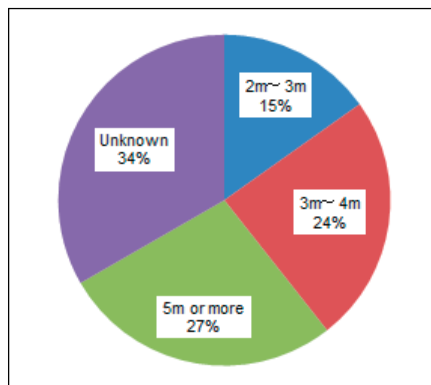


Figure 10. Fatalities according to the height in wooden house constructions

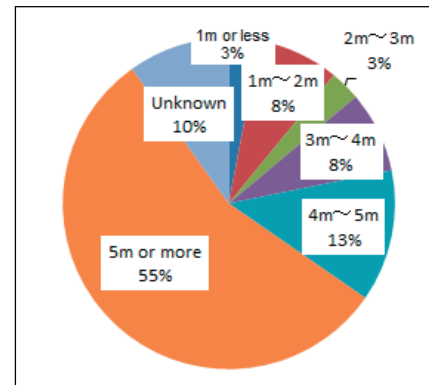


Figure 11. Fatalities according to the height in building constructions

Measure for decrease fall risk from scaffolds

In order to examine further countermeasures to decrease such fall accidents from scaffolds, MHLW established a committee to evaluate various construction methods according to present safety guidelines. From the results of the committee, the Occupational Safety and Health Regulation and the Guideline for Advanced Guardrail Installation Method were amended in 2009.

Figure 12 shows the prefabricated scaffolds erected by the method, and Figure 13 shows the

installation method for using the advanced guardrails. In the method, the upper guardrails are always set from the lower platforms using the advanced guardrails. In using the method, workers are always protected from a fall by the advanced guardrails at the top of the previously erected scaffolds in all construction stages of the scaffolds, i.e. assembling of the scaffolds, work on the scaffolds, and dismantling of the scaffolds.

MHLW aimed to spread the use of this method through their safety guidelines and investigated the use rate of this method on 6,433 construction sites. The result showed that only 31% of construction sites use this method, and it was found that the use of the method was not widespread yet. Therefore, it is necessary to use this method more widely for decrease fall risk from scaffolds.



Figure 12. Prefabricated scaffolds erected by the Advanced Guardrail Installation Method

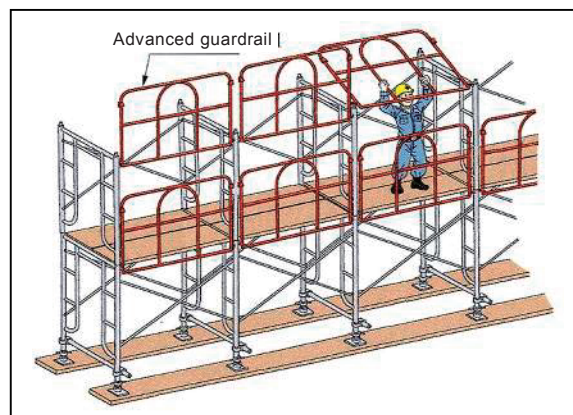


Figure 13. Advanced Guardrail Installation Method

Conclusions

In this study, the injury accident reports by Labour Standard Office in Japan were investigated, and the measure for decrease fall risk was examined. The results are summarized as follows.

- 1) In Japan, 131,478 workers were killed or injured with more than three days' rest by the labour accidents in 2007, and 35% of the accidents were caused by workers' fall.
- 2) 31% of the fall accidents from elevation were happened in construction industry.
- 3) Mainly, the fall accidents from elevation in construction industry were happened in wooden house constructions and building constructions, and fall from scaffolds were the most frequent fall accidents in both constructions.
- 4) In order to decrease such fall accidents from scaffolds, the Occupational Safety and Health Regulation and the Guideline for Advanced Guardrail Installation Method was amended by MHLW in 2009.
- 5) However, only 31% of construction sites use this method, and it was found that the use of the method was not widespread. Therefore, it is necessary to use this method more widely for decrease fall risk from scaffolds.

Acknowledgement

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