

# Assessment of Safety and Health Practices in Road Construction

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## Abstract

The construction sector contributes significantly to a country's socioeconomic growth. It is significant because of the direct and indirect influence it has on all economic activity. The objective of this study was to evaluate the safety and health performance of site workers on various road construction projects in Pokhara metropolitan city and to examine whether the performance indexes were close to the International Labor Organization's code of practices. The information gathered from the respondents was examined using measure central tendency and prioritized by importance. The results of the questionnaire survey showed that Pokhara metropolitan city's construction projects were not found to meet the ILO's health and safety standards whereas few of the rules were effectively followed. Most employees have access to safe drinking and sanitary facilities, with some receiving extra perks. The survey found just seven distinct types of personal protective equipment (PPE), indicating that most workers overlook the use of PPE on the job. Consequently, in addition to quality and quantity, the monitoring office should put greater emphasis on construction site health and safety.

## Keywords

Safety, Health, Worker, PPE and Construction

## 1. Introduction

Both in developed and developing countries, the construction industry has a significant impact on worker health and safety. Construction industry is very substantial economically and socially [1]. Although construction work shares the same high-risk nature all over the world, the fatalities in developing countries are almost three times as many fatalities as in developed countries [2]. The situation is even worse in underdeveloped nations like Nepal, where "safety and health programs" are still in the early phases of adoption and there is a lack of

proper execution in order to achieve a safe working environment. Safety is a crucial factor in the construction industry, especially when it comes to worker health. There is no doubt that the construction sector is one of the most dangerous, and maintaining a safe working environment has been a constant issue. Many accidents occur in construction sites all over the world that result in huge loss of property and life as well, this loss is impossible to compensate.

The goal of construction safety is to avoid accidents and illnesses in the workplace. However, in poor countries such as Nepal, construction safety concerns are not given the importance they deserve, and as a result, safety practices and culture are not as well developed as they should be in construction projects.

### **1.1. Statement of Problem**

The Nepalese construction industry is still learning about safety. Every year, thousands of people die and many more are injured in the Nepalese construction industry, proving that measures to minimize accidents on construction sites are insufficient [3]. Landslides are one of the most common causes of accidents on road construction sites. Accidents in the workplace are also caused by a lack of a controlled working environment and an organization's work culture. Accidents in Nepal's construction sector are primarily caused by a lack of laws and regulations, construction company negligence, government negligence, unskilled labor, and profit motives of firms [3].

The road construction project in Nepal is carried out by different levels of government like Department of Road, Infrastructure Development, Metropolitan Offices and so on. These government offices are working on regular basis from tendering to the inspecting. In spite of inspection and regular control, there lacks the basis concept of safety during the construction phase. Basically, in local level projects like Metropolitan office, because of lack of experience and practice, safety concern is lagging behind quiet distinctly.

### **1.2. Research Objectives**

The main objective of the study is to compare the safety and health as per an International Labor Organization (ILO) code of Practice in road construction project in Pokhara Metropolitan city.

### **1.3. Significance of Study**

This research will help to document the better safety practices approach, and then, it can be implemented or practiced in other road construction projects to improve the safety performance.

### **1.4. Research Purpose**

The purpose of this study is to explain, or compare with minimum compliance of safety and health in construction site at Pokhara metropolitan city or its outcome, which specifies the kind of study that will be carried out.

### **1.5. Limitation of Study**

Only the ILO's code of conduct pertaining to road construction is alluded to in this study, which focuses on safety measures in limited road construction projects in the Pokhara Metropolitan City.

## **2. Literature Review**

### **2.1. Construction Safety Performance Scenario in Developing Countries Like Nepal**

Construction in developing countries like Pakistan and India is more labor intensive than in industrialized countries, requiring about 2.5 to a stunning 10 times the number of workers per activity [4]. This means that the construction site is fairly busy, and with more people comes a higher risk of an accident. In the context of the Nepalese construction sector, the issue is identical.

### **2.2. Safety Management at Construction Sites**

Considering recent efforts to improve construction site safety, the number of occupational injuries and fatalities in the construction industry continues to fluctuate. However, the implementation of H&S in construction has not resulted in a commensurate improvement in the construction industry [5]. Safety management must be robust and applicable to all areas of the job, beginning with the estimating phase and continuing until the last worker has left the site at the project's conclusion. Every conceivable partner to a construction project must be included in the safety program in some way so that everyone is held accountable.

### **2.3. Use of Personal Protective Equipment**

Despite all of the measures taken during project planning and work design, most construction sites have working conditions that need the use of personal protective equipment (PPE) [6]. Personal protection equipment (PPE) includes clothing, goggles, helmets, and other garments or equipment that is designed to protect the wearer's body from injury (PPE). Chemicals, biohazards, and airborne particulate matter are all protected by personal protection equipment (PPE) [7].

### **2.4. Occupational Safety, Health and Environment in Nepal**

When it comes to the Nepali construction business, Khumraj (2015) discovered that workers outnumber machines, and that safety rules are lax. Laborers are at risk in workplaces with machines and equipment; electrical work; construction work; transportation work; chemical use; a dusty environment; a congested, dark, and poorly ventilated environment [8]. Accidents in Nepal are not properly reported. Reports of deaths and the media's coverage of them are all that are reported in the concerned bodies [9].

### **2.5. ILO in Nepal**

In the United Nations, the International Labor Organization (ILO) is the institu-

tion that deals with employment and workplace issues, along with the related rights. A member of the ILO since August 30, 1966, Nepal joined the ILO by applying just Article 3 Para 1 of the ILO’s Constitution. The ILO Country Office for Nepal was created in 1994. There are 11 ILO conventions that Nepal has ratified, including seven core conventions. As a result of the ILO’s efforts, the Government, Workers’ Organizations, and Employers’ Organizations in Nepal have developed a productive result and these three parties have been able to unionize informal workers, implement various social protection measures, revise labor laws and build social dialogue mechanisms as well as ratify ILO conventions because to this relationship [10].

### 3. Material and Methodology

#### 3.1. Study Area (Figure 1 & Table 1)

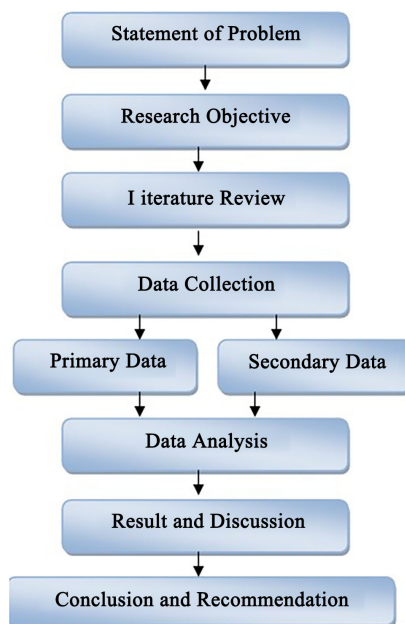


Figure 1. Methodological research framework, Source: (Survey 2022).

Table 1. Selected construction sites.

S.N.	Road Construction Projects by PMC	ContractorName	Contract Amount	Major Works
1	Upgrading of Baglung Buspark Kaskikot Road, PMC-18&24	Mahadev/Khimti J.V	102310657.20	Earthworks, Structures, Premix
2	Upgrading of RTO Road, PMC-17	Ashish/Fewa J.V	82563897.48	Drain, Asphalt Concrete
3	Upgrading of Ward office Thuldhunga Surtane Chainpur Suraudi Sadak, PMC-21	Gajindra/Shree Geeta/Simran J.V	111135173.44	Earthworks, Structures, Premix

Source: (Survey 2022).

### 3.2. Method of Data Collection

Primary data was obtained in the field utilizing a variety of approaches such as field observation and a check list survey. Secondary data was gathered from books, journals, articles, papers, and theses on safety.

### 3.3. Data Used

We will use the data acquired from primary data and secondary data, observation and expert views.

## 4. Results and Discussions

Relative view of respondents (Workers and Supervisors) in terms of their satisfaction level with safety practices and principles adopted in their construction site as per International Labor Organization (ILO) code of practices.

### 4.1. Safety at Workplace

The mean of safety at workplace in construction is 2.78 in **Table 2**, indicating that respondents are dissatisfied with safety measures in their real field of activity.

### 4.2. Scaffold and Ladders

According to the mean score in **Table 3**, the total score is 2.73, indicating that respondents are dissatisfied with the ILO's real site operations and conduct.

### 4.3. Transport, Earth-Moving and Materials-Handling Equipment

**Table 4** shows that the totals mean score for transportation, earth-moving, and materials-handling equipment is 3.21. In compared to the ILO code of conduct, respondents are quite happy with the general performance of transportation, earth movement, and materials handling equipment.

### 4.4. Health Hazards, First Aid and Occupational Health Services

According to **Table 5**, respondents are dissatisfied with health hazards, first aid, and occupational health services, as seen by the mean score of 2.42, which is considerably below 3.

**Table 2.** Respondents view on safety at workplace.

Statements	N	Min	Max	Mean	Std. Deviation	Rank
Housekeeping	103	1	5	3.11	1.102	1
Precautions against the fall of materials and persons, & collapse of structures	103	1	5	2.91	1.086	3
Prevention of unauthorized entry	103	1	5	2.37	1.048	5
Fire prevention and fire fighting	103	1	5	2.59	1.061	4
Lighting	103	1	5	2.93	1.060	2
Safety at Workplace	<b>103</b>	<b>1</b>	<b>5</b>	<b>2.78</b>	<b>0.818</b>	

Source: (Survey 2022).

**Table 3.** Respondents view on scaffold ladders.

Statements	N	Min	Max	Mean	Std. Deviation	Rank
Materials used	103	1	5	2.96	0.969	1
Design and construction	103	1	5	2.82	0.968	2
Inspection and maintenance of scaffolds	103	1	5	2.63	0.990	4
Lifting appliances on scaffolds	103	1	5	2.41	0.964	5
Use of scaffolds	103	1	5	2.82	0.968	3
<b>Scaffolds and ladders</b>	<b>103</b>	<b>1</b>	<b>5</b>	<b>2.73</b>	<b>0.753</b>	

Source: (Survey 2022).

**Table 4.** Respondent view on transport, earth-moving and materials handling equipment.

Statements	N	Min	Max	Mean	Std. Deviation	Rank
<b>Power shovels, excavators</b>	103	1	5	3.25	0.936	<b>2</b>
<b>Bulldozers</b>	103	1	5	3.17	0.933	<b>5</b>
<b>Scarpers</b>	103	1	5	3.12	0.921	<b>6</b>
<b>Asphalt Layers and Finishers</b>	103	1	5	3.21	1.063	<b>4</b>
<b>Pavers</b>	103	1	5	3.27	0.982	<b>1</b>
<b>Road Rollers</b>	103	1	5	3.24	1.080	<b>3</b>
<b>Transport, earth-moving and materials-handling equipment</b>	<b>103</b>	<b>1</b>	<b>5</b>	<b>3.21</b>	<b>0.787</b>	<b>103</b>

Source: (Survey 2022).

**Table 5.** Respondents view on health hazards, first aid and occupational health service.

Statements	N	Min	Max	Mean	Std. Dev	Rank
Access to Occupational health and safety	103	1	5	2.37	0.970	5
Availability and use of First aid	103	1	5	2.70	1.046	1
Information and protection against Hazardous substances	103	1	5	2.62	0.971	2
Measures in working on Dangerous Atmosphere	103	1	5	2.45	1.007	3
Prevention against Heat Stress, cold and wet conditions	103	1	5	2.40	0.974	4
Noise and Vibration controls	103	1	5	1.97	1.024	6
<b>Health hazards, first aid and occupational health services</b>	<b>103</b>	<b>1</b>	<b>5</b>	<b>2.42</b>	<b>0.787</b>	

Source: (Survey 2022).

#### 4.5. General Welfare of Workers

**Figure 2** depicts the availability of several general welfare services in respondents' preferred locations. According to the poll, most respondents had access to

a drinking facility, with 87.4% favoring the provision of such a facility. On all three road construction projects that were seen, the availability of various worker welfare services is depicted.

#### 4.6. Planning (Figure 3)

The total mean score is 3.70, which is higher than 3 and indicates planning is critical to enhancing construction site safety (Table 6).

#### 4.7. Training and Awareness (Figure 4)

According to respondents, training and awareness play a critical role in improving safety on construction sites, as shown in Table 7, with a mean score of 3.62.

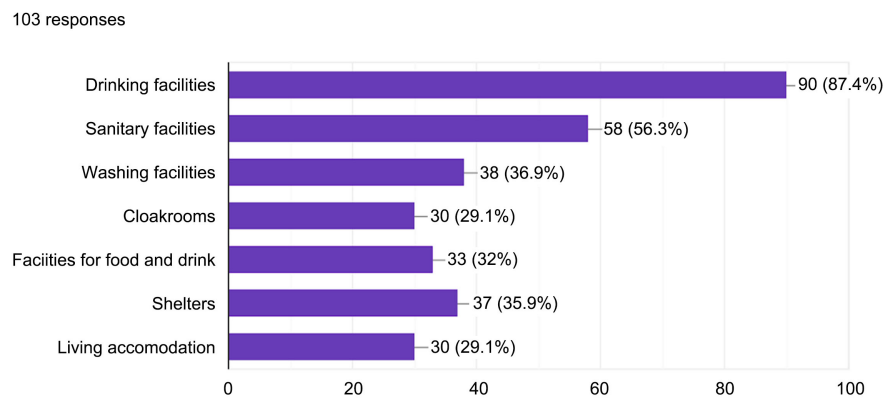


Figure 2. Respondents view on availability of general welfare of worker, Source: (Survey 2022).

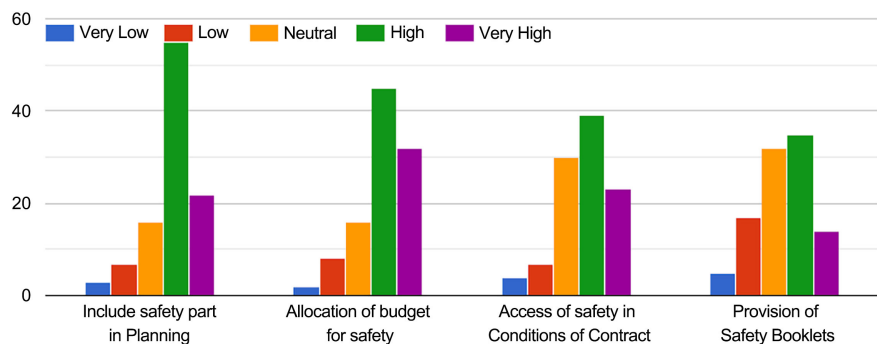


Figure 3. Respondents view impact of planning part, Source: (Survey 2022).

Table 6. Respondents view on impact of planning part.

Statements	N	Min	Max	Mean	Std. Dev	Rank
Include safety part in Planning	103	1	5	3.83	0.94	2
Allocation of budget for safety	103	1	5	3.94	0.978	1
Access of safety in Conditions ofContract	103	1	5	3.68	1.021	3
Provision of Safety Booklets	103	1	5	3.35	1.064	4
Planning Part	103	1	5	3.7	0.812	

Source: (Survey 2022).

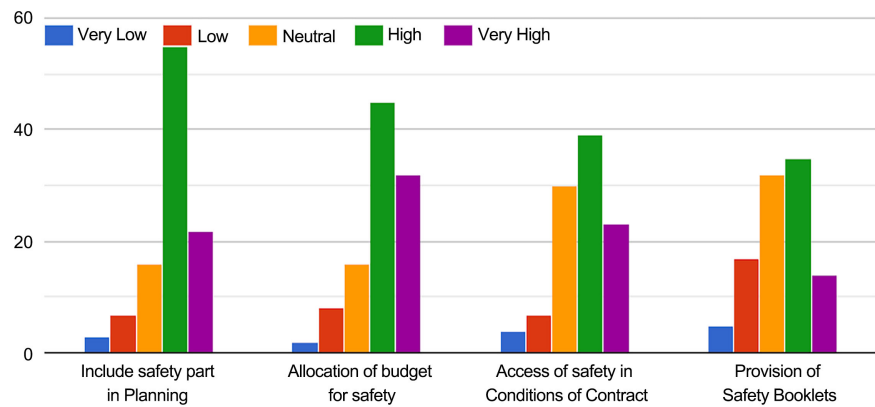


Figure 4. Respondents view impact of training awareness, Source: (Survey 2022).

Table 7. Respondents view on impact of training and awareness.

Statements	N	Min	Max	Mean	Std. Deviation	Rank
Regular training and awareness related to safety and health	103	1	5	3.82	1.064	1
Regular tool Box talks	103	1	5	3.52	0.998	4
Budget allocation for training	103	1	5	3.58	1.098	2
Involvement of Workers in safety briefing and classes	103	1	5	3.54	1.092	3
<b>Training and Awareness Part</b>	<b>103</b>	<b>1</b>	<b>5</b>	<b>3.62</b>	<b>0.917</b>	

Source: (Survey 2022).

#### 4.8. Health and First Aid (Figure 5)

The influence of health and first aid on the effective execution of safety on the building site is summarized in Table 8. The total mean score is 3.62, which is higher than 3 and indicates that health and first aid are critical to enhancing construction site safety.

#### 4.9. Labor Welfare and Motivation (Figure 6)

With an aggregate mean of 3.71, the influence of improvement on several areas of labor welfare and motivation was determined to be rather outstanding (Table 9).

### 5. Summaries of the Research

Safety at work place is worst, provided scaffolders and ladders are not satisfactory, the handling of earth moving, transportation and other heavy equipment also not good, General welfare of workers is not good even 87.4% workers are getting drinking water, Training, motivation, awareness program were not conducted. From the literature review too, we are lagging the ILO, Safety compliance. Nepal has already rectified ILO convention.



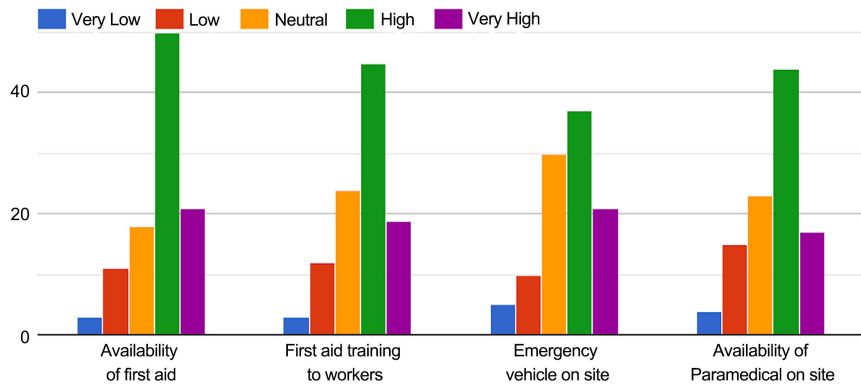


Figure 5. Respondents view impact of health and first aid, Source: (Survey 2022).

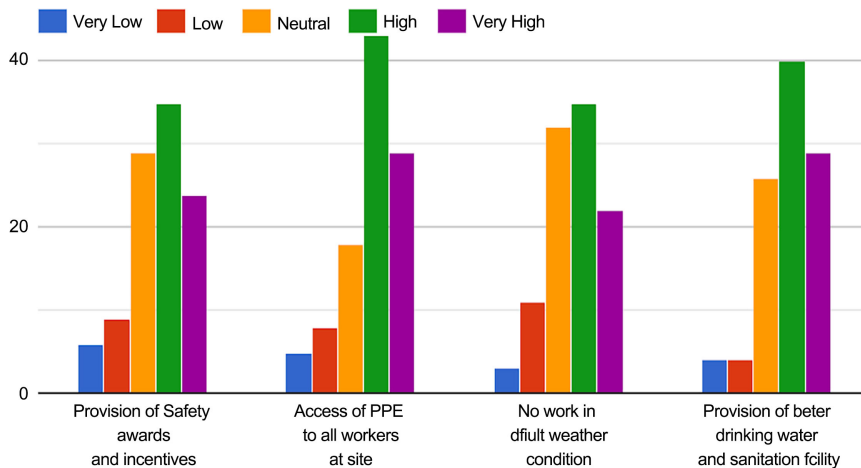


Figure 6. Respondent view impact of labor welfare motivation, Source: (Survey 2022).

Table 8. Respondents view on impact of health aid.

Statements	N	Min	Max	Mean	Std. Dev	Rank
Availability of first aid	103	1	5	3.73	1.002	1
First aid training to workers	103	1	5	3.63	1.01	2
Emergency vehicle on site	103	1	5	3.57	1.072	3
Availability of Paramedical on site	103	1	5	3.53	1.055	4
<b>Health and First Aid</b>	<b>103</b>	<b>1</b>	<b>5</b>	<b>3.62</b>	<b>0.903</b>	

Source: (Survey 2022).

Table 9. Respondents view on impact of labor welfare and motivation.

Statements	N	Min	Max	Mean	Std.Dev	Rank
Provision of Safety awards and incentives	103	1	5	3.6	1.114	3
Access of PPE to all workers at site	103	1	5	3.81	1.085	2
No work in difficult weather condition	103	1	5	3.6	1.032	3
Provision of better drinking water and sanitation facility	103	1	5	3.83	1.011	1
<b>Labor Welfare Motivation</b>	<b>103</b>	<b>1</b>	<b>5</b>	<b>3.71</b>	<b>0.884</b>	

Source: (Survey 2022).

## 6. Conclusions and Recommendations

### 6.1. Conclusion

Based on the results of the questionnaire survey and observations, it is obvious that the practice of safety in Pokhara Metropolitan City Road construction projects does not correspond to the code of practice recommended by the International Labor Organization. On a road construction site, workers and supervisors are easily accessible human resources, but they are also more vulnerable to health concerns.

### 6.2. Recommendation

In order to improve the operation of occupational health and safety management systems in the construction sector it is suggested that:

- Pokhara Metropolitan City Office, in collaboration with the respective contractor, should prioritize safety and health in construction, accelerating efforts to bring actual practice related to road construction closer to the ILO code of conduct.
- The road construction projects should be well analyzed in terms of safety before commencement of project and details of safety should be included in planning part of project.
- Pokhara Metropolitan city office road section should order its entire branch to establish safety and health department to organize safety and health training and consultation for employees.
- The monitoring office should establish safety and health program at all of its branches.

### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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