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Health and Safety Status of Casual Workers in Road Improvement Project Kathmandu Valley, Nepal

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***Abstract**: Construction works on high speed roads or in mountainous landscape can be considered as exceptionally dangerous. During construction period, sometimes people have to work in the middle of the lanes with heavy and harmful equipment and materials so that workers should have to be very cautious while working in these areas. Since construction plays a vital role to the development of the nation, the rate of accident can be reduced if sufficient attention for the safety is provided at the construction site.*

This research was carried out to analyze the health and safety of casual workers and to verify whether the clauses mentioned in the contract regarding workplace health and safety has been followed by the contractors at project location in construction projects in Road Improvement Project (Phase-II).

Safe drinking water, first-aid equipment, sanitary facilities, provision of personal protection equipment (PPE) and training of casual workers on safety procedures, were the measures needed for addressing the health and safety facilities confronting casual workers on construction sites. Inadequate instructions concerning work are ranked as the main cause of the accident on a construction site. Safe drinking water and safety signs are ranked as the most important health and safety facility that need to be provided on site to the casual workers.

Introduction

The term “casual workers” refers to individuals who are engaged on a temporary basis to work for a period of time and whose remunerations are calculated and paid on daily basis. Most of the projects in Nepal are based on labour intensive involving skilled and unskilled manpower. Usually, there are risks of an accident in construction projects that are unavoidable and Nepal is undeveloped in practicing such construction activities. To successfully complete the project, site accidents are one of the most important aspects to be reflected. Nowadays, most of the construction projects involve many equipment, plant hazardous materials, methods, manpower, etc. consequently numerous accidents take places at construction sites. It involves several types of harmful construction resources and elements consisting of sand, cement, steel, chemical, stone, brick, gases, and many more and people works in very risky sites and conditions. Lack of clear guidelines and principles towards protection of workers at construction site, many contractors in Nepal compromise with the health and safety standards to make more profit. Similarly, many supervisors, managers, and workers are amateur and unaware of health and safety procedures. The importance of health and safety in road construction has limited number of research in Nepalese context. There is no data record regarding accidents in road construction project and the magnitude of fatalities during construction in Nepal (Bhattarai, 1996).

In terms of the impact on health and safety of the working inhabitants, construction industries are considered to be one of the most noteworthy industries in the developed as well as developing countries.

Some reasons such as; work quality improvement, construction cost reduction, workers morale enhancement, accident rate minimization, work efficiency augmentation, and fatal accident elimination focuses on the need of safety. The main objective of the study was to analyse health and safety of Casual Workers in Road Improvement Project (Phase II) Construction of Kathmandu Valley, Nepal, financed under credit agreement between Government of Nepal (GoN) and Export Import Bank of India (EXIM Bank) with following specific objectives:

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To assess the health and safety facilities of casual workers in road construction project and to analyze the compliance of health and safety provision.

To rank causes of the accident, health as well as safety facilities of road construction project.

Literature Review

Parties working on site must have appropriate and effective methods in place to identify and address hazards associated with working near infrastructure. Parties need to take all practicable steps to ensure that their work does not harm any other person, including site workers, visitors to the workplace or the public.

Health and Safety in Construction Sites

Safety is the state of being "safe", the condition of being protected against physical, social, spiritual, financial, political, emotional, occupational, psychological, educational or other types or consequences of failure, damages, errors, accidents, harms or any other events. Safety basically is a concern with no loss of life at work place and minimizing injuries to the workmen and other common people. Safety is concerned with the safety of workers and with the damage of property and loss of time (Bhattarai, 1996).

Basically, site operatives are required preparing and arranging their operations, making sure that they are skilled and capable and know the unusual risks of their trade and raise heave problems with their site supervisor or safety representative. To defend the people at work against the possible damages to their health or safety, the main personal protective equipment (PPE) in construction (including outfits that protects from the weather as well) which is intended to be worn. While taking control measures into consideration, the PPE should be regarded as a 'last resort'. PPE is supposed to be worn at each and every construction sites. However, where PPE is the only effective means of controlling the risks of injury or ill health, then employers must ensure that PPE is available. A typical construction site may require workers to wear a hard hat, coveralls, safety footwear, gloves, eye protection and high visibility vest. This equipment must be provided to all employee proper and appropriate condition to use

Construction Accidents and their Causes in Road Construction

Research studies have confirmed that the construction industry is one of the most hazardous industries all over the world. In most countries, the rate of accident and injuries prevailing in the industry are higher than what prevails in other industries (Kartam, 1997).

Two majors factors that lead to the high number of accidents in construction (Ritz, 1994).

a) The industry is highly splintered into a formidable number of very diverging entities having different safety goals in mind.

b) A high rate of temporary workers and turn over with less experienced and untrained workers.

An accident can be defined as unplanned, unexpected occurrence which upset the planned sequence of events and actions resulting in the loss of production, injury to the persons & damage to the plants and equipment.

Lack of training, Poor equipment, Poor equipment maintenance, Non-rigorous enforcement of safety regulations, Lack of attention from leaders ,Lack of planning and organization, Inadequate instruction concerning work, Non-certified skill labour, Lack of emergency measure, Lack of innovation technology, Inadequate supervision of work, Lack of teamwork Shortage of safety management, Lack of personal protective equipment ,Non-perfect of safety and regulations ,Overtime work for labor, Non-effective operation on safety regulation , Poor of education of labourers, Poor safety conscientiousness of labourers, Collapse of stacks, masses of earth, etc. And Fall of objects, tools, pieces of work are majour identified causes of accident.

Hierarchy of Hazard Controls

It is a systematic step by step process used in workplaces to minimize or reduce exposure to hazards. The Hierarchy breaks down as follows, with the most effective measures at the top of the pyramid and the least effective at the bottom.

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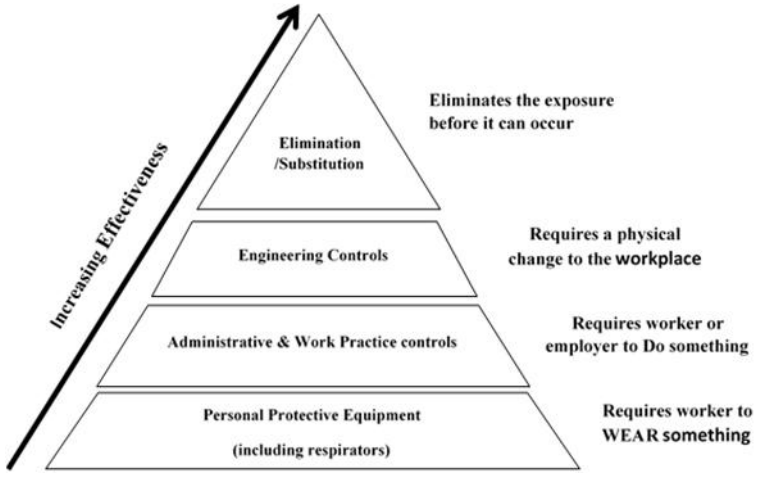

Figure 2.1 The pyramid of hazard controls

Toolbox Talks for Health and Safety

Toolbox talks are an easy way for foremen and supervisors to supplement the OSHA training efforts of their company or organization, and to keep safety front and center in their workers' minds. These short pre-written safety meetings are designed to heighten employee awareness of workplace hazards and OSHA regulations. They are not intended to take the place of formal OSHA safety training for workers, but to supplement it.

Here are a few tips to keep in mind when conducting a toolbox talk for your workers:

- Read the toolbox talk to yourself a couple of times before you hold the actual meeting with workers. That way you will be more familiar with the content to be covered and therefore less apt to stumble while reading to the group.
- Try to hold the toolbox talk in an area that is free of noise and other distractions. If the workers cannot hear you talking, or are distracted by other activities in the area, they won't be focusing on your talk.
- Speak clearly and directly. Mumbling or reading too fast makes it difficult for the workers to understand you. Just take a deep breath, and then speak clearly and at a natural pace.
- Use a prop when possible to help you keep the worker's attention. If you are giving a toolbox talk on setting up a portable step ladder, have one set up nearby so you can point out things as you read the toolbox talk. To really drive home a point, have an unlabeled container you found on the jobsite available when giving a toolbox talk on OSHA's hazard communication standards about labeling requirements.
- Always give workers an opportunity to ask questions at the end of the toolbox talk. Don't make snide remarks to employees who do ask a question, as this will discouraging others from asking questions later.
- Always document your toolbox talks. Even if certain OSHA standards do not require documentation of safety training, it can't hurt to have the information about the topic, the trainer, the date, and names of the workers on file.
- Last but not least, practice what you preach. Nothing makes a trainer lose credibility faster than to have a worker see them doing something that violates the safety precautions that were covered in a previous toolbox talk. Always set a good example.

METHODOLOGY

This study has mainly concentrated on health and safety of casual workers in Road Improvement Project (PhaseII) of package F. out of 11 different road projects in Package F through whole Nepal, only 3 projects under construction of Kathmandu valley were chosen for the study. The study also assesses the legal

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provisions related to health and safety of workers. Balaju-Ranipauwa Section of Balaju- Ranipauwa - Trishuli Road Project, Chovar-Dakchinkali Section of Balkhu- Dakchinkali Road Project and Bhaktapur-Nagarkot Section of Bhaktapur-Nagarkot-Sipaghat Road Project has been selected for study.The main objective of the project is to construct and upgrade the roads which linked to the district headquarters of Nepal.Balaju-Ranipauwa-Kakani-Trishuli Road not only connects capital to the head quarter of Nuwakot district but also provides access to the Trishuli Hydropower Project. Improvement of this road is justifiable in the present contest of depreciation of power. Being part of the alternative access that links capital to the district head quarter of the Nuwakotdistrict.Balkhu-Dakshinkali Road connects a famous religious place, Dakshinkali with the capital Kathmandu. Furthermore, this road is a section of shortest route of Kathmandu-Hetauda. Bhaktapur–Nagarkot–Siphaghat Road is an important road which provides access to a famous tourist place namely Nagarkot

Quantitative as well as qualitative research approach has been applied in this research for data collection. Primary data was collected through a Questionnaire survey, key informants interviews and site visit with a checklist. The questionnaire survey was conducted between the site management staff of contractor and consultant. It was also conducted with casual workers. Two sets of questionnaire were prepared. Among these two sets, one set was for site management (of Contractor and Consultant) and another was for Casual workers. Site visit was carried out with the checklist for recording the condition of the road.

Sample Size

The average number of casual workers working under the study area was 212. Sample size was calculated by using the following formula.

n = N/(1+N*e2) = 68 (Yamane, 1997)

where,

N = population size = 212 (Project)

n = Sample size of casual workers

e = margin of error (10% is taken for this study)

The total Construction Workers is 212. Sample Construction Worker = 68

Almost all the site staff of contractor and consultant was taken. Individual project sample size was calculated through ratio proportion. Based on activities and labour sub-contractor cluster where selected and making sure all cluster have been included.

Table 1. Average casual workers of study area

Project	BRT	BD	BNS	Total
Average Casual Workers	80	60	72	212
Sample size of casual workers	26	19	23	68
Employee	9	9	7	25

DATA ANALYSIS

All the data and information collected from a primary source, secondary source were analyzed by comparing the situation anticipated, and what is actually in the field. The information obtained from the participants was analyzed by frequency analysis using Microsoft Excel and SPSS. The data collected were of both qualitative and quantitative in nature. Basically, percentage based test was generated.

Chi-Squared test was used for the hypothesis testing for identifying casual workers and employers response independent through SPSS.

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$$x^2 = \sum_{i=1}^{n} (O \quad p \quad - E \quad p \quad)^2 / E \quad c \quad p$$

Beside this, Likert Scale is also used in the questionnaire where respondents specify their level of agreement or disagreement on a symmetric agree-disagree scale for a series of statements**.**

Relative Importance Index = (∑w)/AN = (5n5+4n4+3n3+2n2+n1)/5(n+n2+n3+n4+n5) *100

ANALYSIS OF RESPONSE

Health and Safety Facilities of Casual Workers and the Compliance of Health and Safety Provision.

As demonstrated in the literature review, the occupational health and safety of casual workers on road construction sites in Nepal have been compromised as a result of the drive for the economic and social behaviour of both employers and casual workers. The claim made on most of the constructions business was that contractors do not provide some health facilities and safety materials to casual workers on construction sites. The emphasis on this section is to determine whether or not, the employers in Nepal under Road Improvement Project provide health and safety facilities to casual workers on construction sites.

To evaluate the claim both casual workers and employees from contractor and consultancy were a questionnaire. The results that were obtained through their questioned are described as individual topics.

Health Facilities

Table 2. Employer's Perception to the Provision of Health Facilities

Health facilities	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	(%)	(%)	(%)	(%)	(%)
Safe drinking water	12	28	24	32	4
Means of heating food	8	28	32	28	4
Washing Facilities	8	28	28	32	4
Suitable accommodation to rest	4	28	24	40	4
catering service	16	24	8	48	4
Provision of toilet	12	40	16	32	0
Accommodation to change and store clothing	24	24	28	16	8
First-aid /Medical Facilities	4	28	24	36	8
Average rating	11	28.5	23	33	4.5

Figure 1

(Source: Field Survey, 2017)

According to the table 2, employers admitted four health facilities were lacking on site for casual workers. These include the provision of toilet, accommodation to change and store clothing, safe drinking water, and means of heating food. With the average response rate of 52% (12%+40%), employer demonstrates that provision of toilet as a health facility is lacking at the construction site for casual workers.

In addition, accommodation to change and store clothing, safe drinking water and means of heating food are also lacking with average ratings of about 48%, 40%, and 36% respectively on site as per the view point from the employer. Taking an average of the ratings among eight “key health related facilities” of casual workers

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on construction sites, employers rated the displeasure of provision of health facilities as 39.5% (11% + 28.5%) while 37.5% (4.5% + 33%) agreed that contractor provides health facilities in sites.

The same questions were asked to the casual workers to respond the provision of health facilities and results obtained are presented in Table 3.

Table3. Casual Workers Perception to the Provision of Health Facilities

Health facilities	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
Safe drinking water	14.71	13.24	41.18	30.88	0.00
Means of heating food	14.71	19.12	54.41	11.76	0.00
Washing Facilities	16.18	25.00	42.65	16.18	0.00
Suitable accommodation to rest	13.24	27.94	35.29	23.53	0.00
catering service	14.71	22.06	44.12	19.12	0.00
Provision of toilet	17.65	23.53	41.18	17.65	0.00
Accommodation to change and store clothing	17.65	32.35	33.82	8.82	7.35
First-aid /Medical Facilities	14.71	20.59	36.76	20.59	7.35
Average rating	**15**	**23**	**41**	**19**	**2**

(Source: Field Survey, 2017)

Table 3, elaborates the four major items of Health facilities were identified by casual workers were lacking on site. This includes accommodation to change and store clothing, suitable accommodation to rest, provision of toilet and washing facilities

According to the survey, about 50% (18%+32%) of casual workers indicated that accommodation to change and store clothing on the site is a facility which was lacking. Similarly, suitable accommodation to rest, provision of toilet and water for washing and cooking were rated as 41% (13%+28%), 41% (18%+23%) and 41% (16%+25%) respectively. With an average of about 21% (19% + 2%), casual workers agreed to the assertion that employers provide health related facilities for them while an average rating of 38% (15% +23%), casual workers disagreed with that assertion.

The result obtained from tables 4.5 and 4.6 indicates responses from both employers (39.5%) and casual workers (38%). This seems to suggest that the provisions of Health facilities on a construction site in Road Improvement Project have been compromised. To confirm this, the chi-squared test of the contingency table was employed to infer whether differences exist in response between employers and casual workers. Comparing the result obtained from the table 4.5 and 4.6, 39.5% employers and 38 % casual workers disagree with that assertion.

During Key Informant, they said that casual workers are not getting benefitted with the health facilities such as; Safe drinking water, sanitary facilities and water for washing and cooking at the construction site as per the agreement signed by contractors. Workers have to depend on nearby bushes for sanitary service like a toilet.

In field observation, it was noticed that many health related facilities have not been provided to casual workers. In Balkhu –Dakchinkali site, portable drinking water is not provided to casual workers. They are forced to manage themselves. While in Balaju and Bhaktapur sites, the water that is provided on construction sites is stored in unhygienic concrete or ploy tanks. Sanitary services such as toilets, urinals are virtually not available at construction sites. Workers have to depend on nearby bushes for sanitary service like a toilet. There were no any first-aid /medical facilities in all three studied project. Although the water was available at the construction sites, the workers were not cleaning their hands even after sneezing or using the toilet but few of the workers were using water to clean their bodies after work.

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Safety Facilities

These questions were asked between employers and Casual workers to indicate whether they agree or disagree to the provision of some safety equipment by some contractor under RIP. Table 4 below shows the average rate of responses from employers to the safety facilities

Table4. Employer's Perception to the Provision of Safety Materials

Safety Material	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
Safety signs	8	20	16	52	4
Safety helmets or hard hats	12	28	16	32	12
Safety glasses, goggles, and face shields	20	44	8	16	12
Safety boots	16	32	16	24	12
Rain gear	20	36	20	12	12
Hearing protection	28	36	8	20	8
Knee pads	28	40	8	16	8
Gloves	16	28	12	28	16
Flashlights	16	44	12	16	12
Ladder Scaffold platforms	4	32	12	48	4
Average rating	16.8	34	12.8	26.4	10

(Source: Field Survey, 2017)

According to table 4, a total of about 50.8% (16.8% + 34.0%) of employer disagreed with the statement that they provide safety materials on the construction site to casual workers while an average of about 36.4% (26.4% +10.0%) of the employer agreed to the assertion. Among other factors, indications from table 4.7 suggest that safety glasses (goggles and face-shields), Kneepads and hearing protection were the three main safety materials lacking on sites to casual workers.

In addition, an average response rate of about 68%, employers expressed that casual workers lack Kneepads on construction sites while working. Similarly, 64% of employer response that both safety glasses (goggles and face shields) and hearing protection are lacking in construction sites.

The same question was asked to casual workers. The result obtained is presented in table 5.

Table 5. Casual Workers Perception to the Provision of Safety Material

Safety Material	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
Safety signs	1	6	38	53	1
Safety helmets or hard hats	10	18	21	44	7
Safety glasses, goggles, and face shields	21	35	22	15	7
Safety boots	13	38	25	16	7
Rain gear	10	44	29	9	7
Hearing protection	13	41	31	7	7
Knee pads	16	43	25	9	7
Gloves	12	31	29	21	7
Flashlights	9	43	29	12	7
Ladder Scaffold platforms	4	18	49	29	0
Average rating	11.0	31.6	29.9	21.5	6.0

(Source: Field Survey, 2017)

From table 5, the average rating indicates about 42.6% (11.0% + 31.6%) of casual workers disagreed with the assertion while 27.5% of the casual workers (21.5% +6.0%) agreed that contractor provides safety material on

a construction site. Additionally, kneepad, safety glasses (goggles and face shields), rain gear and hearing protection were the four main safety facilities on sites lacking to casual workers. With an average response of about 59%, casual workers expressed that knee pad was lacking. Likewise, safety glasses (goggles and face shields), rain gear and hearing protection had average ratings of about 56%, 54%, and 54% respectively.

During Key Informant, they said that casual workers are not getting benefitted with the safety facilities such as; rain gear, hearing protection, kneepad, safety glasses, etc. at the construction site as per the agreement signed by contractors. Only to the casual workers at BRT construction site had been offered hats and boots as safety equipment.

In field observation, it was noticed that must the employee don't know about the Safety sign. A properly placed safety sign helps to protect the lives of those who are working on construction sites through raising awareness and highlighting potentially dangerous activities. There are different colours which indicate different safety sign in construction. Likewise, red colours indicate danger/stop, yellow indicates caution, orange indicates a warning, green indicates safety and blue indicate information.

Only worker at Balaju – Ranipauwa _Trishuli road construction site wear helmet and boots but it was very limited in number and no other PPE. It can be implied from above results that use of PPE was very limited. The slogan of being safe and its implementation by Contractor and concerned authorities in developed countries seems very far from implementation in Nepal. The only reason, not to provide PPE to workers was to save money on Contractor's part. Hence, the client needs to address this issue in some way so that Contractors are oblique to provide enough PPE.

Compliance of Health and Safety Provision

I. Provision of Insurance

While observing contract documents, the standard specification for Road and Bridge Works is applicable for all the Road Improvement Project. Hence, all the relevant clauses regarding insurance of that specification are applicable. All the studied project sites have their insurance provision in their construction sites. Insurance covers Works and Third Party Insurance, Workers Compensation Insurance and Insurance of Equipment.

II. Safety Reporting

In Road improvement project, safety monitoring has been done monthly to check the quality assessment of the workers and their working condition. For that one environmental engineer and one social engineer has been assigned to this job. Safety reporting was done only to their internal management level and there were no any cases reported to the concerned authority about the accident.

Reporting of accident helps to prevent a similar accident in recurring and it also helps to safeguard the social welfare and another right which may arise due to the accident. Casual workers may not report the accident because of fear of medical treatment and discipline: concern about the record and reputation; avoidance of Red tape and poor understanding of importance.

III. Safety Training

About 92.6% respondents said they have-not attained any training before working on the site. They were working without following proper safety rules and regulation. This has violets the rule and regulation made in the contract document between DOR and contractor but this has been the practices in the construction industry since a long time back in the context of Nepal. This seems that even concern authorities have failed to stop workers working without proper safety training.

During field visit and interview with all respondents, the focus was on "knowing the employee is the best practice of safety". To do that, toolbox talk is the effective way. During toolbox talk, discussed the work plan and procedures for the day, identification of possible hazard, the safety tools, and equipment to be used. Toolbox talk is found to be used significantly in the construction industry for a positive relationship, interaction, stress reduction, proactive injury prevention, culture change, coaching intervening and motivation resulting in higher performance.

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Ranking the Causes of Accident, Health and Safety Facilities

Causes of Accident

As per George (2013), Construction is a high hazard industry. Accident does not come with a warning but can be minimized with some precautions. Fortunately, the rate of accident in this RIP-(Phase-II) was comparatively very low with compare to other projects. Also, the accidents that occurred were of a minor type and no casualties have been reported. The view of public and workers expresses that Client and the Contractor should be more accountable in making construction site safe. Hence, the Client and the Contractor must devise some tangible working modality that ensures all construction activities were executed in the safest way possible thus ensuring the safety of all concerned involved in the construction.

Consultants and Construction Supervision Engineers were asked to rank the cause of accidents at a construction site. Table 4.10 below present the average rating of cause of accident whose detail calculation is in Appendix 8

Table 6. Ranking of cause of accident in construction site

Factors	Σ(n)	I. INDEX	RANK
Inadequate instruction concerning work	113	90.4	**1ST**
Lack of planning and organization	109	87.2	**2nd**
Inadequate supervision of work	103	82.4	**3rd**
Lack of teamwork	101	80.8	**4th**
Poor equipment maintenance	100	80	**5th**
Poor equipment	99	79.2	**6th**
Non-effective operation on safety regulation	99	79.2	**6th**
Shortage of safety management	97	77.6	**7th**
Fall of objects, tools, pieces of work, etc.	95	76	**8th**
Lack of attention from leaders	94	75.2	**9th**
Collapse of stacks, masses of earth, etc.	81	64.8	**10th**
Lack of personal protective equipment	78	62.4	**11th**
Non-rigorous enforcement of safety regulations	77	61.6	**12th**
Lack of training	72	57.6	**13th**
Poor safety conscientiousness of laborers	71	56.8	**14th**
Non-certified skill labor	69	55.2	**15th**
Lack of emergency measure	69	55.2	**15th**
Non-perfect of safety and regulations	69	55.2	**15th**
Lack of innovation technology	67	53.6	**16th**
Poor of education of laborers	64	51.2	**17th**
Overtime work for labor	62	49.6	**18th**

(Source: Field Survey, 2017)

The respondents ranked 'inadequate instruction concerning work' as 1ST with an important index of 90.4.This is then followed by 'lack of planning and organization' with an index of 90.4.

This indicates that workers need proper instruction and planning prior starting any work in the site to ensuring safety on construction sites. Inadequate supervision of work is also one of the causes for an accident in road construction site.

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There are numerous and an enumerable cause of accidents that occur on site and it is a duty of the site supervisor to identify these causes and ways to eliminate them. Before starting any construction work, there must be toolbox talk with the workers about work plan, proper instruction, and detail of site. Supervision includes planning and allocating work, making decisions, monitoring performance and compliance, providing leadership and building teamwork, and ensuring workforce involvement. Therefore proper supervision of work also helps in prevention of accident on a construction site.

Important for Addressing the Health and Safety

Based on employer's reaction, it is ranked from not very important to very important to determine the importance regarding health and safety concerns of casual workers. When the these factors were ranked using Relative Importance Index, it turned out that the most important health facilities for casual workers in road construction site are safe drinking water. Besides this, the other important factors were first –aid /Medical Facilities and provision of toilet.

Safe drinking water provided to the worker should be fitted for human consumption and it should be stored in closed containers.

Table 7. Ranking of Health Facilities for Casual Workers

Factors	Σ(n)	I. INDEX	RANK
Safe drinking water	118	94.4	1ST
First-aid /Medical Facilities	100	80	2nd
Provision of toilet	97	77.6	3rd
Suitable accommodation to rest	95	76	4th
Washing Facilities	94	75.2	5th
Means of heating food	93	74.4	6th
Catering service	81	64.8	7th
Accommodation to change and store clothing	78	62.4	8th

(Source: Field Survey, 2017)

There must be first aid box containing all the medicine and medical equipment to cope with the number of workers on a construction site. Provide information to workers about sexually transmitted diseases. Adequate washing facilities should be provided as near as practicable to toilet facilities. There should be separate sanitary, washing and sleeping facilities for men and women.

Table 8. Ranking of Safety Facilities for Casual Workers

Factors	Σ(n)	I. INDEX	RANK
Safety signs	111	88.8	1ST
Safety helmet and hard hats	107	85.6	2nd
Training in safety	104	83.2	3rd
Safety boots	103	82.4	4th
Appointment of safety officer on site	101	80.8	5th
Safety glasses, goggles, and face shields	99	79.2	6th
Gloves	97	77.6	7th
Rain gear	91	72.8	8th
Ladder Scaffold platforms	90	72	9th
Flashlights	82	65.6	10th
Hearing protection	80	64	11th
Knee pads	79	63.2	12th

(Source: Field Survey, 2017)

When the above factors were ranked using Relative Importance Index, it turned out that the most important safety facilities for casual workers in the road construction site are safety signs. Other important factors were safety helmet and hard hats and training in safety.

Safety sign is one of the important safety facilities that must be provided on a construction site. There are different safety signs like prohibition, warning, mandatory and emergency escape sign. The Road works ahead sign is the first sign to be seen by the driver, so it should be placed before work site. Clear or chemical goggles should be provided to workers who are likely to be exposed to eye or face injury from airborne dust or flying particles, harmful heat, concrete mixing or other hazardous work. Respiratory protective equipment like a mask should be provided to workers to protect them against airborne dust, fumes, and other means. A safety officer is a person who is responsible for making construction site safe. It is important for a safety officer to visit the site regularly to motivate workers to use personal safety tools and practice safe working environment. The safety office is accountable for observing and evaluating harmful and risky situations and developing measures to assure workers safety

CONCLUSION

There are generally claim that the contractors don't provide health facilities at the construction site for causal workers. They are compiled to work without proper sanitary facilities, safe drinking water, no proper catering service and others. Employees think that health related facilities are lacking in the site under RIP. Even though contractor has these provisions in the contract, they hesitate to invest the extra amount of money for safety equipment. No proper monitoring on this matter was found in RIP. Casual workers were found untrained, unskilled and uninformed about the safety measure and equipment's to be used. Only the workers at Balaju-Ranipauwa road construction site were provided hats and boots as safety equipment.

In Road improvement project, regarding health and safety facilities and provision, there is a clause in the contract to address health and safety issues and all the respondents reported that they have worker's insurance on their construction sites. Safety monitoring has been done monthly to check the quality assessment of the workers and their working conditions. But there was no detailed record for safety reporting and accident investigation. Generally, safety reporting is done only to the internal management. One environmental engineer and one social engineer are assigned for this job. The training to workers is necessary to improve construction safety. It was found from the survey that most of the casual workers are not getting safety training.

From the employee's perception, inadequate instruction concerning work is ranked as the main cause of the accident on a construction site. Safe drinking water and safety signs are ranked as the most important health and safety facility that needs to be provided on site to the casual workers. Besides this, the other important factors were first–aid equipment's, sanitary facilities such as toilets, showers, changing rooms, etc. and hard hats or helmet as they believe should be provided to the causal workers but in reality, they neglect and gives less importance to the health and safety of the causal workers. There is no proper supervision on this matter in RIP. Workers need proper instruction and planning prior starting any work to ensuring safety in construction sites.

RECOMMENDATIONS

The consultancy and concern authority should visit the construction site to make sure all the safety tools have been provided at the construction site and the casual workers follow them properly. The client should monitor both the consultancy and the contractor for promoting safety culture at a construction site. The clients to include safety in Bill of Quantities (BOQ) in bidding documents and allow contractors to price for it and accordingly deduct in every interim payment certificate if safety provision is not met.

The contractor should train the workers, promote the safety culture for workers and educate on how to avoid the risk and use the equipment properly in the construction site regularly on their own. The contractor should prepare the regular safety meeting with the causal workers before starting any work on the site. It is better to have a toolbox talk every morning before the commencement of work about health and safety and safety awareness.

The contractor should make sure that all workers are provided personal protective equipment and all of them wear these PPE and punish the workers who make safety violation. The consultancy should necessary take

action on any safety hazards occurred on the site rather than just reporting and mentioning on the monthly report. The consultants should determine the factors that can cause accidents in the construction site such as poor instruction concerning work, poor equipment and minimize them during the construction project.

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