

RISKS EVALUATION OF OCCUPATIONAL HEALTH AND SECURITY SPECIFIC TO FOREST ROAD EXECUTION

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Abstract: *This paper presents the methodology of risk assessment of accidents and occupational health where there are specified the required steps of risk level evaluation, the scales for measuring the severity and probability of consequences and methods of risk treatment. Based on these theoretical notions, the elaborated case study focuses on risk assessment of health and occupational security for a multi-skilled worker specific to the process execution of forest road. After the assessment, there is a significant minimization of identifying risk factors and an improvement in workplace activities.*

Key words: *risk factors, health and occupational security, multi-skilled worker, risk assessment.*

1. Introduction

Risk assessment, the process of evaluating the risks to safety and health arising from hazards at work, forms an integral part of the Occupational Health and Safety Management Systems (OHSAS), whereby all hazards are identified and evaluated taking into consideration existing control measures. The exercise should be carried out by competent persons in the field. The ultimate aim is to eliminate or minimize risks at work through tightening of control measures. The risk assessment process may also identify the training needs of employees and contribute towards the building of a preventative safety and health culture. In this order of ideas, the commitment of management, employees

and competent persons are important in carrying out a proper risk assessment [3], [4], [7].

Organizations are becoming more and more aware of the need for implementing a health and safety management system. Trained and experienced consultants provide specialized assistance and guidance for the implementation of occupational health and safety management system in any organization [6], [8].

Risk management is an activity directed towards the assessing, mitigating to an acceptable level and monitoring of risks. In some cases the acceptable risk may be near zero. Risks can come from accidents, natural causes and disasters as well as deliberate attacks from an adversary [2], [6].

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The activity in a professional work environment that does not endanger the safety or health worker personnel represents a priority of any organization. In this respect there apply the principles of identification, evaluation, avoidance, and control risk of injury and illness associated with the professional activities of the organization.

The objective is to help an organization understand the risks which can be minimized or removed to assure its employees and other interested parties that they are going through a hazardous process in meeting the product requirements of their customers.

Assessing the level of security is a systematic process of all aspects of workplace undertaken to determine the sources that may cause bodily harm, constituting the basis for substantiation of preventive measures and control risks [1].

2. Methodology for Risks Assessment of Accidents and Occupational Health

Risk assessment of accidents and occupational health at the workplace is a method that aims to determine the quantitative level of job risk based on systemic analysis and risk assessment.

The essence of the method consists in the identification of all risk factors examined at the workplace based on checklists and quantifying size default risk based on the combination of severity and maximum frequency of predictable consequences [5].

The intrinsic component of managerial strategy, the prevention activity represents a set of processes and steps taken or planned at all stages of design and development of work processes and it is designed to provide the work process development with conditions of maximum security to the process of participants' integrity and health. Considering these aspects there derive two major objectives of prevention:

- Human resource: reducing the numbers of accidents at workplace and occupational diseases;

- Reduce the cost of work accidents and occupational diseases.

It is generally considered that the steps to be followed in order to assess the level of risk should be as presented in Figure 1.



Fig. 1. *The steps of risks level evaluation*

The used method consists in the identification of all risk factors from the analyzed system (workplace) based on predetermined checklists and quantification of risk size based on the combination of severity (Table 1) and frequency of maximum predictable consequences (Table 2).

Table 1
Scale for measuring the severity of consequences

Severity	Consequences
1	Negligible: first aid only
2	Low: medical treatment (3-45 days)
3	Medium: partial disability (45-180 days)
4	High: partial disability (work capacity < 50%)
5	Critical: partial disability (work capacity 50-100%)
6	Catastrophic: permanent
7	Hazard: death

Table 2
Scale for measuring the probability
of consequences

Likelihood	Consequences
1	Extremely rare: $P < 10^{-1} / \text{year}$
2	Improbable: $10^{-1} < P < 5^{-1} / \text{year}$
3	Rarely: $5^{-1} < P < 2^{-1} / \text{year}$
4	Occasional: $2^{-1} < P < 1^{-1} / \text{year}$
5	Probable: $1^{-1} / \text{year} < P < 1^{-1} / \text{month}$
6	Frequent: $P > 1^{-1} / \text{month}$

The occupational health risk assessment is therefore a systematic procedure to identify potential health hazards, evaluate the extent of exposure subjectively and/or objectively, and to establish the need for, and effectiveness of existing control measures.

Various models for conducting occupational health risk assessment provide step-by-step guidance for the identification and assessment of significant occupational health hazards and assist in producing suitable and significant occupational health risk assessments.

These goals can be achieved only by eliminating or reducing the occupational risks (Figure 2).



Fig. 2. The treatment process of occupational risks

3. Risks Evaluation for Execution the Forest Roads - Case Study

Another important component in the execution of forest roads is the human resource. In this sense, there can be analyzed and assessed risks related to occupational health and safety.

The case study is based on the risk assessment process of occupational health

and safety for a multi-skilled worker.

The components of the evaluated work system are:

- Production equipment;
- Tasks to multi-skilled worker;
- Work environment.

For the analyzed workplace, multi-skilled workers perform activities on excavators, graders, and bulldozer or compactor cylinder. Specific activities that they carry are:

- Opening and removing the road corridor outside the land requirement of wood;
 - Route recognizing regarding technical marks;
 - Removing the bushes from the corridor;
 - Removal of ground vegetation layer;
 - Drainage of existing path;
 - Grading the route;
 - Realization of embankments using an excavator with straight bucket specific to longitudinal or frontal procedure;
 - Realization of embankments using the excavator with reversed bucket used for digging ditches, drains, in clay and sandy land;
 - Realization of embankments in mixed profile with bulldozer;
 - Realization of cut-area embankments;
 - Embankments grading using a grader;
 - Compaction of embankments with different types of compaction machines.
- In the execution process of forest roads, there can be mentioned the activities presented in Figure 3.



Fig. 3. *The stages of forest roads construction*

There was elaborated the “Assessment sheet on workplace” and there were identified forty-four risk factors of which

ten are located in the unacceptable risk level. The overall level of risk calculated for workplace is:

$$N_{rg1} = \frac{\sum_{i=1}^{27} riRi}{\sum_{i=1}^{27} ri} = \frac{388}{126} = 3.08. \quad (1)$$

Risk factors that exceed the acceptable level are:

- Functional movement of pieces of equipment during the tests, checks, after repairs, cleaning or restart the active part because of lack of security against accidental start;
- The risk of slipping, tipping the machine or crushing;
- The failure of control equipment;
- Electric touch, directly or indirectly due to damaged insulation/protection fault;
- Influence of lighting conditions due to bad weather;
- Distribution of performers with inadequate training in the workplace;
- Failure to follow specific work instructions:
 - during normal operation of work equipment;
 - when starting/stopping the work equipment part or all equipment;
 - in case of an accident;
 - in case of fire;
- Not using individual protective equipment;
- Inadequate delimiting (marking) of work area during interventions.

4. Conclusions

The method can be used during the design phase, as well as the operational phase, but its application requires a team of people specialized in safety and technology analysis.

Implementation of security barriers (prevention/protection) proposed will improve the working conditions and will reduce the risk level value of workplace.

The overall risk level calculated for workplace is 3.08, a value that belongs to

the category of jobs with medium risk level.

For risk factors that are situated in the unacceptable domain, there has been developed "Measure sheet proposed for the workplace". After diminution/elimination of risk factors, there was obtained an overall risk level of 2.47, and the security level is 4.53. Security level for a workplace is inversely proportional to the level of risk.

Analyzing these results, we can see that workplace presents a medium to high security level.

Regarding the distribution of risk factors according to generating sources after the implementation of corrective actions, the situation is presented in Figure 4.

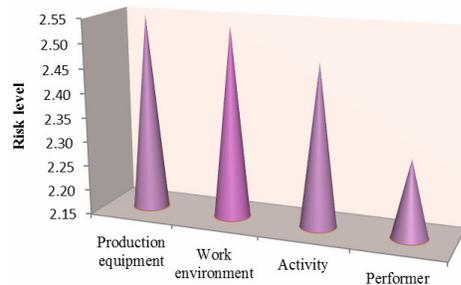


Fig. 4. Distribution of risk factors

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