

Disability-sensitive occupational risk assessment

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Abstract. This paper presents the findings of an ongoing National Institute for Research and Development in Occupational Safety “Alexandru Darabont” INCDPM project developed in collaborations with BAUM Engineering SRL that addresses the occupational safety issues related to workers with disabilities, with emphasis on disability-sensitive risk assessment. In our project we developed a method of occupational risk assessment that is disability-sensitive, in order to help employer and safety professionals. The disability-sensitive risk assessment method will identify all the risk factors in the system that can be the ultimate cause of injury and/or professional illness by means of predefined control lists and quantifying the risk based on the combination of gravity and probability of risk factor manifestation. The main steps in applying the method will be: establishment of the assessment team; description of the analysed system (workplace, installation); identification of risk factors in the system; assessment of the risks of occupational injury and illness; prioritizing risks and establishing prevention priorities; proposing prevention measures. Every step mentioned before will be disability-sensitive, taking account of individual workers’ differences and avoiding discrimination at the same time.

1 Introduction

Disability and ill health affect a relatively high percentage of the workforce. It is estimated that 23.5% of the working population in the EU have a chronic illness and 19% have long-standing health issues [1,2]. The employment rate of persons with disabilities (aged 20-64) stands at 50.6%, compared to 74.8% for people without disabilities (2017) [3]. For people with severe disabilities employment rates are lower and in most EU member states only a small proportion of working age individuals with severe disabilities are in employment. Moreover, women with disabilities, young disabled persons and persons with high support needs are more likely to be discriminated against and excluded from the labour market [3]. Increasing the employment rate of people with disabilities was one of the main objectives of the European disability strategy 2010-2020 [4]. The progress report (2017) [5] on this strategy concluded that although efforts have been made, the employment rate remains rather low mainly due to the lack of equal opportunities in the labour market. The

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employment situation of women and men with disabilities needs to be further improved through quality jobs in open, inclusive and accessible work environments.

One of the reasons that a **Disability-sensitive occupational risk assessment** it seems for most of the employer a very difficult task, is because they must comply with health and safety duties and avoid discrimination at the same time. In general risk assessments need to take account of individual workers' differences. It is important neither to assume that all workers are the same nor to make assumptions about health and safety risks associated with a particular disability.[6]

2 Method

In our project we developed a method of occupational risk assessment that is disability-sensitive, in order to help employer and safety professionals. The disability-sensitive risk assessment method will identify all the risk factors in the system that can be the ultimate cause of injury and/or professional illness by means of predefined control lists and quantifying the risk based on the combination of gravity and probability of risk factor manifestation.

The main steps in applying the method will be: establishment of the assessment team; description of the analysed system (workplace, installation); identification of risk factors in the system; assessment of the risks of occupational injury and illness; prioritizing risks and establishing prevention priorities; proposing prevention measures. Every step mentioned before will be disability-sensitive, take account of individual workers' differences and avoiding discrimination at the same time.

Our disability-sensitive risk assessment at the workplace will cover: the task, for example the design of the job, work activities; the individual, for example any specific needs with respect to disability; work equipment, for example assistive technologies, whether workstations and equipment are adjusted to individual requirements; the work environment, for example the layout of premises, lighting, heating, access, exiting; work organization, for example how work is organized and schedules; physical hazards, such as dangerous substances; psychosocial hazards such as stress or bullying; information and training needs, for example providing safety information and training in different mediums; involvement of employees and worker representatives, including consulting them about the risks and prevention measures.

The principle of the method is to identify all risk factors in the analyzed system (workplace) based on predefined checklists and quantify the size of the risk based on the combination of severity and frequency of the maximum predictable consequence. The level of security for a job is inversely proportional to the level of risk. [7]

2.1 Establishment of the assessment team

The assessment team will consist of safety professionals and ergonomists (occupational safety and health OSH services and authorities), health professionals (a physician specialized in occupational medicine), a specialist from disability employment services or disability organizations. The team that must be brief on how to avoid discrimination and also need to take account of individual workers' differences. It is important neither to assume that all workers are the same nor to make assumptions about health and safety risks associated with a particular disability. For example: identify groups of workers who might be at greater risk; make a specific assessment of the risks to them, taking account of both the nature and extent of the disability and the working environment; take account of people's abilities when planning work - disabled workers often have special skills, which

should not be lost because of poorly adapted working conditions; consult the individuals concerned during the risk assessment process; seek advice as necessary.

2.2 Description of the analysed system (workplace, installation)

At this stage, a detailed analysis of the workplace is performed in order to obtain: identification and description of the system components and its mode of operation (description of the technological process, work operations, machines and equipment used - parameters and functional characteristics, tools, etc); the workload of the worker in the system (based on the job description, written orders and decisions, current verbal provisions, etc.); description of the existing environmental conditions; the safety requirements for each component of the system. The information required for this stage is taken from the company's documents (technological file, technical books of machines and equipment, job description for the worker, specifications, environmental factor analysis bulletins, norms, standards and work safety instructions). A complementary source of information for defining the system is the discussions with the workers at the analysed workplace.

2.3 Identification of risk factors in the work system

Identifying the risk factors in the work system is an essential step for the quality of the risk assessment. Practically, it is established for each component of the evaluated work system (respectively workplace), based on a predetermined list, what dysfunctions it can present, in all the foreseeable and probable situations of operation. In order to identify all possible risks, it is therefore necessary to simulate the operation of the system and deduce the respective deviations. This can be done either by a verbal analysis with the worker, in the case of relatively low-risk jobs, in which accidental dysfunctions (or disease-generating) are quasi-obvious, or by applying the event tree method. Also, the simulation can be performed concretely, on an experimental model or by computer processing. Regardless of the solution adopted, the working methods are direct observation and logical deduction.

In the case of objective risk factors (generated by the means of production or the work environment), their identification is relatively easy, knowing the parameters and functional characteristics of machines, equipment, installations, physic-chemical properties of materials and materials used, or bulletins analysis of environmental conditions.

Regarding the worker, the operation is much more difficult and involves a high degree of indeterminacy. As far as possible, all its foreseeable and probable errors in relation to the assigned workload, in the form of omissions and wrongdoing, and their impact on its own security and on other elements of the system shall be analysed.

The identification of risk factors of the workload is performed, on the one hand, by analysing the conformity between its content and the work capacity of the executor to whom it is assigned, and on the other hand, by specifying possible operations, work rules, wrong work procedures. Regarding the worker, the operation is much more difficult and involves a high degree of indeterminacy. As far as possible, all its foreseeable and probable errors in relation to the assigned workload, in the form of omissions and wrongdoing, and their impact on its own security and on other elements of the system shall be analysed.

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In the *Identification of risk factors in the work system* step most of the disability-sensitive aspects come into place. For example, for the work system' component „work

task” along with the „classic” occupational risks factors (such as: improper content of work load in relation to safety requirements - wrong operations, rules, procedures, absence of operations, improper working methods, wrong sequence of operations, under-sized / over-sized load in relation to worker capacity, physical load - static effort, forced or vicious work positions, dynamic effort, mental stress - high work pace, difficult decisions in a short time, repetitive operations of short or extremely complex cycle, monotony of work), now we have dynamic effort by moving with crutches, walking sticks, walking frames, stroller on long routes through the company yard, climbing stairs due to unreasonable accommodation, stress due to moral harassment, stress due to lack of proper information and training, stress due to lack of technical equipment and auxiliary devices (software, devices) specially adapted to the type of activity.

The identified risk factors are entered in the “*workplace evaluation sheet*”, which also specifies, in the same stage, their concrete form of manifestation: their description and the size of the parameters by which the respective factor is assessed.

2.4 Assessment of the risks of occupational injury and illness

The “*list of possible consequences of the action of risk factors on the human organism*” (provided by the Ministry of Health) is used to determine the possible consequences of the action of risk factors. The severity of the consequence thus established is assessed on the basis of the grid “*rating scale of the severity and probability of the consequences of the consequences of the action of risk factors on the human organism*”. Important information for the most accurate assessment of the severity of possible consequences is obtained from the statistics of accidents at work and occupational diseases produced at the workplace or similar jobs.

To determine the frequency of possible consequences, the scale from “*rating scale of the severity and probability of the consequences of the consequences of the action of risk factors on the human organism*” is used. The classification in the probability classes is made after establishing, on a statistical or calculation basis, the intervals at which the events can occur (daily, weekly, monthly, annually, etc.). Those intervals then turn into probabilities expressed by the number of possible events per year.

The result obtained following the previous procedures is identified in the *Risk Assessment Grid* and is entered in the *Workplace Assessment Card*. With the help of the scale for rating the risk / security levels, these levels are then determined for each risk factor. This gives a ranking of the size of risks in the workplace, which makes it possible to establish a priority of prevention and protection measures, depending on the risk factor with the highest level of risk.

The overall risk level (Nrg) in the workplace is calculated as a weighted average of the risk levels established for the identified risk factors. In order for the obtained result to reflect as accurately as possible the reality, the rank of the risk factor, which is equal to the level of risk, is used as a weighting element. In this way, the factor with the highest level of risk will also have the highest rank. This eliminates the possibility that the compensation effect between extremes, which involves any statistical average, masks the presence of the factor with the maximum level of risk.

The Global Risk Level (N_{rg}) is calculated as a weighted mean of risk level values determined for all identified risk factors, using the following formula:

$$N_{rg} = \frac{\sum_{i=1}^n r_i \cdot R_i}{\sum_{i=1}^n r_i} \quad (1)$$

where:

- R_i is the risk level determined for the risk factor i ;
- r_i – weight for the risk factor i ; by definition, $r_i = R_i$;
- n – number of identified risk factors.

Finally, all the results of the risk assessment for a certain workplace is centralised in the *Workplace assessment card*. For each identified risk factor, the values of severity (G), probability (P) and risk level (R_i) are recorded as well as proposed measures.

3 Further research

We intend to incorporate this disability sensitive risk assessment method in a decision support system that will facilitate the activity of decision makers (managerial staff in an economic unit), at different levels of management (from the supervision of technological processes to top management), in order to make better decisions (more effective and documented). Such systems will provide sufficient support to the decision-maker (related to occupational risks) to minimize certain risks that have been identified.

4 Conclusion

In our project we developed a method of occupational risk assessment that is disability-sensitive, in order to help employer and safety professionals. The disability-sensitive risk assessment method will identify all the risk factors in the system that can be the ultimate cause of injury and/or professional illness by means of predefined control lists and quantifying the risk based on the combination of gravity and probability of risk factor manifestation. The main steps in applying the method are: establishment of the assessment team; description of the analysed system (workplace, installation); identification of risk factors in the system; assessment of the risks of occupational injury and illness; prioritizing risks and establishing prevention priorities; proposing prevention measures. Every step mentioned before is disability-sensitive, taking account of individual workers' differences and avoiding discrimination at the same time. The method is suitable for a large diversity of workplaces, regardless their activity domain or complexity, even if detailed system information is not available at the start of the assessment process.

The results presented in this paper are partial results from the project „*Partnership for knowledge transfer and research development related to the assessment and prevention of occupational risks that can lead to disasters (PROC)*”, ID / SMIS Code 2014+: POC P_40_182 / 111954, Subsidiary contract nr. 6/03.02.2022 SC BAUM ENGINEERING SRL

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