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DEVELOPING A SITE SAFETY ASSESSMENT METHOD FOR USE IN CONSTRUCTION WORKS

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Abstract

We would like to present the methodology of a site safety survey we have developed during the construction works, based on the Safety and Health Protection Plan we use, in order to reduce the probability and severity of risks during the construction works by extending the safety and health aspects. We will also be responsible for supplementing and modifying our Safety and Health Plan in accordance with our own criteria, and for proposing solutions to the organisational issues identified during the inspections.

Keywords: *construction, human safety, control questionnaire*

1. Introduction

The Constitution of our country must guarantee to all citizens the right to the highest attainable standard of physical and mental health, so employers are obliged to provide the most suitable working conditions possible, so that the risk to the health and safety of workers is reduced to an acceptable level as soon as the work process starts. In many cases, however, they do not have the means to develop methods that can fully protect their workers (Baradan et al., 2019; Buniya et al., 2021). In Hungary, the level of technology and engineering is often not in line with that in Western European countries, so we usually take for granted a certain degree of underdevelopment in this area (Oswald et al, In the construction sector, workers are exposed to a significant amount of hazards, as this sector has the highest rate of serious and fatal accidents (Manu et al., 2012).

2. Description of the on-site safety assessment introduced

The aim of the safety assessments carried out on site was to identify the sources of danger arising from activities at specific workplaces on construction sites that could pose a risk of any health hazards to workers. In addition, solutions were proposed to reduce the occurrence or the presumed impact of the

risks identified during the reviews, mainly through organisational measures, the use of collective technical protection, the provision of personal protective equipment or, where this was no longer possible, some technical solution, taking into account the employer's costs.

It is important that the results of the regular assessments and evaluations carried out as part of this safety assessment should demonstrate to the employer that we have taken all necessary measures to assess and eliminate workplace hazards or at least minimise them. In the event of any defects or deficiencies, they were recorded on a so-called time list, which allowed us to keep track of the time period during which the hazard persisted and whether work in the area had to be stopped immediately. In practice, the Safety and Health Plan was used as a basis for drawing up a list of hazards that would occur during the construction work and, if deemed necessary, a list of their sub-items (Harmat and Somogyi, 2012). In the event of hazards occurring during the various work processes, the list had to be amended and updated on several occasions, which meant that the contents of the Safety and Health Plan had to be proposed for amendment on several occasions.

The protocols and various documents considered prior to the launch of the investigation, and my review of their adequacy, are set out in Table 1.

Table 1. *Documents and requirements checked before the start of the inspection*

ssz.	Name of document	Finding	Comment
1.	Employment contract	is, appropriate	
2.	Workers occupation health a valid certificate of an aptitude test	is, appropriate	
3.	Occupational safety and health education diary	is, appropriate	
4.	Fire safety education diary	is, appropriate	
5.	Occupational accident record book	is, appropriate	
6.	Form of the current OSH Code of Conduct	is, appropriate	
7.	Declaration of receipt of personal protective equipment	is, appropriate	
8.	Rules on the conduct of aptitude tests	is, appropriate	
9.	Regulating the movement of material	is, appropriate	
10.	Declaration of measures to regulate the protection of non-smokers	is, appropriate	
11.	Occupational safety and health education materials	is, appropriate	Broken down into workflows
12.	Drunkenness test code	is, appropriate	
13.	Regulations on the placing in service of dangerous and non-dangerous machinery	is, appropriate	
14.	Documents related to fire safety		
14.1	The fire safety code	is, appropriate	
14.2	Fire classification	is, appropriate	
14.3	Fire alert plan	is, appropriate	
14.4	Register of installed fire extinguishers	is, appropriate	

ssz.	Name of document	Finding	Comment
14.5	Fire drill protocol	not relevant	
15.	Machinery, equipment		
15.1	Commissioning of dangerous machinery	not relevant	
15.2	Periodic safety review	is, appropriate	
15.3	Machine books	is, appropriate	
15.4	Operating and maintenance instructions	is, appropriate	
15.5	List of maintenance records	is, appropriate	
16.	Investigation reports		
16.1	Contact protection	is, appropriate	
16.2	Fire safety standardisation	is, appropriate	
16.3	Lightning protection	is, appropriate	
16.4	Noise measurement, noise map	is, appropriate	Approved by the municipality
16.5	Whole-body vibration measurement	not required	
16.6	Local vibration measurement (hand, arm)	is, appropriate	
16.7	Airspace measurement	not required	
16.8	Climate measurement	not required	As discussed in the OHS training material "In case of heat alarm"
16.9	Measurement of extraction, ventilation efficiency	not required	
16.10	Illumination measurement	for information purposes	According to standard 1.1 of EN 12464-1:2003, the required illumination level can range from 100 to 400 lux.
16.11	Measurement of ionising radiation	not relevant	
16.12	Measurement of non-ionising radiation	not relevant	

It is advisable to assign the separate, daily assessment and monitoring of work processes to workers with the appropriate job functions, so that the responsibilities of direct work managers are not only extended to monitoring and proposing the updating of hazard lists as necessary. Initially, the list of hazards in the work process contained few elements. Several aspects of the investigation were only recorded before the actual work process started. Once the existing work process had been completed, it was not taken down, but the attention of the workers concerned was drawn to new types of hazards that could be encountered during the following operations and activities, and how to avoid them, and an attempt was made to focus on them until the next work process started. In addition to the inclusion of a

potential source of danger on the list, its precise identification should be determined as soon as possible and regular monitoring of its elimination should in all cases be required of workers with the appropriate professional qualifications. The duration of each hazard was also recorded separately, so that it was possible to monitor the duration of workers' exposure to the adverse health effects and the number of workers affected at the workplace under consideration. These monitoring reports were also broken down into working weeks, so that we could keep a hard copy and up-to-date copies with us without any problems. This two-part method enabled us to gain a better overview of the frequently varying overall picture of the work, which was due to the nature of the work, and to reduce the injuries that were common to the various phases of the construction work, but often of varying severity, by making the work itself easier to carry out. The method proved to be cost-effective, relatively easy to apply and transparent, and the number of accidents and injuries was reported to be well below average compared to work carried out during similar periods.

3. The method of workplace safety assessment in practice

The test criteria developed within the study areas presented below are not presented for reasons of space. The areas of investigation are outlined below.

Risk assessment of working conditions

In the following, the baseline condition, i.e. the physiological factors after taking over the workplace, the work organisation, the interaction of the workplace itself with the human, the workplace practices and site structure, the work practices, the physical factors effects on occupational health are assessed (Jeong, 1998, Mahmoud et al., 2021).

- An overview of physiological factors;
- Evaluation of work organisation;
- Assessing the interaction between the workplace and human factors;
- Evaluate the workplace practices and site structure;
- Assessing the impact of electricity;
- Physical factors.

Examining the design of the workspace

It includes an assessment of the minimum requirements, stability and strength tests, energy distribution equipment, escape routes, traffic routes, hazardous area requirements, the amount of free space to be provided in the workplace, the provision of personal protective equipment (Shaumsuddin, 2015; Rácz, 2017; Ress, 2017; Baker, 2018; Baker, 2019).

- Minimum requirements for construction workplaces;
- Stability and strength;
- Energy distribution equipment;
- Escape routes;
- Transport routes;
- Free space for movement in the workplace;
- Provision of personal protective equipment.

Inspection of the machinery and tools to be used

It means the assessment of the conditions for the safe operation and maintenance of machinery and equipment.

- Requirements for work equipment and workplace,
- Maintenance-related inspections,
- Studies on work organisation,
- Examination of the installation of machinery.

A recommendation was made to keep machinery out of each other's reach when working. The arrangements for communication and cooperation between the equipment concerned must be laid down in writing and made known to the workers and those within the working range, and the person responsible for controlling the machinery must be designated and made known to all! In addition, a new proposal is made to ensure that, in all cases, clearly visible signallers are used to reduce the likelihood of risks arising during the work of machinery operators.

Assessing the impact of manual handling

It includes an examination of the safe conditions of manual handling of materials encountered for the first time at the workplace, with a focus on monitoring for injuries to the spine and soft parts of the trunk, such as strains, tears, haematomas and the development of occupational diseases that may cause a persistent pathological condition.

The risk of back injury to workers when the load was carried or held by one or more persons included. During the study, manual handling of materials by workers who could lift - remove, push - pull, transfer or move materials, taking into account the unfavourable ergonomic conditions specified in the Safety and Health Plan. Moving the load was particularly likely to cause back injuries if the load was inherently too heavy or too large, if it was difficult to shape and grip, if its contents could shift, or if it was positioned in such a way that it could be moved by bending the torso or turning it repeatedly.

Hazardous substances and mixtures testing

The test points for the use of hazardous substances are structured according to the following main criteria.

- Documentation, staffing conditions;
- Investigating material handling;
- Examining the use of;
- Organisational measures.

The on-site safety assessment has shown that the risks from working with hazardous substances and mixtures cannot be further reduced by reasonable instructions and practical techniques. We found that those working with the substances and mixtures to be used had the necessary expertise and the investigation showed that adequate control of the work had been ensured so that the carrying out of this work, with the deficiencies remedied, no longer posed a risk greater than the so-called tolerable risk.

Requirements for work near public utilities

Continuous liaison with authorities and utilities is required, as the proposed drinking water pipeline may cross gas pipelines or gas backbone. Therefore, construction activities cannot be started and carried out without professional supervision. In the case of crossings, the gas pipelines must be located by digging an exploratory trench before construction starts.

During the work, any section of gas pipe that we discover should only be covered up with the permission of the competent authority. We, as the contractor, are obliged to protect the excavated pipeline until it has been covered up, it must not remain uncovered for a long period of time and it is forbidden to place any other utility equipment on it. Furthermore, care must be taken to ensure that any concealment, removal or obliteration of the gas distribution pipeline markings does not take place.

4. Using the time list

Table 2 presents a time list showing the duration of the hazards encountered during the application of the on-site safety and health assessment method, broken down into working days to inform about changes. The results of the on-site safety survey were entered into the time list in a format not previously used to show the current occupational safety and health status of the work site. Given the importance of avoiding forced stoppages, the duration of the hazards was made available to all concerned. In the event that we indicated any avoidable defects or deficiencies, or emphasised how long they had persisted, we felt that this was an incentive to correct them quickly, to change the work organisation as soon as possible or to introduce a technical solution quickly. The results show that there were recurrent deficiencies during the construction period and in many cases the employer considered it essential to extend the system of sanctions of its own design.

Table 2. *Time schedule (Green = Risk of inspection eliminated, Yellow = Risk under inspection does not exist, further inspection is justified due to its nature, Red = Risk exists! Action required)*

Location	**1. working week**					
N.A.	07.13.	07.14.	07.15.	07.16.	07.18.	07.19.
Improper access to first aid boxes	X	0	0	0	0	0
Checking the condition of working trenches (by workers)	X	0	0	X	0	X
Unnecessary stays in workplaces (by workers)	X	X	X	0	X	X
Lack of precautions against the risks from dust arising	X	0	0	0	0	0
Failure to attend health and safety training	X	X	X	X	X	0

5. Summary

The on-site safety assessment method we have introduced has been used to assess the established risks to the health and safety of workers arising from the nature of all work activities. However, it could not address the risks arising from the routine activities that we bring with us to the workplace, given their inevitable and often self-evident nature. It was also not possible to assess the extent of exposure to adverse psychological effects outside the work environment, beyond the so-called "I don't care" behaviour, which is mostly brought from home. In terms of working conditions, the design of the

workplace, the conditions of the various periods of work, the machinery and equipment used did not endanger the health and physical integrity of the workers and did not meet the requirements for safe working conditions that do not endanger health. The implementation of the measures and their regular monitoring have ensured that risks are kept at a minimum level. Fire safety and health and safety training was provided on a daily basis, before the start of work, in accordance with the activities carried out, according to a training syllabus established by an external safety engineer. A weekly written feedback process was also carried out with those present. The workers were made aware that the work should always be carried out with due care and skill, maintaining the safe technical condition of the machinery and equipment and using personal protective equipment as intended, so that the activities during the construction period will not present a risk greater than the minimum or acceptable level. Failure to do so may result in penalties or even serious injury for omissions, errors, omissions, inattention, or failure to comply with the employer's instructions.

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