WORK SAFETY SELF-ASSESSMENT (PART II). APPLICATION, WORKER

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Abstract. *Work safety self-assessment is usually applied to small and medium enterprises, but also to large enterprises on subsystems such as sections, workshops, departments, by designated worker. Self-assessment involves going through a series of questions whose answers cover the main health and safety issues for assessed organization. Thus, a qualitative self-assessment is carried out through a "Weak points – Strong points" table, and a quantitative self-assessment on the work system components: work task, worker, work means and work environment. The paper focuses on the "Worker" component.*

Rezumat. *Autoevaluarea securității muncii se aplică, de regulă, întreprinderilor mici şi mijlocii, dar şi întreprinderilor mari pe subsisteme cum ar fi sectii, ateliere, departamente, de către lucrătorul desemnat. Autoevaluarea presupune parcurgerea unei serii de întrebari a căror răspunsuri acoperă principalele probleme de securitate şi sănătate în muncă de la unitatea evaluată. Astfel se realizează o autoevaluare calitativă, prin intermediul unui tabel "Puncte slabe - Puncte tari", si o autoevaluare cantitativă, pe componentele sistemului de muncă: sarcina de muncă, executant, mijloace de muncă şi mediul de lucru. Lucrarea de faţă se axează pe componenta "Executant".*

Keywords: occupational safety and health, qualitative self-assessment, quantitative self-assessment

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1. Introduction

The method for work safety self-assessment applicable to small and medium enterprises was carried out by the National Research and Development Institute of Occupational Safety – INCDPM "Alexandru Darabont" Bucharest [1].

With the appearance of the "Microsoft Office" package and especially the Microsoft Excel component, as a general software for data processing, the application of the method has become much simpler [2]. An example of the application of the method

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for the independent component of the work system, namely for the work load, is presented in the paper "Work Safety Self-Assessment. Application, Work Load" [3].

The paper presents the work safety self-assessment, for the dependent component of the work system, namely for the worker, applied to the Metal Casting Laboratory within the Faculty of Materials Science and Engineering of the "Gheorghe Asachi" Technical University of Iași.

For each question corresponding to the "Worker" component, a self-assessment value is assigned. Based on these values, by using the standard grid, the qualitative assessment is obtained, namely the "Weak points – Strong points" table. The created table is the basis of the measures taken for the evaluated compartment, so that the weak points become strong points, and the strong points remain at the same level.

In the same way, based on the self-assessment values for each question corresponding to the "Worker" component, a quantitative assessment is also determined. Depending on the number of strong points of the component in relation to the number of applicable items, a Score is obtained that leads us to a rating for the value of the score.

The work safety self-assessment can be thought of in relation to the assessment of the work safety level [4, 5], but also to the assessment of the risks of work accidents and occupational illness [6-9]. The link continues with the occupational health and safety management and with the occupational risks management [10, 11]. Work safety self-assessment is useful for a scientifically based risk analysis [12, 13].

2. Work safety self-assessment method

The work safety self-assessment method is intended for the assessment of occupational safety in small and medium-sized enterprises. The method can be applied to companies of any size, when the evaluation is carried out on subsystems, such as departments, workshops, workplaces, etc.

The work safety self-assessment method is applied by the appointed persons from these units, persons with attributions in occupational safety and health. The intervention of an external expert is not allowed.

The method is based on a series of questions that cover all essential aspects related to safety and health at work in a company.

The designated worker evaluates each question, taking into account the concrete situation in the company, assigns a score in the range [0, 5] with the increment of 0.5 for all applicable items. For items that may be irrelevant for a specific company, so for non-applicable questions, the value {-1} can be assigned. The self-assessment

values assigned by the person designated with safety and health in the company will be transferred to the Items_Self-Assessment sheet, then these values will be compared with the values from the Standard_Grid sheet in the Excel document [2].

The self-assessment method involves a qualitative evaluation through "Weak points - Strong points" (WP-SP) tables and also a quantitative evaluation by making the ratio between the number of "Strong points" and the number of "Applicable questions" on all components of the work system.

For qualitative self-assessment, the Qualitative_Self-Assessment sheet is used [3], in which the sections and chapters are highlighted in the first column, and in the following columns, WP and SP are highlighted respectively (the "abbreviated question" is written if the self-assessment value corresponds to the grey or white portion of the standard grid or "-"). The relationship between the self-assessment value given for a question and the grey, white or non-applicability areas is described in the work "Work Safety Self-Assessment. Application, Work Load" [3].

3. Applying of work safety self-assessment method

The work safety self-assessment method, applied at the Metal Casting Laboratory within the Faculty of Materials Science and Engineering of the Gheorghe Asachi Technical University of Iaşi, is presented below. The work safety self-assessment is applied to the dependent component of the work system, namely to the worker.

3.1. Work system

The "Worker" represents the human factor directly involved in the execution of a work task. Any worker is an executor, regardless of position, when he fulfills his duties arising from the work task. The "Worker" represents one of the four elements of the work system related to the accomplishment of any work process, generating risk factors of work accidents and occupational illness. In the case of the worker, the own risk factors are wrong actions and omissions. By definition, the worker is the potential victim of the work accident or occupational illness. Without its presence, the injury or illness, the defining element of the work accident, respectively of the occupational disease, cannot occur [14].

According to the Occupational Health and Safety Law no.319/2006 [15] and Government Decision no.1425/2006 – Methodological Norms for the Application of the Provisions of the Occupational Health and Safety Law [16], the work system is composed by four defining elements, namely, the work task, the worker, the means of work or work equipment and the work environment on workplaces or workstations.

In the Metal Casting Laboratory, students engage in manual forming of both molds and cores, design and size casting nets for casting molds, and determine a range of

properties of molding materials and metals being cast. For metals and alloys, students determine the fluidity of metallic materials and their linear contraction.

3.2. Worker

The worker is a dependent component of the work system. The workload is the independent component, the other components (the means of work or work equipment, the work environment on workplaces or workstations) being dependent on the workload, but also on each other, including the worker.

The application of the work safety self-assessment for the Worker requires the creation of the tables regarding: Items_Self-Assessment. Worker, Table 1; Standard_Grid. Worker, Table 2; Qualitative_Self-Assessment. Worker, Table 3; Quantitative_Self-Assessment. Worker, Table 4 [2]. The appreciation of the quantitative self-assessment is based on the value of the obtained score [1, 2].

Table 1. Items_Self-Assessment. Worker

"Section/Chapter/Item"	*"Abbreviated Item"*	*"Value granted"*
1. "The ability to control risks"		
1.1. "Avoiding risks"		
1. Assess the quality of the information you have regarding the risks inherent to your company's activities.	1. Quality of information	4.5
1.2. "Assessing unavoidable risks"		
3. Assess the quality of the documentation at your disposal regarding measures for labour protection and risk prevention.	3. Quality of documents	4.0
1.8. "The information and training of workers in the field of labour protection"		
10. Do you formulate instructions on the safety and health of your employees? Do you prepare (train, improve) your employees: - when recruiting them? - when transferring them to a different job? - in the event of introducing new equipment? - in the event of introducing new technology? If an external company carries out an activity in your company: - do you inform them about the risks in your company and the existing means of protection and prevention? Assess the training and information measures taken by your company by referring to the actual situation.	10. Training / information	4.5
1.10. "Workers' participation"		

"Section/Chapter/Item"	*"Abbreviated Item"*	*"Value granted"*
12. For all health and safety issues at work: - do you consider consulting your employees or their representatives with regard to: • the organization of professional training and work safety? • the training of new employees? • the organization of first aid and the quick evacuation of buildings? • the dangers to which they may be exposed? - do employees participate in the measures being taken? - do you use their skills and knowledge? • are they free to make suggestions? • do you take note of these suggestions? Assess the participation of workers in ensuring safety and health at work in your company by referring to the most unfavourable situation.	12. Participation of employees	4.5
2. "Risk prevention policy"		
14. Assess the degree to which the security procedures and regulations are observed within your company.	14. Observing safety regulations	4.5
20. Assess the level of cleanliness and order existing within your company.	20. Order and cleanliness	4.0
4. "Machine protection"		
34. When you buy a new machine you pay attention to: - the integration of security systems in the design phase: • with regard to the production process? • taking into account the inherent interruptions of activity? - the opinions of workers on the security systems of the previous machines? - the specification of safety and machine protection requirements on the order sheet (for the new machine)? - the protection of all moving parts (for example, by screens, grills or light rays)? Assess the importance that you grant to protection devices when purchasing a new machine by referring to the actual situation in your unit.	34. The importance of protection	5.0
5. "Noise and vibration"		
5.1. "Noise"		
41. Assess the information you provide to workers about the noise risks and the means of protection against them.	41. Information on noise	4.0
5.2. "Vibrations"		
46. Assess the information you provide to workers about vibratory risks and the means of protection against them.	46. Information on vibrations	4.5
8. "Risks of fire, explosion and electrical hazards"		

"Section/Chapter/Item"	*"Abbreviated Item"*	*"Value granted"*
8.1. "Fires and explosions"		
67. Assess the extent to which the staff knows and observes the instructions and procedures to be followed in the event of a fire and/or explosion.	67. Staff information, fire/explosion	4.5
8.2. "Electric hazards"		
76. Assess the extent to which your workers are informed on electrical hazards.	76. Information of staff on electricity	5.0
77. Assess the extent to which your workers observe security procedures in case of electrical hazards.	77. Observing the rules related to electricity	5.0
9. "Dangerous materials: risks related to health and labour protection"		
84. Assess the extent to which your workers understand the hazards associated with the handling of substances and products.	84. Employees risk awareness	5.0
85. Assess the extent to which your workers observe the rules on wearing the individual protective equipment in the presence of dangerous materials.	85. Wearing individual protective equipment	4.0
86. Assess the extent to which your workers observe the rules on personal hygiene at work.	86. Employees hygiene	4.0
89. Assess the extent to which you are aware of the occupational diseases that may occur in your company.	89. Knowledge of diseases	5.0
10. "Collective and individual protection at work and in the surrounding areas"		
10.1. "Collective protection"		
92. Assess the participation of workers in choosing collective protection.	92. Staff participation	4.5
10.2. "Individual protection"		
97. Assess the extent to which workers comply with wearing these means.	97. Wearing individual protection means	4.5
11. "Transport of weights"		
11.1. "Hand transport of weights"		
101. Assess the extent to which workers know the optimal handling techniques (for example, the correct positioning of the parts of the body during such an operation).	101. Staff information	4.5

"Section/Chapter/Item"	*"Abbreviated Item"*	*"Value granted"*
102. Assess the degree to which the individual characteristics of workers (age, physical condition, etc.) are taken into account in handling operations.	102. Staff characteristics	4.5
11.2. "The mechanical transport of weights"		
105. Assess the extent to which your workers actually use the available equipment.	105. Use of mechanical handling equipment	-1.0
12. "Maintenance activity"		
109. Assess the compliance of subcontractors, companies organizing your maintenance activity (if applicable) with the maintenance rules of your company.	109. Compliance with rules by third parties	3.5
110. Assess the knowledge and observance of your maintenance rules by your staff.	110. Compliance with rules by the staff	5.0
13. "First aid organization"		
114. Assess the attention paid to workplaces and specific working conditions while establishing first aid measures.	114. First-aid plan	4.5
115. Assess the training of staff in providing first aid.	115. Staff training	4.5
116. Assess your staff's knowledge of first aid measures specific to particular situations (for example, in the event of an accident caused by a chemical substance).	116. Staff knowledge	5.0
14. "The participation of workers in the process of ensuring labour safety"		
117. Do the workers in your company observe the security measures. Assess the observance of these preventive measures by reference to the actual situation in your unit.	117. Observing preventive measures	5.0
119. Do you assign responsibilities (to a particular individual or to the entire staff) in the field of risk prevention. Assess the assignment of responsibilities in terms of risk prevention by reference to the actual situation in your unit.	119. Assignment of responsibilities	5.0

Table 2. Standard_Grid. Worker

"Section/Chapter/Abbreviated Item"	*"Standard Grid"*											*"Logical values"*		
1. "The ability to control risks"														
1.1. "Avoiding risks"														
1. Quality of information	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
1.2. "Assessing unavoidable risks"														
3. Quality of documents	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
1.8. "The information and training of workers in the field of labour protection"														
10. Training / information	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
1.10. "Workers' participation"														
12. Participation of employees	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
2. "Risk prevention policy"														
14. Observing safety regulations	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
20. Order and cleanliness	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
4. "Machine protection"														
34. The importance of protection	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
5. "Noise and vibration"														
5.1. "Noise"														
41. Information on noise	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
5.2. "Vibrations"														
46. Information on vibrations	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
8. "Risks of fire, explosion and electrical hazards"														
8.1. "Fires and explosions"														
67. Staff information, fire/explosion	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
8.2. "Electric hazards"														
76. Information of staff on electricity	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
77. Observing the rules related to electricity	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
9. "Dangerous materials: risks related to health and labour protection"														
84. Employees risk awareness	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
85. Wearing individual protective equipment	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
86. Employees hygiene	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2

"Section/Chapter/Abbreviated Item"	*"Standard Grid"*											*"Logical values"*		
89. Knowledge of diseases	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
10. "Collective and individual protection at work and in the surrounding areas"														
10.1. "Collective protection"														
92. Staff participation	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
10.2. "Individual protection"														
97. Wearing individual protection means	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
11. "Transport of weights"														
11.1. "Hand transport of weights"														
101. Staff information	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
102. Staff characteristics	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
11.2. "The mechanical transport of weights"														
105. Use of mechanical handling equipment	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
12. "Maintenance activity"														
109. Compliance with rules by third parties	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
110. Compliance with rules by the staff	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
13. "First aid organization"														
114. First-aid plan	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
115. Staff training	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
116. Staff knowledge	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
14. "The participation of workers in the process of ensuring labour safety"														
117. Observing preventive measures	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2
119. Assignment of responsibilities	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	-	1	2

Table 3. Qualitative_Self-Assessment. Worker

"Section/Chapter"	*"Weaknesses"*	*"Strengths"*
1. "The ability to control risks"		
1.1. "Avoiding risks"		
	-	1. Quality of information
1.2. "Assessing unavoidable risks"		

"Section/Chapter"	*"Weaknesses"*	*"Strengths"*
	3. Quality of documents	-
1.8. "The information and training of workers in the field of labour protection"		
	-	10. Training / information
1.10. "Workers' participation"		
	-	12. Participation of employees
2. "Risk prevention policy"		
	-	14. Observing safety regulations
	-	20. Order and cleanliness
4. "Machine protection"		
	-	34. The importance of protection
5. "Noise and vibration"		
5.1. "Noise"		
	-	41. Information on noise
5.2. "Vibrations"		
	-	46. Information on vibrations
8. "Risks of fire, explosion and electrical hazards"		
8.1. "Fires and explosions"		
	-	67. Staff information, fire/explosion
8.2. "Electric hazards"		
	-	76. Information of staff on electricity
	-	77. Observing the rules related to electricity
9. "Dangerous materials: risks related to health and labour protection"		
	-	84. Employees risk awareness
	-	85. Wearing individual protective equipment
	-	86. Employees hygiene
	-	89. Knowledge of diseases
10. "Collective and individual protection at work and in the surrounding areas"		

"Section/Chapter"	*"Weaknesses"*	*"Strengths"*
10.1. "Collective protection"		
	-	92. Staff participation
10.2. "Individual protection"		
	-	97. Wearing individual protection means
11. "Transport of weights"		
11.1. "Hand transport of weights"		
	-	101. Staff information
	-	102. Staff characteristics
11.2. "The mechanical transport of weights"		
	-	-
12. "Maintenance activity"		
	109. Compliance with rules by third parties	-
	-	110. Compliance with rules by the staff
13. "First aid organization"		
	-	114. First-aid plan
	-	115. Staff training
	-	116. Staff knowledge
14. "The participation of workers in the process of ensuring labour safety"		
	-	117. Observing preventive measures
	-	119. Assignment of responsibilities

Table 4. Quantitative_Self-Assessment. Worker

"Section/Chapter/Abbreviated Item"	*"Weaknesses"*	*"Strengths"*
1. "The ability to control risks"		
1.1. "Avoiding risks"		
1. Quality of information	-	2
1.2. "Assessing unavoidable risks"		
3. Quality of documents	1	-
1.8. "The information and training of workers in the field of labour protection"		

"Section/Chapter/Abbreviated Item"	*"Weaknesses"*	*"Strengths"*
10. Training / information	-	2
1.10. "Workers' participation"		
12. Participation of employees	-	2
2. "Risk prevention policy"		
14. Observing safety regulations	-	2
20. Order and cleanliness	-	2
4. "Machine protection"		
34. The importance of protection	-	2
5. "Noise and vibration"		
5.1. "Noise"		
41. Information on noise	-	2
5.2. "Vibrations"		
46. Information on vibrations	-	2
8. "Risks of fire, explosion and electrical hazards"		
8.1. "Fires and explosions"		
67. Staff information, fire/explosion	-	2
8.2. "Electric hazards"		
76. Information of staff on electricity	-	2
77. Observing the rules related to electricity	-	2
9. "Dangerous materials: risks related to health and labour protection"		
84. Employees risk awareness	-	2
85. Wearing individual protective equipment	-	2
86. Employees hygiene	-	2
89. Knowledge of diseases	-	2
10. "Collective and individual protection at work and in the surrounding areas"		
10.1. "Collective protection"		
92. Staff participation	-	2
10.2. "Individual protection"		
97. Wearing individual protection means	-	2
11. "Transport of weights"		
11.1. "Hand transport of weights"		
101. Staff information	-	2
102. Staff characteristics	-	2

"Section/Chapter/Abbreviated Item"	*"Weaknesses"*	*"Strengths"*
11.2. "The mechanical transport of weights"		
105. Use of mechanical handling equipment	-	-
12. "Maintenance activity"		
109. Compliance with rules by third parties	1	-
110. Compliance with rules by the staff	-	2
13. "First aid organization"		
114. First-aid plan	-	2
115. Staff training	-	2
116. Staff knowledge	-	2
14. "The participation of workers in the process of ensuring labour safety"		
117. Observing preventive measures	-	2
119. Assignment of responsibilities	-	2
TOTAL puncte	**2**	**25**
$SCORE_{Worker}$:	**92.59**	
$Appreciation_{Worker}$		
*"***Very Good**. Some aspects can be improved. Keep the same way*"*.		

3.3. Interpretation of the results

Table 1 shows the questions in extenso from the 14 sections and the corresponding chapters and also the abbreviated questions. The third column presents the values assigned by the worker designated for occupational health and safety. Table 3 is the WP-SP table determined on the basis of the evaluation values and the benchmark in Table 2. Table 4 is also a WP-SP type table used for quantitative self-assessment, and here, depending on the value of the calculated Score, the appreciation is obtained through a series of four ratings presented in Table 5.

Table 5. Quantitative Assessment - SCORE

"Appreciation"	*"Maximum Score"*	*"Minimum Score"*
"**Very Good.** Some aspects can be improved. Keep the same way".	100	75
"**Medium Score.** You have to be more careful".	75	50
"**Critical Situation.** You have to improve the theme as soon as possible".	50	25
"**It is time to act**. You have many things to do in order to improve to situation".	25	0

It can be easily seen from the WP-SP table, that for the "Worker" in the Metal Casting Laboratory, the questions "3. Quality of documents" and "109. Compliance with rules by third parties" represent weak points. Thus, we can say that for these questions it is necessary to request financial resources, materials, etc. to move them from weak points to strong points. Resources can also be requested to maintain strong points.

Conclusions

The work safety self-assessment method is intended for the assessment of the work safety by the person designated by the company, with attributions in occupational health and safety, the intervention of an evaluator from outside the unit not being allowed. The obtained document is related to the moment when it was created, representing the current image of the safety at work in the assessed company.

The person designated with health and safety at work fills in the Excel document the self-assessment value from Table 1 for each item, automatically generating Table 3, which actually represents the WP-SP table, for the Worker and Table 4 with the calculated score and the rating. Thus, the designated worker intervenes only on health and safety at work issues and does not intervene on data processing issues, thus eliminating human error.

In the case of carrying out an assessment of the work accidents and occupational illness risks at a workplace, the head of the assessment team requests from the designated worker, as a complementary source of information, the work safety self-assessment documents for the last three years.

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