

## **Risk analysis of steel construction projects documentation blast furnaces.**

Silvie Dobiášová<sup>1, a</sup>, Karel Kubečka<sup>2, b \*</sup>

<sup>1</sup> VŠB-Technical University of Ostrava, Department of Structure – Ph.D. student, Faculty of Civil Engineering, L.Podéšť 1875, Ostrava 708 33, Czech Republic

<sup>2</sup> VŠB-Technical University of Ostrava, Forensic Institute, Faculty of Civil Engineering, L.Podéšť 1875, Ostrava 708 33, Czech Republic

<sup>a</sup> silviedobiasova@seznam.cz, <sup>b</sup> karel.kubecka@vsb.cz

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**Abstract.** This paper shows the example of the blast furnace project risk assessment project documentation. Evaluation is performed by expert Universal Matrix of Risk Analysis (UMRA) and in the second part will be aligned with the evaluation using RPN index. Individual analysis of the research questions will reveal whether and to what extent it is necessary to deliver it to the weighting of individual factors or whether it is sufficient to use a constant scale factor input data.

### **Introduction**

Risks analysis is used in various fields of human activity. The use of these methods is based on their application by completely different means than they are known and were originally intended for. The Method UMRA (Universal Matrix of Risks Analysis) was used for the first time around the year 1986 (by Prof. Milík Tichý) for the construction of a tunnel as a whole (from a sketch), which means for the period from the initial idea, through a life cycle to its death. From 2005 to 2013 this method was applied separately for the individual phases of the construction [3], [4]. The method was consequently used also in forensic research and was proved and thus was verified in practice. On the basis of this verification a “certified methodology” was utilized for various dual usage with subsequent integration into instruction.

The possibility of usage (and also an official confirmation of an applicability of this certified methodology) has provided in this case an alternative method of forensic research and for giving proof.

At the same time a way has been opened for the application of other methods of risk analysis in the fields, which these methods were not primarily intended for. It is worth mentioning the use of SWOT analysis for assessing whether an area is suitable for construction (Pavel Vlček [7] – dissertation, FAST VŠB-TUO, Ostrava 2012).

### **Risks in project activities**

Field of project preparation, it's means designing, it's completely without risk – it is dominant idea. Purely and simply because, that designed of construction buildings is make according to standards [1], [5], [6], which guarantee practically certainly, that proposition will be safe. In actual fact situation is completely different from idea.

As example is make evaluation project documentation of blast furnace (Fig. 2) by method UMRA (Universal Matrix of Risk Analysis). Method work with the same – constant important consider factors. Consider factors are not evaluated different parts of constructions as load-bearing masonry and masonry, but individual parts of project documentation.

Aims of this analysis are:

- Estimate, where necessary awaiting in project (object or process) implementation danger is and which is his source hazard and hazard scenario.

- Estimate importance of hazard.

Method is founded on comparison logical – numerical analysis assessment importance hazard for investigated project by experts. Number of experts is arbitraries, method can used only one expert. Team of experts or teams of experts, are led by risk analyst. In case, when only one expert used this method, expert is also risk analyst.

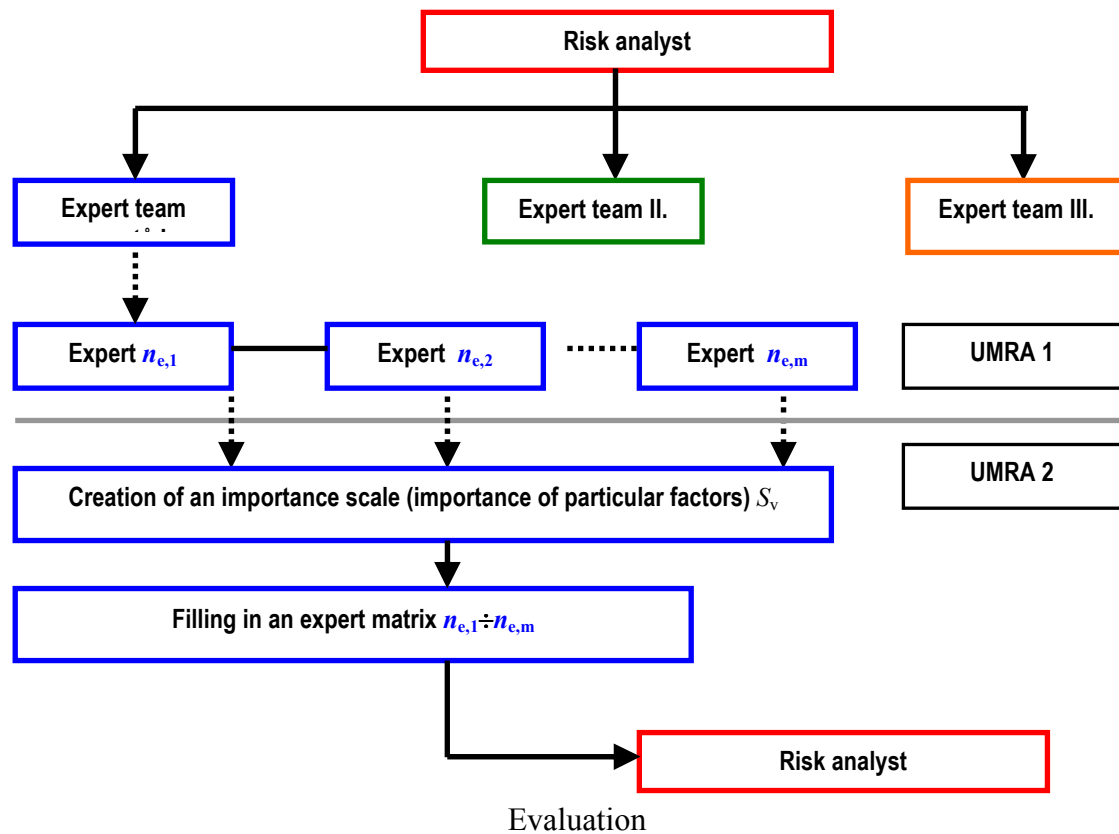


Fig. 1. Process of work of the expert team while analyzing the risk

The interest of students in this alternative way of assessing buildings, with the possibility of estimating what is the life-time of a building, is enormous. This information has an importance not only from the forensic science point of view, but also and foremost from the economical aspect. The reason for that is the possibility and mainly justification for potential reconstruction. In other words, it is important to find an answer to the question whether we should reconstruct a building or demolish it and build a new one.

The team of experts evaluates an identified part of a problem (project), which is demarcated by a certain danger – a risk. The number of parts of the problem, evaluated by the team of experts, is arbitrary while various (or the same) parts can be independently dealt with by different expert teams with a varied number of people.

The goal of this expert risk method is to provide the most accurate information about the source of the danger in relation to the consequences of its origin and the anticipated extent of its occurrence, which is directly related to economic indicators – in the case of construction to investment costs or investment into the reconstruction (rehabilitation) of the building. Graph 2 shows the situation (Fig. 1).

The team of experts has several members, its number can vary according to the seriousness of the evaluated issue. The easiest alternative is when the team is represented by one person who is the risk analyst at the same time (as it is described above in the case when the person makes the decision whether to proceed to a communication step...)

Work is divided into two subsequent phases (Fig. 1). These are called UMRA 1 and UMRA 2. In the first phase (UMRA.1) the risk analyst familiarizes him/herself with the project that he/she is going to manage and which will be examined for risk analysis on the basis of a defined aspect (qualitatively the defined and specified perspective of the project) One example is e.g. “the static qualification for evaluating an object”.

The risk analyst then introduces the experts of an expert team to the core of the method and to the task of the method in risk analysis, for experts are specialists in their profession (in a given aspect) unfamiliar with the details of risk evaluation. The experienced person in this example is the risk analyst. The experts are needed to be introduced to a minimum amount of information which represents the importance of the segments of the project of the chosen aspect including the rules of the structure, the significance of the sources of danger including the rules of the structure of danger, especially the practice of filling in a form. We can simply compare it to a technical questionnaire. The evaluation is mainly the matter of the risk analyst, the expert’s task is to fill in the form.

### Risk assessment in construction projects

When the complete form is finished the first step of risk analysis is done. The description of consequences, realization of hazard and importance hazard UMRA is adjusted, logical and numerical parts are worked up. Logical part is description with instruction for fill experts’ matrix.



Fig. 2. Blast Furnace– Alchevsk Ukrajina

Evaluation is made according to known analytic relationships [1], [2], [3], [4], [5]. It could use evaluation with help histograms, where are demand added static aggregate data.

In case project of blast furnace in Alchevsk was the first risk factor many specialized, which practically each specialized was designed in different part of world. Customer (investor) was American company invest in Ukraine in Alchevsk, construction was made in Ukraine and main coordinator of project was Dutch company Danieli Corus. Technological part of blast furnace and foundations constructions was designed in Canada. The whole supporting steel construction was designed in Czech Republic by division steel structures company BKB Metal, a.s., and part of workshop documentation steel construction (aspect extent and complicated) was distance assigned. For elimination of risk, revision of drawing documentation and static calculation had to be made on high level. Attended situation, that on steel construction was made change and different change was debated between Dutch coordinator (manager of project) and for example investor – customer or designer of technologies.

Revision had to mark with date and exact description and revision part had to mark in drawing documentation. Between revision, as was called, with date served for communication between manager of project and division steel structures. Implementation of system revision was at the beginning complicated, but after time it improved was prevent serious mistakes in project, many collision between technologies and construction and this system of revision overcame language barrier and overall ease communication.

As base for designed steel construction was supplied study, on the base this study was made the first estimate dimension main load-bearing elements. This study of steel construction obtained designers of technologies and after their treatment demand was make steel construction and project for building permit (project for building authority in Ukraine).

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