

## RISK PLANNING IN CONNECTION WITH PUBLIC PROCUREMENT

Jitka Vlčková<sup>1</sup> - Svatava Henková<sup>2</sup>

**Abstract:** *The article focuses on the option of creating a list of undesirable phenomena and a way of planning to deal with the risks related to a given planned construction. Price is usually the most important evaluation criterion in public procurement, therefore, our objective to show the necessity of the timely incorporation the costs of safety measures into bills of quantities. Hereby the same entry conditions are created for all applicants. An effort is made to provide a sufficient amount of arguments to aid in understanding the necessity of the timely production of an Occupation Health and Safety Plan for a construction site at the construction planning stage. The Plan includes safety measures which will affect the prices quoted for the project during the public procurement procedure, and also the length of the construction process.*

**Keywords:** Risk plan, procurement, preparation of construction, plan for occupational safety and health, contractor, risk

### 1 INTRODUCTION

As in other branches, in the building industry the final result of any construction activity depends on many circumstances. The main aim is the creation of a structure which is of the highest quality possible for the most acceptable price. If we look at the realization of the construction plan through the eyes of the client, they are interested in obtaining the structure they have invested in as fast as possible, with the highest level of quality and user comfort. From the contractor's point of view, they need to build a structure for which they will be paid well. It needs to serve well, too, so that they don't have many duties to fulfil during the warranty period.

In order to keep the requirements of both parties in balance, the following conditions must be fulfilled. The first condition which influences the above-mentioned aspects is design. The successful realization of building work depends on the production of a plan which covers every aspect of the project while maintaining the quality of prepared project documentation as regards essential details and proposed procedures, and with an emphasis on the suitable selection of materials. However, even excellent project documentation will not save a construction project from problems if it is not followed during the realization process for certain subjective or objective reasons.

The second condition that can ensure the quality of future construction work is that the preparations for it are well-executed. These preparations begin at the point when the bids made during the public procurement procedure are being processed. Such selection procedures are governed by public procurement laws, of which there have been several since 1990, each of them accompanied by a large quantity of amendments. The latest and currently valid law, Act No. 137/2006 Coll., is the worst of them even after amendment as far as procurement is concerned as it gives priority to the lowest-priced bid during the selection of the contractor (supplier). An incredible amount of problems arise from this. Exceptionally low

prices result in delays, the use of poorly-chosen technical procedures and, of course, extra work.

Currently, a completely new public procurement law is being prepared which should take other priorities into consideration than just the bid price. Some of these aspects are, for example, protection of the environment (Kantová et al. 2014) or documentation aimed at ensuring occupational health and safety practices are of high quality during the execution of construction. We would therefore like to focus on one of these aspects of construction preparation in our article. It is something which influences all other areas: occupational safety.

Occupational safety needs to be dealt with as soon as the documentation for a project starts being prepared. Planners should incorporate the requirements for the safe execution of construction work into the project documentation after consultation with the occupational health and safety (hereinafter OHS) coordinator, and the needed financial sums should consequently be incorporated into the tender budget. In this way, equal conditions should be provided for all parties during the selection of the contractor. In an ideal situation, the evaluation of the offer should also consider the preparedness of the construction in the area of OHS. We should realize that an advanced national economy is characterized by both economic indicators and the level of care for workers, including the satisfaction of requirements regarding OHS.

In contrast with other areas of manufacturing, the building industry has rather specific approaches to the preparation, organization and mainly the execution of the work it does. The attitude of a building company to how OHS is handled says a lot about the quality of the company and its approach to the values created. It is the duty of every employer to look out for risks, take measures to eliminate them, and learn from any deficiencies and accidents that may arise.

But why deal with accidents and undesirable situations when the occurrence of such events can be prevented? As has already been stated, it is advisable to discuss and incorporate the necessary requirements for the safe execution of construction into the project documentation when it is being prepared. Cooperation

between the investor, designer and OHS coordinator is already necessary during the creation of project documentation as during this preparation phase it is still possible to adapt the planned structures and choose technical procedures which will enable work to be performed safely. The design can be changed to incorporate required safety elements without which its realization would be impossible or highly risky. The first step in the risk management of a planned construction project is to identify the danger, determine its source and draw up measures to remove undesirable phenomena. The resulting consequences of an undesirable phenomenon are expressed via a financial sum which places a value on the occurring damage. This sum is used to remove the consequences of the undesirable phenomenon which occurred. However, there are situations when it is very difficult and indeed often impossible to express the occurring damage in financial terms. This is mainly the case with damage to the environment, or to the health of employees or even third persons, i.e. persons who are not taking part in the construction process itself. In this world, another important consequence is the loss of reputation suffered by a company in relation to such types of damage. Many people begin subconsciously seeing the company in a negative light, which makes it harder to get new orders. Such a situation can often lead to the company's downfall. We do not have experience with such things so far in the Czech Republic, but it can be expected that with growing requirements for the quality of realized work, greater emphasis will also be placed on references and the good reputation of companies.

One large, high-risk group of structures is that of linear structures. During their construction, the probability that undesirable phenomena will occur is related mainly to insufficient safety precautions at the construction site, and to deficiencies in measures taken at excavations against workers falling into them (Čech 2013). There can also be inadequate information about the composition and quality of foundation soils, which is connected with the use of an insufficient amount of probes. This results in a lack of knowledge regarding the real geological conditions present at the construction site. During the realization of linear structures, new risks can also arise very often in relation to non-compliance with technical procedures, the proposal of unsuitable construction machines (Štěrba et al. 2013) (Štěrba 2014), a change in the financial situation of the construction firm or also to the occurrence of undesirable phenomena due to acts of God. It is therefore an essential part of risk management to continuously monitor the state of geological conditions and evaluate them in comparison with the state that is assumed to exist as found in the project documentation. The project documentation should also include various technical measures enabling soil behaviour to be kept within the required limits and thus provide a safe working environment. Financial reserves for the provision of these measures are also an inseparable part of the project.

## 2 REQUIREMENTS FOR ELIMINATING RISKS

How should risk management be approached in the case of linear structures in order to ensure the safe realization of such structures? Unlike in the case of a construction site for buildings, where the site equipment is usually placed within one compact area, linear structures mainly feature zones with storage sites along the length of the constructed structure, while the buildings housing the site's equipment and facilities are concentrated in one suitable place. In the case of extensive linear structures, one independent construction yard is built where all the needed structures containing equipment and facilities are concentrated and from which workers are transported to individual parts of the construction site, i.e. individual work sites. Such a construction site must mainly fulfil technical requirements, which are:

- to prevent unauthorized persons from entering the site
- to separate construction site operations from activities taking place around the site,
- to ensure the construction site is visibly marked even when visibility is low, or at night,
- to provide safe entry and exit routes for machines using local roads,
- to select suitable safety measures that prevent employees from falling into excavations ,
- to provide safe storage of construction material in a manner that does not endanger either workers or activities taking place in the surrounding area,
- to ensure workers and machines can move around safely during the execution of construction work,
- to provide healthy and sanitary conditions for workers at the construction site,
- to create basic conditions for the protection of the environment, which mainly involves the use of machines that are in good technical condition,
- to arrange waste sorting and collection.

Organizational measures include:

- to familiarize workers with selected work procedures,
- to familiarize workers with safety and fire risks,
- to ensure prescribed personal protective equipment is used, mainly high-visibility workwear, suitable work shoes and protective helmets,
- to notify workers concerning the prohibition against the use of alcoholic beverages and narcotics,
- to notify workers concerning the prohibition against movement under suspended loads or in the danger zones of machinery, and the prohibition against entering uncovered excavations and loading the edges of excavations within a minimum distance of 0.5 m, etc.,

- to appoint a person responsible for safe site operation and compliance with all set rules.

The technical and organizational rules stated above have been gradually introduced on the basis of experience obtained from repeated situations that have occurred at linear structures. Conformance to these rules is a prerequisite for ensuring that a place of work (construction site) is safe and harmless to health. The best way of ensuring that the systematic regulations detailed above are followed is via regular occupational safety training.

And how is it with the responsibility for the fulfilment of the requirements related to compliance with OHS regulations? According to the Labour Code, the employer is obliged to create a working environment and working conditions that are safe and harmless to health with the aid of a suitable OHS organization and by taking measures to avoid risk. The employer and managers at all levels are always responsible for the fulfilment of OHS requirements. This means that if the building company has an appointed specialist who is qualified in risk prevention (an OHS coordinator), one must bear in mind that while this person is responsible for fulfilling his or her duties related to the employer, he or she is not responsible for the fulfilment of OHS tasks within the company as this is beyond his or her competence. If this qualified person informs the employer, or his or her direct superior, in a verifiable way about the fact that OHS requirements are not being met, it is the duty of the employer to rectify this. If no remedy is arranged, the full responsibility for non-compliance with OHS regulations is passed on to the employer.

During the execution of construction work, when the contract is signed between the ordering party, the contractor and the OHS coordinator, the ordering party becomes the employer of the latter subjects. It needs to be understood here that if the OHS coordinator notifies the ordering party about an instance of non-compliance with OHS duties by the contractor, and the ordering party then fails to take any measures to rectify this, the ordering party becomes fully responsible for any possible damage. This duty was moved by law to the party that ordered the construction project in order to financially safeguard such projects as the sum provided by the ordering party for the execution of the project also influences the approach at the site to OHS. In recent years, when contractors have been chosen according to the lowest price offered, it often happened that contractors entered selection procedures with an intentionally underestimated price just to get the contract. Of course, lowering the price had the greatest impact on OHS. For these reasons, efforts are now being made to prepare procurement procedures in such a way that all participants compete on equal terms. One of the criteria should be the incorporation of specific OHS requirements into the project documentation, making it possible to ensure that the needed finances are taken into account in the tender budget, which the bids of participating would-be contractors are based on. It

should be every investor's aim to have structures built which are both economically and safely planned.

In the past year, there has been a significant growth in public procurements, in which the state is the investor. These orders are a large source of income and have a major share in the total number of investments made in the building industry. According to the statistics, public procurements grew 2.3 times from 2011 to 2015. However, the financial volume of these orders in CZK increased more than 4.3 times. It is therefore important that public procurements are organized so contractors are selected that have experience with the given kind of work, which is mainly visible from their references. Such a contractor is able to realize an order in a timely, high-quality and safe manner without unnecessary extra costs, if sufficient time is given for the preparation of the construction work. Good preparation for the selection of an experienced contractor should be part of every ordering party's investment plan, and this is especially true when the ordering party is holding a public procurement procedure. Well-prepared project documentation is needed, as is the production of an OHS plan for the preparations for construction work. When producing the plan, its creator must propose suitable safety measures aimed at risks which can occur during individual work procedures or during the individual stages of construction. These measures for the elimination of risks are subsequently incorporated into the tender budget. Selection procedure participants will decide on the pricing of the selected safety measures when producing their bids. In this way, the same terms and conditions will be provided for each contractor during the selection process. When determining the criteria for the selection of the contractor in public procurement proceedings, the ordering party should not only be interested in the lowest price but also in the quality as well as the safe and timely realization of the order.

At present, many procurement procedures involving large quantities of money end up at the Office for the Protection of Competition (OPC), as unsuccessful applicants do not want to accept the fact that another contractor received the contract. They use the supervisory body as a weapon in their competitive battle. They try to overturn the result of the selection procedure in their favour, or at least prevent a competing company from gaining the order. This can result in the order not being realized at all, or that the launch of work on it is put off, which can result in missing the chance to obtain finances from a grant. The newly prepared public procurement law should hopefully result in the tightening of entry conditions and mainly the determination of equal conditions for all candidates. In addition, procurement procedures will have more evaluation criteria than simply the price of the submitted bid.

It is stated in the proposal for the new public procurement law that building companies should include the costs of safety measures in their bids. It is also stated that it will be possible to exclude unreliable contractors which have failed to complete previous

orders or have produced work of unsatisfactory quality, based on negative references.

Over the last year, with regard to EU grants related to the completion of utility networks in municipalities, and to grants for the development and improvement of the quality of roads, the number of linear structures built in the Czech Republic increased significantly. With the growing number of these structures in towns and densely populated areas, the risk of the occurrence of injuries resulting from the inadequate safeguarding and marking of these structures is also increasing. A technically well-prepared construction project includes a sufficient amount of safety elements which eliminate common safety risks.

### 3 RESULTS

After consultations with certain enlightened contractors who are not indifferent to the health and safety of their employees, we decided to create a set of safety measures for linear structures. With such structures it is important to classify the construction project correctly according to its location, i.e. whether it is in a built-up area with many people moving around, or if it is on the edge of a built up area or just in location where other human activity is not expected. Linear structures are very specific with regard to the realization of work and OHS measures. In addition, earthwork construction (and not only those related to linear structures) ranks among those tasks where possible injuries very often result in serious damage to the health of workers, or even death. When a worker or machine is buried in material, the pressure on the worker's body is so great that in most cases the result is instant death, or such serious injuries that death eventually follows. Safeguards in place at excavations are sometimes inadequate, mainly during the execution of short-term and less extensive earthworks (Fig. 1) which are performed by contractors with insufficient experience and whose managers are either unaware of all the risks or underestimate them. We want to create a new perspective on these issues and offer the proposal of safety measures aimed at fulfilling OHS requirements so that the risks involved in the execution and safeguarding of earthworks will not be underestimated and will be dealt with according to the specific conditions at the given construction site. Such risks are related mainly to activities taking place in the surroundings of the construction site, the need to propose suitable construction machines for the execution process, and also to the movement of persons at the locations where construction is expected.

Mainly fencing is proposed as a safety measure for construction sites in built-up, highly-frequented areas, particularly at places within 20 m of a children's playground or sports ground, an entrance or main access route to a school, kindergarten or similar institution, and also at locations where the depth of the excavation is greater than 2 metres. The fencing around the construction site must be sufficiently firm and stable (Fig. 2) so that when a person leans on it or

collides with it, they are prevented from falling into the ditch.

The height of the fencing must be at least 1.8 m. When covered fencing is used, higher emphasis needs to be put on the stability of the fencing. The load-bearing capacity limit for wind load is required to be 90 kg/m<sup>2</sup>.

In other cases, railings are used (Fig. 3). Fencing using railings which fulfil strength requirements can be placed on the edge of the excavation. It has to be sufficiently firm and stable so that if a person leans on it or hits it, they are prevented from falling into the hole. The height of the railing must be at least 1.1 m.



*Fig. 1 Incorrect fall-prevention measures at an excavation (archive of authors).*

In the case of linear structures, we are also interested in how excavations are safeguarded to prevent workers from falling into the depths, as well as whether the construction site is in a protected zone for utility networks, railway or trolleybus lines, roads, etc. We also need to deal with material storage options from the aspect of the placement, stability and most of all size of storage areas, which are linked to requirements for the supply of material for the construction process. When cutting down green vegetation both in areas which have not been built on and those which have, it is necessary to guard against the presence of unauthorized persons in the danger area. Machines should be completely stopped when fuel is added. It is necessary to prevent oil products or oils from leaking into ground waters. When costs are high, they are mainly related to safety measures on roads. This is particularly the case when exceptional traffic control measures are needed, such as diversions, or when mobile light signalling devices are used (Fig.

4), when a road is partially closed or narrowed, during the execution of a crosscut, while ensuring the needed amount of crossings are available, and during the

provision of facilities allowing the safe movement of persons with reduced mobility and orientation, etc.



*Fig. 2 Correct execution of fencing (archive of authors)*



*Fig. 3 Correct use of fencing (archive of authors)*



*Fig. 4 The use of a mobile lighting signalling device and traffic signs (archive of authors)*

## 4 CONCLUSION

Working procedures addressing the security arrangements for the construction project is a content of OSH Plan. The security arrangements should ensure the safety of all persons involved in the construction and to ensure the safety for all people moved around construction site. Planned software of risks will help to correct pricing of linear structures in compliance with the requirement for secure implementation of the construction works in the highest quality with the most appropriate costs.

## REFERENCES

- [1] Čech, D., 2013. Stavitelství do kapsy (in Czech). 1st edition, Prague: Published for the Czech Chamber of Certified Engineers and Technicians Active in Construction (ČKAIT) by the ČKAIT Information Centre.
- [2] Kantova, R. & Motyčka, V., 2014, Construction Site Noise and its Influence on Protected Area of the Existing Buildings. ISSN 1022-6680, ISBN 978-80-214-5003-5. Switzerland: Trans Tech publications Ltd,
- [3] Štěrbá, M., Čech, D. & Venkrbec, V., 2013. Návrh základních stavebních strojů pro zemní práce (in Czech). Silnice a železnice, 8(03/2013), pp.88 - 89.
- [4] Štěrbá, M., 2014. Effective Design Of Construction Machinery And Machine Assembly In Construction. In Integrated Approaches to the Design and Management of Building Reconstruction. Brussels: EuroScientia vzw, pp. 73 - 77.

## AUTHORS ADDRESSES

<sup>1</sup> Ing. Jitka Vlčková

Brno University of Technology, Faculty of Civil  
Engineering, Mutěnická 19, 628 00 Brno  
Czech Republic

E-mail: vlckova.j@fce.vutbr.cz

<sup>2</sup> Ing. Svatava Henková

Brno University of Technology, Faculty of Civil  
Engineering, Hradisko 673, 664 01 Břilovice nad Svitavou  
Czech Republic

E-mail: henkova.s@fce.vutbr.cz,