Methods of protection population by sheltering from the perspective of municipalities with extended powers

Jakub Rak and Lucie Jurikova

Abstract *— The article introduces a proposal for the information system for the support and management of the population protection in the area of the municipality with extended powers and its subordinate bodies. The proposal results from the legislation of the Czech Republic as well as the requirements of the municipality bodies and other users of the information system. Furthermore, the article is devoted to a description of "a shelter module" which is one of the nine basic elements of the information system. Presently, the shelter module is being employed within the framework of the municipality with extended powers in Zlín and it fulfils the majority of the requirements of its practical utilisation.*

Keywords — Information Systems, Population Protection, Risk Management, Public Administration, Process Control, Systems.

INTRODUCTION

The Protection of the population in the Czech Republic has considerably stagnated within the last 30 years. The protection of population and especially its particular parts such as population sheltering have been strongly affected by the considerable reduction of funding. Moreover, the archaic management structure on which the increasing demands are being imposed is the issue. Within the scope of the cooperation with the Department of population protection and defence of the municipality in Zlín, the possibilities of streamlining and simplification of the processes related to the provision of population protection in the area of the town are being resolved. Particularly, the emphasis is being placed on the considerable involvement of the population in the whole process of planning and implementation of the protection of population together with the increase in their responsibilities.

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PROBLEM FORMULATION

Based on the cooperation with Department of population protection and defence of the municipality in Zlín (MEP Zlín), and the staff requirements evaluation, the primary insufficiencies of the existing methods of population protection provision were specified. The absence of system solutions together with a clearly defined unified processes is considered to be the most severe issue. Currently the provision of the population protection is based mainly on the high specialisation of individual staff members and their skills. Such a system is very vulnerable and dependent upon individual staff members. The worker becomes practically irreplaceable and his or her possible loss would cause significant problems in the running of the department and the protection of population. Further, another no less serious problem is presented by a divided approach of the individual municipalities and MEP towards the resolution of the various areas of the population protection. From the state's perspective there exists several significant documents describing the scope of powers of the individual systems in the field of the protection of population. However, these documents primarily define the degree of responsibility and scarcely prescribe the method of document processing. This is left to the competence of the individual municipalities.

The problems could be solved by the creation of an information system for the management and planning for the protection of population. Nevertheless, a great deal of requirements is imposed upon such a system and it is necessary to propose an appropriate structure for its implementation and for the mutual linkage of its individual users.

A. Information System for Management and Planning of the Population Protection in the Territory of the MEP – the Requirements

- ***Municipality with extended powers,***
  represents the top layer of the information system. It comprises of the highest level of competence for administration and data producing and processing. It covers the whole system created for the execution of its duties.

User	*Requirements*
Municipality with extended powers	Management of documents and administration
	Data sharing within the system
	Process standardization
	User-friendly operation
	Reduction in the dependence on chosen staff members
	Process simplification
	Increase in communication between citizens and authorities
	Streamlining of communication with municipalities
	Shared responsibility of the population

Table 1: Municipality with extended powers - Requirements [3]

- ***Municipalities,***
  impose similar requirements on the system as the MEP. The basic difference between them lies in the complexity of the processes. The municipalities require the maximum process simplification in the first place and at the same time the minimum requirements to be imposed upon their staff. They represent the second layer with the emphasis on the clear assignation of the objectives. The requirements are thus similar:

User	*Requirements*
Municipalities	Management of documents and administration
	Data sharing within the system
	Process standardization
	User-friendly operation
	Increase in cooperation with citizens
	Process simplification
	Shared responsibility of the population
	Streamlining of communication with MEP

Table 2: : Municipality - Requirements [3]

- ***Fire Rescue Service and other Units of Integrated Rescue Service,***
  From the point of view of these units united in the process for the protection of population, the information system should be regarded as a tool which facilitates communication with MEP and municipalities:

User	*Requirements*
Fire Rescue Service and other Units of Integrated Rescue Service	Management of documents and administration
	Data sharing within the system
	Process standardization
	Provision of communication with municipalities and MEP
	Process simplification

Table 3: Fire Rescue Service and other Units of Integrated Rescue Service - Requirements [3]

- ***None profit and humanitarian organizations,***
  For these organisations the creation of the system provides close cooperation with the MEP authorities and the municipalities during the provision of assistance in extraordinary and emergency events as required. The creation of such a tool enables a substantial streamlining of the involvement of these units.

User	*Requirements*
None profit and humanitarian organizations	The improvement of cooperation with MEP and municipalities
	Data sharing within the system
	User-friendly operation
	Transparency
	The possibility of communication

Table 4: None profit and humanitarian organizations – Requirements [3]

- ***Citizens,***
  From the citizens' point of view the creation of the tool for communication with the authorities is important. The citizen represents the ultimate user of the information system. The requirements of the citizen:

User	*Requirements*
Citizens	The improvement of cooperation with MEP and municipalities
	Increasing awareness in the field of the protection of population
	Communication facilitating between the citizen and the authority
	Easy access to information – transparency

Table 5: *Citizens* - Requirements [3]

Based on the requirements of the evaluation of individual users of the information system the basic structure of the information system of management and support of the population protection in the territory of the MEP has been proposed.

PROBLEM SOLUTION

The requirements of the evaluation of individual users together with the consideration of technical possibilities led to the specification of several basic points influencing the structure of the proposed system. In order for the basic structure of the information system to be proposed the required levels of access of its future users must have been determined. It is also necessary to observe the legislation.

B. The basic components of the information system

The basic components of the proposed structure of the information system are depicted in the fig. 3. The first part comprises of nine base areas of the population protection and takes account of the Concept of protection of the population by the year 2013 until 2020. It is a database with accurately defined right of access for individual users. In principle, it is the shared data with defined rights of access, administration and editing.

The second part represents the field of data processing. The related systems will be under the MEP's administration and the user will use them by means of the web interface. Nonetheless, the definition of the access rights of individual users to chosen areas poses the problem. In figures 1 and 2 the possible look of the web application is shown. In this case the web of the crisis management support in the MEP Zlín is in the test operation.

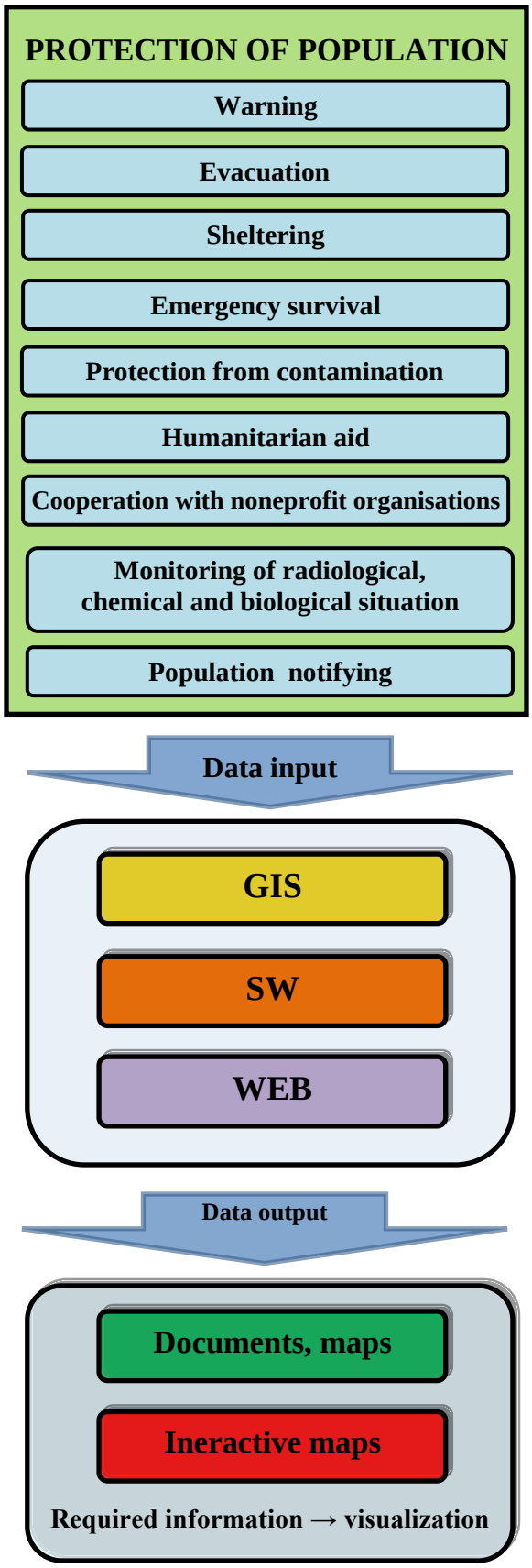


Fig.1 The structure of the public protection information system. [5]

The third part clarifies the data presentation and the results of their processing. This part is intended primarily for the staff members of the MEP while other users of the information system are mostly provided with edited data in the form of various documents, maps etc.

Fig.2. The demonstration of the web application – the start page. [6]

Fig.3. The demonstration of the web application – the detail of the entry form. [6]

Fig.4. The demonstration of the web application. [6]

C. Linkages of the individual components of the information system

The information system allows mutual communication of all users. Individual users will only have access to those areas directly applicable to them but for safety reasons will not be allowed to access the administration area of the system. Only the system administrator – the MEP – has full access rights. The utilization of the information system is thus partly devalued. However, these settings guarantee maximal security of the IS and at the same time lower demands on operations. These are the essential requirements on the practical application of this IS. Despite these restrictions the system enables the fulfilment of requirements of the MEP of the population protection management and planning. Owing to this fact, it is possible to anticipate the practical utilization of the IS.

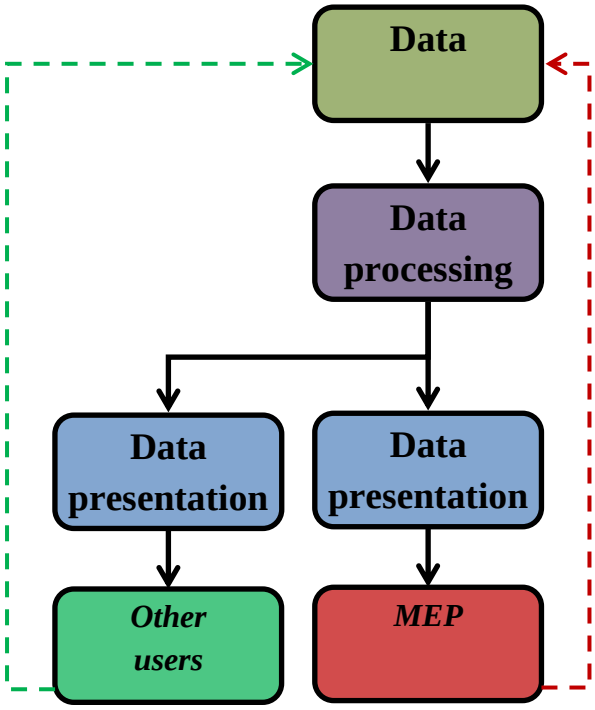


Fig.5. The linkages of the basic parts of the public protection information system. [5]

D. The demonstration of the shelter module and methods of project planning and documentation processing.

The following section contains an example of the "shelter module" processing. This method of shelter processing is being implemented within the system for population protection by the municipality in Zlín (MEP Zlín). The "shelter module" is capable of independent working; however, it is planned to be incorporated into the comprehensive IS for population protection. The scheme of utilisation of the "shelter module" is evident in figure no. 5. Its basis is formed by the project and planning documentation of the individual permanent but predominantly improvised shelters. These documents are prepared and distributed amongst the population over the period before an extraordinary event occurs (EE). In case of an EE occurrence, the whole shelter system is activated. It is the provision of the building material supplies in particular and the eventual coordination of the construction works.

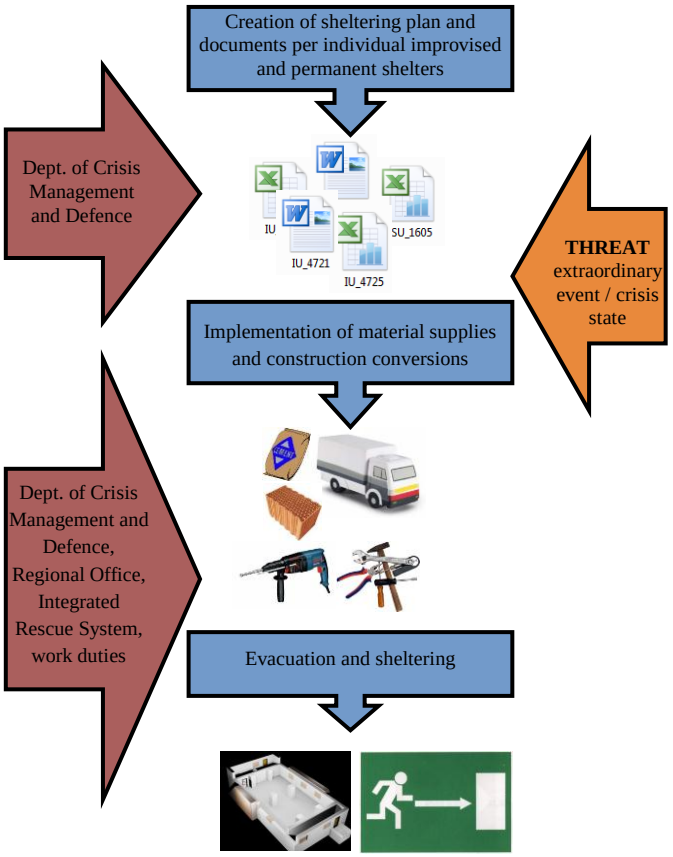


Fig.6: Structure of the population sheltering system [3]

For the actual design of the construction and modifications of the individual shelters, there is the so-called "standard" (full and reduced) which determines the minimum required protective characteristics, which is used as an instrument for the simplification and standardisation of permanent and primarily improvised shelters design.

The module is being presented by documents created in the user-friendly Microsoft Excel environment. It includes textual and graphic sections; the graphic section is being processed by means of Autocad software in 2D or 3D for more complex structures.

The standard for planning and design of improvised shelters is a base of the system. It was created in co-operation with City of Zlín Municipal Authority's Dept. of Crisis Management and Defence with emphasis on simplicity and inexpensiveness of proposed construction conversions. The standard stems from former norms, measured, calculated and ascertained facts, and is structured into several parts:

a) **Basic data on a shelter, executor and owner**: address, responsible persons, shelter number, executor number, designation and type of the object, date of promptitude and operation, etc.
b) **Current status without conversions**: technical/tactical data of the shelter, dimensions, plans, photographs, construction material and properties, equipment, etc.
c) **Proposed conversions:** a list of proposed conversions (minimum/optimum), necessary material incl. suppliers, a work plan, etc.
d) **Status after the conversions**: technical/tactical data of the shelter, dimensions, construction – eventual changes, etc.
e) **Notices, attachments, links to incidental documents, etc.** [3]

In frame of sheltering system in the City of Zlín, mainly improvised shelters are planned to be utilised. Permanent shelters are to be used less commonly, and also in other ways if there is no emergency:

- Primarily:
- Emergency sheltering (minimum time necessary for promptitude, for management and crisis authorities – protected workplaces, etc.);
- Civil defence and crisis management material warehouses (selected permanent shelters).
- Secondarily:
- Emergency housing (selected permanent shelters – permanently designated);
- Drill and training site.

The standard is focuses on (designing) the improvised shelters and integrating existing permanent shelters to the sheltering system (fig. 7). The system will allow a relatively easy management and planning of the population protection by means of sheltering. Currently we are in a stage of implementing the standard to the whole system and its optimisation. [2]

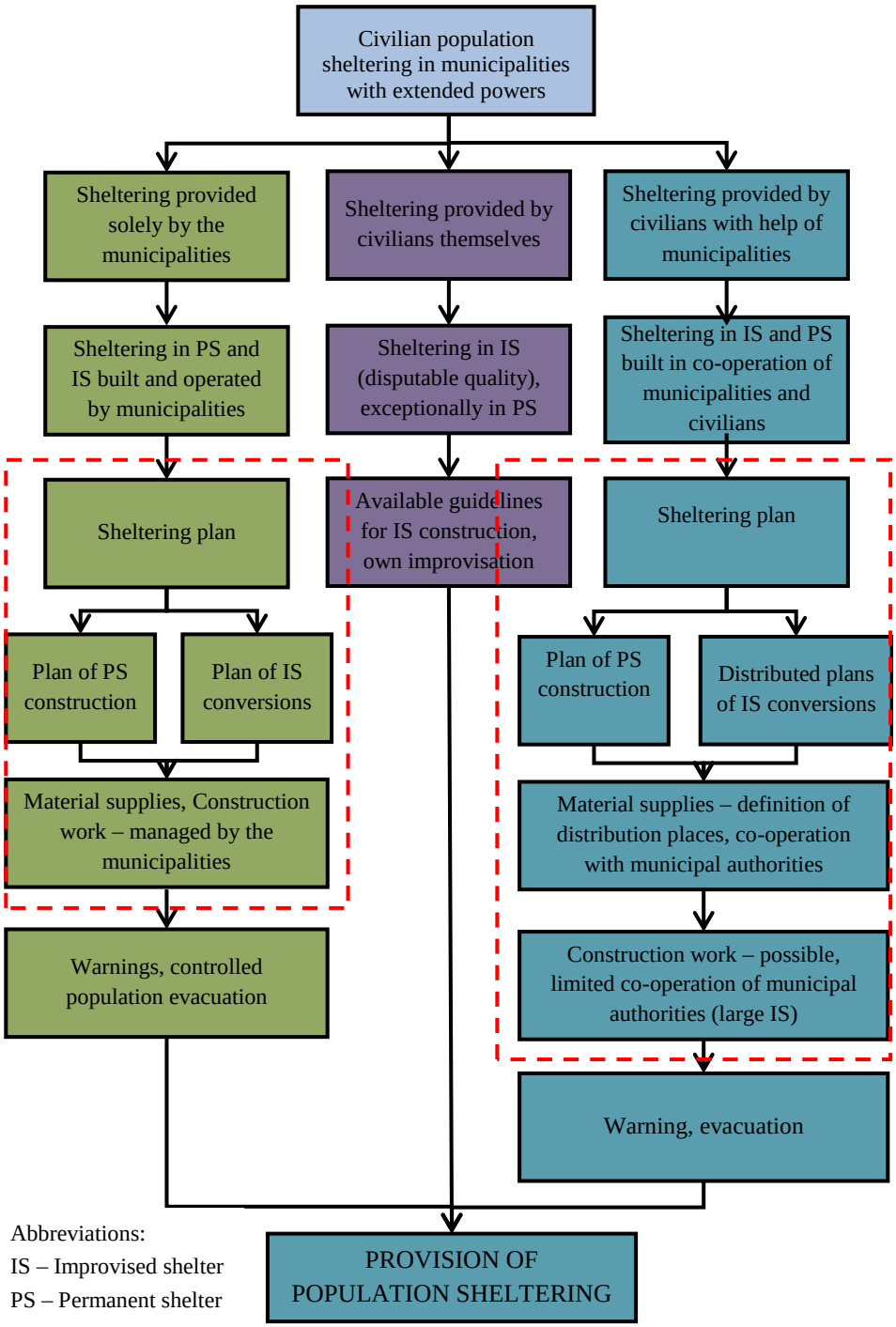
A vision of utilising the standard and the whole system structure is illustrated in fig. 1 and 2. As demonstrated, everything depends on initial basic documentation of the shelters, i.e. the standard and its implementation into a tool for sheltering management, Geographic information system (GIS) and web interface allowing remote access and data sharing. [3]

The sheltering management tool

An interactive tool for sheltering management covers the whole system. It is a simple application allowing administration, modification and display of all the data.

The tool is structured into several further structured basic areas, selected with emphasis on lucidity and simple usage (minimum user knowledge). These are:

1. **Sheltering plan.**
2. **Sheltering infrastructure.**
   a. Sheltering.
   b. Emergency sheltering.
   c. Emergency housing.
   d. Civil defence material warehouse.
3. **Documentation.**
   a. Shelter records.
   b. Design data.
   c. Contracts with suppliers.
   d. Other documents.
4. **Contacts.**
   a. Crisis management bodies.
   b. Sheltering teams, maintenance, auditing.
   c. Material and work suppliers.
1. **Graphical sheltering plan.**
   a. Links to City of Zlín's GIS.



Individual sheltering infrastructure elements will also be assigned certain attributes to ease work and searches for the most appropriate solution.

Users and administrators (several administration access levels to the data) will operate the tool.

The final tool (the full standards) comprises of five fundamental documents (subject cards) and supplemental information:

- General part
- Procedure for putting into operation
- Construction
- Construction works
- Construction calculations
- Supplemental information

At present, the tool is being implemented in real conditions by the MEP Zlín. Demonstrations of the created tool are depicted in figures 8 to 11.

- General part

This is used for the identification of the object intended for the conversion to the IS. It contains the basic identification data (address, utilisation, map etc.) and information on the construction, measurements and equipment of the shelter.

THE SCRIPT OF THE IMPROVISED SHELTER	Registration no.:	
	Other description	
	Copy no.:	

Municipality with Extended Powers :	Processed by:
Municipality, town:	Approved by:
User of the shelter in peacetime (operator)	Municipal responsible person / user:
planned gravity field of the shetered persons (house numbers – streets):	**Capacity** maximum / utilised /

Address of the IS:

Utilisation of the shelter peaceful / militant

IS determination:		Personnel of the IS - commander, medic. Helpers
Utilisation:		
Type:		
Putting into operation time:		
Operating time:		
air exchange:		

Fig.8: General part of the "standard".

- Construction

The subject card "Construction" includes an itemization of the basic construction data taken from the "General part". These are mainly detailed layouts of the modified areas, measurements, specifications and types of materials to be used.

Construction - characteristics

Construction work	number	Description	reference
Walls, ceilings	1	Material, measurements, thickness, condition, function (perimeter wall, bearing wall, transverse etc.), internal - external, notes	Tab. K/1
Openings	2	Number, measurements, function, internal - external, distance from the floor, distance from the surrounding terrain, notes	
Adjoining room	3	Material, measurements, thickness, function, internal - external, openings, notes	
Other aspects	4	Surrounding estate, power and water supplies etc.	

Tab. K/1a

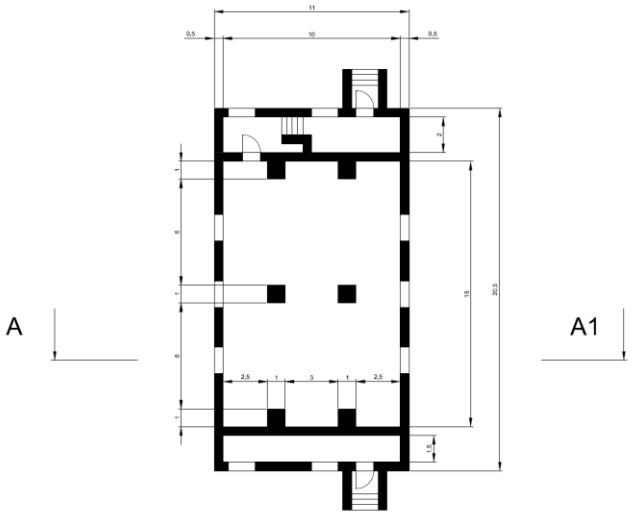


Fig.9: Card "Construction" – characteristics and graphic part.

In this subject card the relevant characteristics of the surrounding areas and objects are stated.

- Construction works

The subject card contains a detailed description of the construction works. It features the main modifications, their descriptions and the procedure for their implementation by means of text and images.

All activities are placed in a work schedule that at the same time serves as a check list. Individual tasks are subjected to termination times of 2 and 12 hours. In the event of extensive modifications the time period may extend. These termination times have been determined based on the requirements for a fast realisation and launching of the IS. This allows the employment of shelters even in events of vast industrial accidents and others.

Construction Works

Construction works	number	Description	reference
Windows fortification and tamping - openings filling	1		Tab. K/1
Filtered ventilation device	2		
Entrance alcove, fortification and tamping of the entrance	3		
Other modification	4		
Other modification	5		

Tab. K/2a

Work flow	Time
A)	within 2 hours
B)	within 12 hours
C)	extended period

Fig.10: "Construction Works" - description of the work.

- Construction calculations

CALCULATIONS

Calculations TYPE 1.

The figure

Ko = 3,25*Kst / (1-V2)* (Kz*Kst+1)*KM

	Without modifications	*With modifications*
Ko =	2672	4553

	Fill in the value	*With modifications*
Kst =	760	760
V2 =	0,5	0,225
Kz =	0,00216	0
Km =	0,7	0,7

Fig.11: Card – "Construction calculation".

The subject card "Calculations" serves mainly for the design and definition of the particular modifications and protective characteristics of the shelter.

CONCLUSION

The proposed structure of the IS is based on the requirements of the staff of the Department of population protection and defence of the municipality in Zlín. At the present time, the system is being implemented and edited based on practical utilization requirements. The main objective of this development is the creation of a working system that will be used without becoming a burden for its users. The possibility of the unsuccessful practical application of the IS poses the principal risk. In order to lower the risk such a structure has been proposed to maintain the simple and undemanding operation even at the expense of a lesser utility value. Provided the complex system is proposed it is likely that it would not be used in practice. A similar event occurred with several previous information systems in the field of crisis management and population protection.

ACKNOWLEDGEMENTS

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