

# **Provision of Technical Protection of the Railroads in Crisis Situations by the Private Construction Companies**

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## **ABSTRACT**

After 1989 became changes in the Czechoslovakia (Czech Republic). The Crisis management in the railway transport can't stay. In the recent years is a necessary new system for effectivity and economic profitability.

**Keywords:** technical protection, crisis situations, renewal of railways, civil organizations

## **1 INTRODUCTION**

In the recent years, many changes of outer and inner conditions for the provision of maintenance, preservation, and renewal of railways under emergency conditions have occurred. The current system of "Technical protection of the railway", which is based especially on the so-called emergencification of the Special Renewal Works of the Ministry of Transport of the Czech Republic and renewal units of the state infrastructure manager, is not suitable anymore. The reason for this is its designation for the crisis states of military character. not successfully reflected the recent changes of economic and organization conditions in the Czech Republic.

Today's system of "Technical protection of the railway" has exhausted its possibilities of adaption to the new conditions and requirements. Therefore it must be replaced by a new, preferably contractual system between organs of state administration and local governments and private entities active as enterprises in the branch of transport engineering. The considered system has all prerequisites for an efficient function, chiefly because its foundations are assumed to rely on existing construction companies. These dispose of sufficient workforce, modern technical and material means. Construction companies already have appropriate organization structures and adequate capacity abilities and they are not limited

by anything. The main advantage of the new solution is the possible placement of construction companies as solvers of all crisis states which is not possible with the current system.

## **2 THE PRESENT ATTITUDES TO THE SOLUTION OF RENEWAL OF RAILWAY IN THE CZECH REPUBLIC**

The issues of protection and renewal of rail infrastructure are nowadays solved by the system of Technical Protection of the Railway. Technical protection of the railway is a set of measures implemented for increasing resistance of the Determined Railway and provide an instant renewal of railway operations for the defense of the Czech Republic during the crisis situation.

Technical protection of the railway is arranged for a specially assigned part of the rail network which is called Determined Railway. The Determined Railway is a section of the currently operating railway that is to be operated for the whole duration of declared military crisis states under conditions and in the extent given by the Ministry of Defense.

The guarantor of the system is the Ministry of Transport of the Czech Republic. It guarantees the fulfillment of requirements given by the Ministry of Defense.

## **3 DESIGN OF NEW CONTRACTUAL SYSTEM OF PROVISION OF TECHNICAL PROTECTION AND RENEWAL OF THE RAILWAY CRISIS STATES USING PRIVATE ENTITIES**

The contractual system is one of the limiting elements of the whole structure of tasks and measures resulting into successful preparations for

a renewal of railway infrastructure in crisis states and increasing legal certainty of the supplier (final supplier) that the contracted organizations are going to fulfill their obligations timely and in demanded quality.

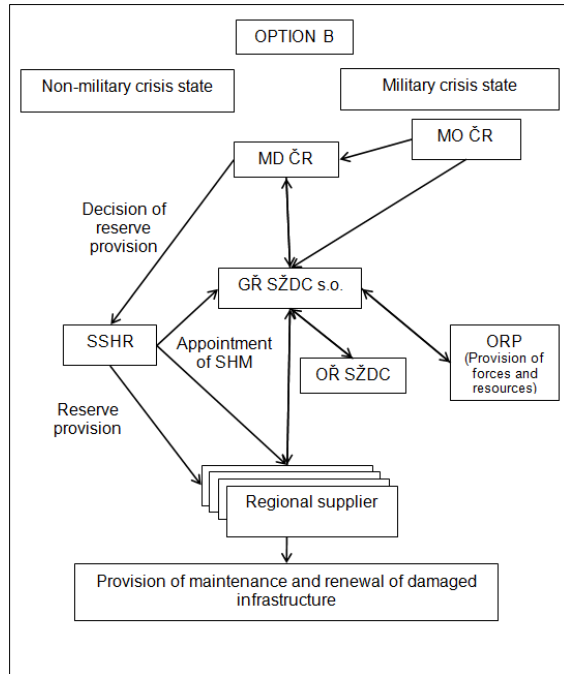


Figure 1: 1<sup>st</sup> Option

source: Authors

None of the contracts that are presently being concluded can be fully utilized for construction works solution during the period after the declaration of a crisis state. The following chapter offers a coherent design of the factual and content-related form of such a contract. The basis for this was the structure of a withheld performance contract which was for various options confronted against the requirements of railway infrastructure renewal and possibilities of private entities.

In order to provide renewal of railway infrastructure in crisis states, the newly designed system must be:

- suited to the framework of the legal environment of the Czech Republic and the present crisis legislation
- utilizable for the solution of all crisis states (i.e. both military and non-military crisis situations)
- realizable by private entities in both regional and whole-state extent,
- able to increase its performance for the crisis situation (especially military crisis situation).

Options of the suggested solution possibilities:

**1st. option:** Infrastructure manager in the Czech Republic (SŽDC company) provides the solution of all crisis states on its own competence, directly in regional scope, on the basis of contracts only concluded for the solution of crisis states by way of construction companies active in the given region or nearby.

**2nd option:** Infrastructure manager in the Czech Republic provides in the military states (if needed) further forces and resources, i.e. in limited amounts determined special units by way of a mandatory (SO) according to Public Notice No. 280/1999.

For the simultaneous provision of both non-military and military crisis states a combination of two options must be chosen both, first and second, too.

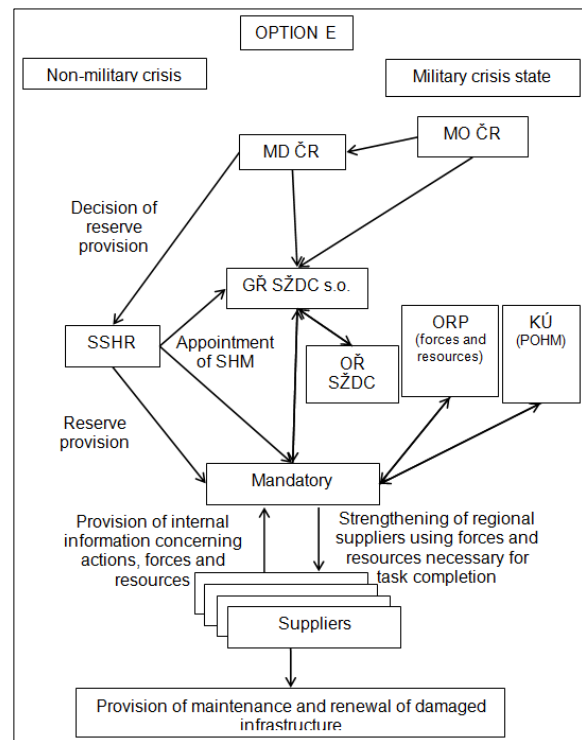


Figure 2: 2<sup>nd</sup> Option

source: Authors

Multiple-criteria analyses were performed for the choice of a suitable option for renewal of infrastructure.

#### 4 TECHNICAL DETAILS OF SOLUTION

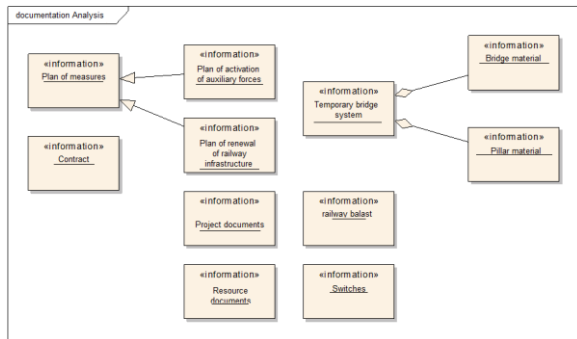
For the design of a software solution of a contractual system of maintenance and renewal a technological design in given environment was to be outlined.

**Documentation objects**

The following diagram (Figuration 3) shows other business objects related to the model.

It is the plan of measures and plans derived from it. Other objects are sets of data of bridge units assembled according to a valid claim during the relevant process. The last object shown is the object of the contract.

Generally said this is the plan of measures and plans derived from it. Other objects are sets of data of bridge units assembled according to a valid claim during the relevant process. After all, the last object shown is the object of the contract.



**Figure 3: Business object of the documentation**

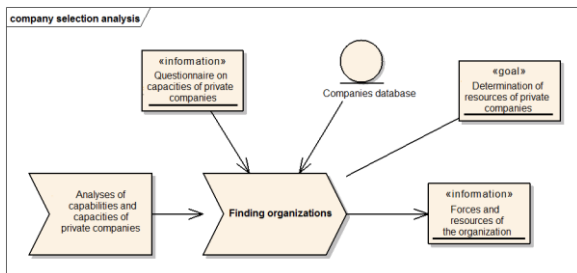
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**Organization Selection Process**

The following diagram (Figuration 4) shows the process of selection of private entities based on a questionnaire and a database of companies. The input of the process is information from the questionnaire and the database of companies. The objective is information on accessible forces and resources of organizations.

**Plan of Measures, Conclusion of Contracts**

Based on the known forces and resources of private entities and on the plans of measures, contracts with private organizations are concluded.

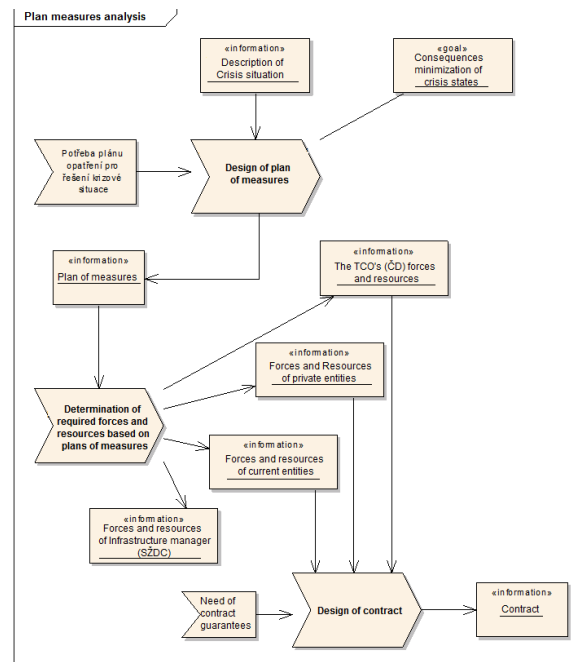


**Figure 4: Business process in the company selection**

source: Author

The following diagram (Figuration 5) shows three processes:

- 1) Design of plan of measures: the output of the process being a plan of measures
- 2) Determination of the required forces and resources: the input into the process being the plan of measures, the output being information on forces and resources of the Infrastructure manager (SŽDC), Train operating company (The Czech Railways - ČD) and private entities.
- 3) Contract conclusion: the input being information on forces and resources of ČD and private bodies, output a concluded contract.



**Figure 5: Business process of plan design of measures, contract conclusion**

source: Author

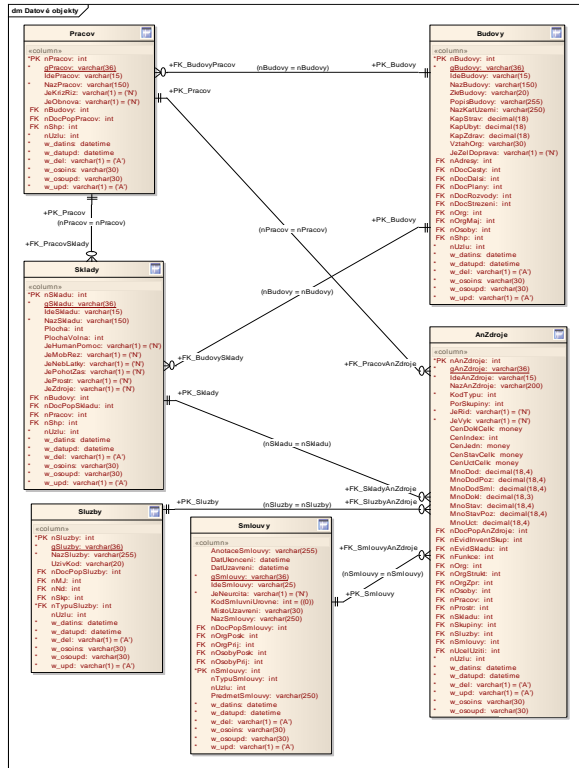
**5 THE SOFTWARE SOLUTION STRUCTURE**

The next diagram (Figuration 6) depicts the structure of software solution of database tables related to data objects and their reciprocal relations.

**Implementation of the suggested model of a new system of railway infrastructure renewal in the crisis information system used in the Czech Republic**

By the authors was create the Plan of renewal of railway infrastructure. That node enables based data for individual units (regional headquarters) from the central headquarters. In the case of an

urge to split this node into independent nodes for individual users. For the sake of completeness, “Groups for Crisis Management” were implemented in the crisis information system, enabling fast orientation in relevant activities of crisis management.

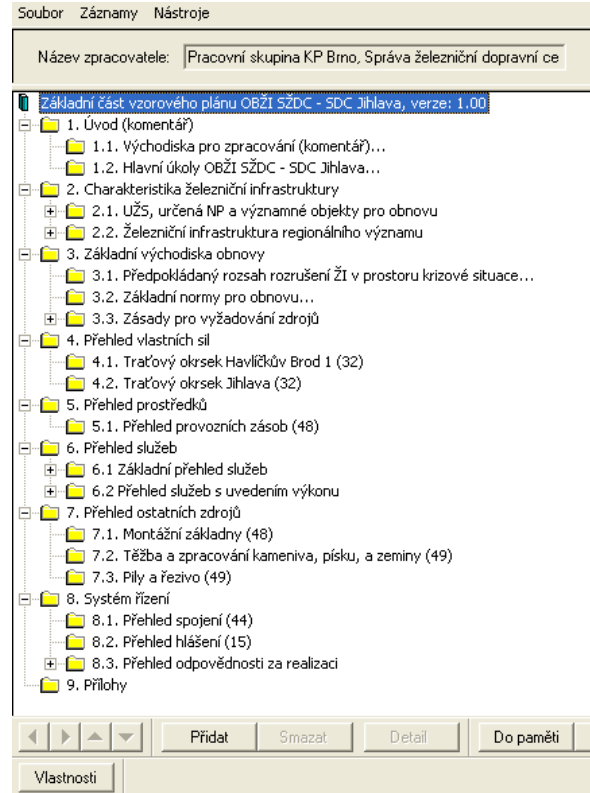


**Figure 6: Data object, data model**  
source: Authors

One of the main outputs of the Plan of renewal of railway infrastructure is a document that puts together and generates all necessary data for a crisis situation. These data are saved in the data section. The format of the document is preset to MS WORD. The tree menu of the crisis plan represents the outline of one document for crisis planning. Each branch of the tree menu represents one chapter of the document. Individual chapters can contain various parts of another chapters or a link to the another data section.

The structure of the document is designed in a way that comprises all necessary information on managerial control for crisis situation solution. The document is structured logically and it is based on characteristics of the railway infrastructure, including e.g. an overview of the forces and resources for task accomplishment or a suggested

solution of a situation in an area that has been struck. A crisis plan document shown in the Figure 7 solves a crisis situation in the Vysočina region using forces and resources of the relevant region and contractual relationships with a private entity.



**Figure 7: Document of the crisis plan**  
Source: the KISKD software, created by the author

**Model Example of Crisis situation:**

The plan of renewal of railway infrastructure was designed for regional headquarters operating in the Jihlava Region in the Czech Republic. The plan was created electronically, especially in order to prove the functionality in the new model of crisis information system. For this example was formulated the subject of a crisis situation and it became the starting point for the arrangement of the Plan of measures to solve a crisis situation at the Jihlava Region.

One of the most important functions of the software is the ability to process operatively the universal Plan of Renewal of Railway Infrastructure at any concrete crisis situation, using continuously updated data. This plan makes enables alteration and screening of the hierarchy of independent tasks or tasks grouped in folders of one measure. Plans of measures can be processed either in the “Crisis planning” category or in the

“Crisis situation solution” category. The measures consist of individual folders and tasks. Each folder or task is characterized by the initial and terminal node. If individual folders and tasks are realized gradually, i.e. serially, then the terminal node of the preceding folder (task) is at the same time the initial node of the following folder (task). If individual folders and folders and tasks are realized concurrently, i.e. in parallel, all folders and tasks have a common initial and terminal node. Both ways of ordering of folders and tasks can be arbitrarily combined. Within the hierarchy of folders, it can be observed that a superior folder ends as soon as the last task in any of the subordinated folders has ended. At the same time, it holds true that the beginning of any subordinated task will correspond to the earliest possible beginning of its folder. These folders represent an aggregation of the embedded tasks.

After entering the command to calculate the plan, a time analyses based on entered folders and tasks is automatically performed and all calculated figures and balances updated.

#### **Assessment of software operation**

With regard to the present organization structure of the Railway Infrastructure Owner, a decision was met to utilize a system of one network nodes in such a way that more solvers be involved in the solution of a crisis situation (sharing for more users on one node is possible).

The differences in comparison with understanding the “paper document” are immense, which is an essential indicator for crisis management. Data search, including a detailed one, is possible using different criteria. It is also possible to sort, pack and order them as needed. The operation has verified various methods of data updates. Data can be updated either individually directly in the program or in bulks using .xls spreadsheets.

Formal and content sufficiency of the plan was proved, as well as its transparency and fast processibility. An indisputable advantage is the fact that the plan does not have to be printed after each change which sharply contrasts with the limited capabilities of a “paper document”. The precondition for this is the continuous maintenance of the data section of the software. Updates of the plan are enabled simply by setting the proper attributes to the document. The plan can be extended by other parts. Its parts or the whole document can be printed. The plan can be exported between the nodes. The operation has proved that the information system is fully functional. The

tasks implied by the subject were completed in a very short time. The advantage of the system is the fact that it can also be used in ordinary situations (not only during the crisis situations).

## **6 CONCLUSION**

Limiting the pursuance of the planning of technical protection of the railway on the needs for military crisis states only is nowadays unacceptable as such system cannot be utilized for solutions of crisis states of non-military character, e.g. vast floods. The work has pointed out the suitability of such planning also for peace crises states. The possible replacement of the present system of technical protection of the railway by a new system of renewal of railway infrastructure thus appears, i.e. one based on the capabilities of private bodies.

The work suggests a verbal model of circumstances for the creation of a system based on the chosen option. It deals with the possibilities, conditions, and scope of activities.

Based on the accomplished analytical BPM modeling, new relations have been realized in the crisis information system, providing conditions for a complex solution of a new system of renewal of railway infrastructure. The information system was filled with data with junctions of a 3-level specification. A Plan of Renewal of Railway Infrastructure was designed on the basis of this data. This plan was then exposed to a model situation of a crisis situation which resulted in the software generating all required documents in required time and quality.

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