

AUDITING THE RAILWAY SECTOR AND RISK ASSESSMENT

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Abstract: *The analysis of the risks in the railway system (as is essentially the rail transport sector) also has to take into account a number of elements of the previous analysis (statistical analysis data of railway accidents) as well as analysis of the tree of causes. Statistical data provide information on the likelihood of accidents and work-related accidents, the severity of the consequences and the production mechanisms, thus enabling us to correct some elements of the "a priori". At the determining of the corrective measures, it is not always possible to take into account the correspondence between the cause and the preventive measure. This is because sometimes more measures are needed to eliminate a risk and in other cases it is possible that one measure will eliminate more risks).*

Key words: *audit, monitoring, risk, standards, supervision, evaluation.*

1. Introduction

According to the definition, the audit is a professional examination of information in order to express a responsible and independent opinion in relation to a certain standard. Etymologically, the notion of audit comes from the Latin language in which *aditum* means the meaning of listening. This approach, which refers to the listening action, subsequently to the investigation, the end of which requires suggesting solutions to solve or improve. Regarding these, the audit allows for a reasoned and independent reasoning. The audit first applied to financial representations. Audit theorists claim that this was already in place in Athens, in 500 BC, where three councils were responsible for checking the fortress's income and expenses. Another perspective from which the audit definition can be regarded is the subject of the process by which competent and independent individuals collect and evaluate evidence to form an opinion on the degree of correspondence between those observed and certain predetermined criteria.

In accordance with Directive 2004/49 / EC, the basic elements of the safety

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management system should include procedures and methods for carrying out risk assessment and for implementing risk control measures whenever a change in operating conditions or new material generates new infrastructure or operating risks [2]. Risk assessment involves identifying all the risk factors in the system under consideration and quantifying their size based on the combination of two parameters: severity and frequency, thus achieving partial risk levels for each risk factor, is global risk levels for the whole system analyzed. Security is defined as sheltering from any danger, and risk is the possibility of reaching a danger, potential danger, security and risk being two abstract, opposite, mutually exclusive concepts. Defining security as a risk function $y = f(x)$, where: $y = 1/x$, it can be said that a system will be even safer as the risk level will be smaller and more mutual.

2. The Content of the Audit and Evaluation Activity

Whenever a system already in operation is subject to change, the importance of change must also be assessed taking into account any safety related changes affecting the same part of the system as from the entry into force of this Regulation or at the date of the last application of the risk management process set out in this Regulation, if that date is after the latest one. The aim is to assess whether or not all of these changes are a significant change that requires the full implementation of the CSM for risk assessment and appraisal.

The acceptability of the risks of significant change should be assessed using one or more of the following principles of risk acceptance: application of practice codes, comparison with similar parts of the rail system or an explicit risk assessment. All these principles have been successfully used in a number of rail applications as well as in other transport modes and sectors.

The "explicit risk estimation" principle is frequently used for complex or innovative changes. The proposing party should be responsible for choosing the principle to be applied.

Audit activity is represented by a well-defined number of preactions, namely audit planning, pre-audit, spot audit, post-audit and follow-up audit, the latter only if required to the extent of the findings. Audit planning is essentially composed of the development of the audit program, the designation of audit teams and the setting of audit objectives. The foreword auditee consists of four aspects, namely the initial contact with the organization audited in this case, the assignment of responsibilities within the audit team, the examination of the initial documents to document the audit team and, last but not least, the preparation of the audit plan and the audit requirements.

On-the-spot audits involve going through stages, such as opening meetings, auditing techniques, conducting interviews to assess information, additional audit team meetings, preparation of audit findings, and auditing session.

The post-audit is defined by two activities, one of which consists in the preparation of the audit report, the activity that is the task of the audit team, to be signed by the chief auditor and the top management leader of the audited entity. This stage is considered completed after the corrective action plan has been sent to the audit team. Audit tracing is triggered only in the event of major nonconformities being detected during the auditing activity of the railway organization. In the accepted sense in the niche occupied by the railway transports in Romania, non-compliance means the non-fulfillment of one or more

of the requirements contained in the Regulations (EU) (such as those with 1158/2010, 1169/2010, 445/2011, 1300 / 2015, Regulation (EC) No 402/2013) or which are included in other railway transport reference documents in the Member States of the European Union (EU). In the light of the same legal framework, major non-compliance is understood and accepted as representing a cumulative deviation from reference documents that may induce risks associated with hazards that can not be accepted and that do not allow / update / modify / maintain / the renewal of the safety certificate / safety authorization or the recognition certificates.

The Safety Certificate is the document certifying that a licensed railway transport operator can execute a type of rail transport service on Romanian railways [1]. The safety authorization is the document certifying that the railway infrastructure manager / manager ensures the requirements regarding the safety of the train traffic, the transport safety and the quality of the public services in the railway transport, on the railway infrastructure in Romania. The Certificate of the entity in charge of maintenance (ERI) is a document attesting that all the criteria and requirements of Annex III to Regulation (EU) No. 445/2011.

The number of members of an audit team (chief auditor and auditors) is at least 2 in accordance with SR EN ISO / CEI 17021/2015 and determined on the basis of the calculation formula (1):

$$N_a = N_m \times Y. \quad (1)$$

where: N_a represents the total number of members of the audit team, N_m is the minimum number of members that make up the audit team, and Y is the size of the sample that will be audited by an organization with multiple locations. Please note that for evaluation audits Y is obtained with the next equation (2):

$$Y = \sqrt{X_L} \quad (2)$$

and in the case of supervisory audits, it is determined based on the following calculation relationship, which is explained by the relation (3):

$$Y_s = 0.6 \times Y \quad (3)$$

It should also be noted that the final result will be rounded up to the next natural number. All members of the audit team must be appointed from the employees of the Romanian Railway Safety Authority (ASFR), who have the capacity of external auditor. When selecting them, criteria such as knowledge of audited processes, audit experience, teamwork skills, the ability of audit team members to interact effectively with the auditee, knowledge of the regulatory framework for rail safety management, and knowledge of requirements legal and regulatory procedures, procedures for granting / renewing / updating / modifying a safety certificate / safety authorization and the requirements applicable to these areas. Also included in these priority criteria are attributes such as having the technical knowledge appropriate to the specific activities, the overall competence of the audit team required to achieve the audit objectives, ensuring the

independence of the audit team from the activities being audited and avoiding conflicts of interest [2].

Audit objectives are established with the main focus on the implementation of the SMS, allocation of SMS related resources, monitoring, measurement, reporting and performance analysis in relation to the key objectives and targets set by the audited organization correlated with the requirements of the reference and / or other applicable regulatory acts, management accountability in relation to the established safety policy as well as recommendations from accident investigation reports / railway incidents [2]. The responsibilities are determined by the chief auditor and communicated as part of the pre-audit activity. The Chief Auditor establishes for each member of the audit team the responsibilities of the process or parts of the audited process. For this, the chief auditor considers the experience, professional skills, specializations, professional knowledge of each auditor within the team. The opening meeting is held at the auditee's office on the first day of on-site audit and is led by the chief auditor. Participants in this meeting are the audit team, the representatives of the audited organization, including senior management representatives and process leaders, contact persons. During the on-the-spot audit, the auditors examine each of the processes in the audit plan that will be audited. Each audited process is evaluated, taking into account its interactions with other relevant applicable processes. The audit team uses the interview sheets to conduct the interview and can carry out case studies to provide more information about the audited processes.

For each interview, the auditor together with the audited organization selects the interviewees, then prepares a set of questions that they will use during the interview. During the on-the-spot audit, the auditor should first ask general questions about the existence of processes related to the core activities of the audited organization, followed by questions that would enable the auditor to identify the risks and maturity of processes. The auditor identifies the responses to be supported by records of the audited organization and decides which are the copies that can be set up in audit evidence.

The examination of the documents for the granting / updating / modification / renewal of a safety certificate / safety authorization is carried out in two stages, checking on the basis of the applicant's check list the conformity of the documents related to the certification dossier with the requirements and the criteria in the applicable regulations in force as well as the analysis of the certification dossier, which is finalized by the preparation of the document examination report by the person responsible for the file. Where further information is required on the documents examined, the file manager shall request them from the audited organization [2].

The assessment of the effectiveness of audited processes is mainly through the presentation of objective evidence including (but not limited to) analyzes conducted by the management of the audited organization on the operation of the process, analysis of the compliance of the process with the reference documents, analysis of the accidents / incidents produced, the analysis of the complaints received from stakeholders, the analysis of the effectiveness of the corrective actions taken as a result of non-compliance, the analysis of the results of the internal audits and the audits carried out by external bodies, including the analysis of the causes of non-compliance found in the audits. Audit evidence also includes issues pertaining to the understanding and implementation of the safety management system (SMS) policy and objectives by senior management staff and executives, internal and external communication, allocation of process-related resources and employee performance appraisal.

Auditors check for any weaknesses identified in the application of procedures by deepening the interview to see if they are an isolated or systemic case. If this finding reveals weaknesses or issues beyond the auditor's duties, then he / she must present them to the audit team and the Chief Auditor asks how to proceed. If there is not enough time to clarify all the weaknesses identified, the auditor should mention them in the audit report and ask the audited organization to take appropriate action.

During audits, audit teams collect audit evidence that consists of observations / copies of records and documents / photos and the like. At the end of the audit, the audit team formulates conclusions on the achievement of the audit objectives, using the evidence gathered. Any finding in the audit report that is not substantiated by material evidence should be highlighted. For the findings of the audited processes, the audit team must identify the strengths of the audited organization, the requirements that are met and those that are not met as well as the areas of improvement [1].

The on-site audit ends with the closure meeting taking place on the last day of the audit. The closure meeting aims to understand the managers of the audited organization and their recognition of audit results as responsible for the preparation and implementation of remedial actions, inform management of the audited organization about the post-audit activities and agree with the organization audited over the period of time required to submit a possible corrective action plan.

At the closure meeting, the chief auditor shall present the main findings of the audit team members, make an assessment of the involvement of the auditee's representatives in conducting the audit. Also on this occasion, the Chief Auditor shows the stage of achievement of audit objectives and insists on the objectives that have not been reached, if any, and briefly outlines how the audit plan has been followed and whether changes were needed to this, explaining reason. At the same time, the auditor is responsible for presenting the audit findings drawn up by the audit team on the basis of the collected audit evidence and determines how the audited entity is informed of the preparation of the audit report and how to request additional audits required to prepare the audit report.

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The chief auditor is responsible for drafting this document with the support of the audit team. The assessment of the remedy of non-conformities ascertained in the audit is mainly based on objective evidence that includes, but is not limited to, the audit conducted by the management of the audited entity about the nonconformities found, the analysis of the effectiveness of the corrective actions taken by the audited organization as well as any other evidence that the audit team deems necessary. The Chief Auditor communicates to the audited organization the manner in which the requested documents are transmitted.

The analysis of the evidence submitted by the audited organization is done by the nominated audit team by verifying on the spot the measures taken by the audited

organization. Following this analysis, the Chief Auditor may propose an on-site verification of the measures taken by the audited organization through a follow-up audit or request additional documents.

The on-site tracking audit is similar to the on-site surveillance audit. Following the collection of audit evidence, the Chief Auditor draws up the tracking audit report, which is disseminated to the audited organization for any observations / proposals. After that, the chief auditor drafts the final report of the tracking audit that is being distributed to the audited organization.

In the event that the auditor considers the remedial plan not to be fulfilled or that the non-compliances found have not been adequately dealt with by the audited organization, propose in the audit report, for approval to the ASFR Director, the interruption of the renewal of the certificate / safety or, in the case of a surveillance audit, the suspension of the safety certificate / authorization / certificate.

3. Conclusions

Common Safety Methods - CSM should not be applied if a change in safety is not considered to be significant. But this does not mean that there is nothing to be done in this case. The proposing party takes a form of preliminary risk analysis to decide whether the change is significant. This risk analyzes, as well as any reasoning and arguments must be documented to allow audits by the National Safety Authority - NSA.

Assessing the importance of a change and deciding whether the change is significant or not need to be independently reviewed by an assessment body. The degree of independence required for an assessment body depends on the level of safety that is required for the assessed system.

References

1. Dae, G., Carabineanu, M., Dumitru, G., *Process Stages Authorization For Putting In Service*, Proceedings of Scientific Journal of the Balkan Tribological Association JBTA, ISBN 978-973-719-570-8, published at the Publishing House "SciBulCom", Sofia. The journal is ranked by Thomson Reuters (ISI Web of Knowledge), 30th of October - 1st of November 2014, Sinaia, Romania.
2. Dumitru, G. and others, *Risk Assessment of Hazards from the Railway Sector by SUVA Method and HAZOP Procedure*, Bulletin of the Transilvania University of Braşov - 2015, Series I: Engineering Sciences.