

SPECIALISED SOFTWARE APPLICATION OF THE HS MANAGEMENT SYSTEM FOR THE MANAGEMENT OF ACTIVITIES WITH ENTERTAINMENT PYROTECHNIC ARTICLES MR-PYRO.EXE 01

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Abstract: *The development of the system document models in the field of MR-PYRO was done taking into account the adaptation of the application requirements of this management system, to the organizational and work process particularities specific to the pyrotechnic field, but also with the requirements of the legislation in force in the field of occupational health and safety, namely Law 319/2006 on safety and health at work and the methodological rules for its application, as well as specific legislation (Law 126/1995 on the regime of explosive materials and the Technical Norms of application with subsequent amendments and additions). The scientific article offers an original perspective of solving the problem in the field of management system of pyrotechnic articles (MR-PYRO). The MR-PYRO.EXE 01 software application ensures the operational and procedural development of the MSSM system documents based on the analysis and evaluation of the particular way of occurrence of all aspects of occupational safety and health managed at the level of economic operators working in the field of pyrotechnic articles.*

Keywords: *pyrotechnic articles, software, legislation, procedures, organization*

1. Approach to risk management in terms of organizational objectives for professional fireworks companies

1.1. General considerations

An organization's management policy is not based solely on economic parameters, neglecting certain aspects of protecting workers' health and safety in the performance of their work tasks. In line with European requirements, achieving health and safety at work must become an integral part of the organization's social role [1], [2].

The implementation of a system of risk management specific to the use of pyrotechnic articles of entertainment category F4 is an effective tool for organizing and concentrating efforts in order to better ensure the optimal management of specific risks by considerably improving professional performance with continuous training and development of staff.

Even in the absence of pyrotechnic legislation setting out the reasons why occupational safety and health specific to activities with pyrotechnic articles should be an integral part of a management approach, it is logical that productivity, quality and safety at work are intrinsically linked.

Addressing occupational safety and health issues specific to pyrotechnic articles activities will not only ensure that high costs of accidents and occupational diseases are avoided, but will also improve work

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productivity. Well-trained and motivated pyrotechnic workers, working with certified equipment and products kept in appropriate conditions, can achieve economic results under the quality and performance conditions required by community standards.

1.2. MR-PYRO part integrated into the overall management of the organization

Conceptually "art of leading", defined as management also has other meanings highlighted in the Romanian Explanatory Dictionary, such as the set of organizational, leadership and management activities of enterprises or the science and technique of their organization and management [3],[4].

Management deals with management processes and relationships, with a view to formulating principles and laws in the field, and provides the technical-scientific tool for developing the managerial mechanism needed to achieve the planned objectives.

Through MR-PYRO, organizations can control their occupational health and safety risks (conditions and factors affecting the condition of pyrotechnically certified workers and any other person) and improve their performance (measurable system outcomes related to the organization's control of occupational health and safety risks based on established policy and objectives).

An MR-PYRO system is applicable to any pyrotechnic organization that aims to:

- establish an MR-PYRO to eliminate or reduce the risk to pyrotechnically certified and trained personnel and other stakeholders who may be exposed to risks associated with the activity;
- establish, document and implement, maintain and continuously improve the MR-PYRO;
- ensure compliance with MR-PYRO's stated policy with the application of the legislative provisions in force.

Implementing an MR-PYRO also involves resourcing and establishing responsibilities and authority for the staff involved, including:

- top management and their representative;
- horizontal management at all levels;
- pyrotechnicians and people trained for various specific activities;
- other specialists involved in the work of the organization involved in MR-PYRO;

The requirements of an MR-PYRO can be integrated into any management system, the extent of application depending on various factors such as the organization's risk policy and the complexity of the operations it performs.

The organization regardless of the size and number of works performed with the release of pyrotechnic articles category F4 must also fulfil the requirements:

- obtaining all the authorizations for carrying out the work, the storage space and the personnel with specific skills;
- assessment procedures must be in place for which internal/external audits are required;
- it must lead to better compliance with legal provisions in the field of occupational safety and health;
- it must facilitate cooperation with the authorities verifying compliance with legal provisions in this area;

MR-PYRO must be integrated, in the sense that it is an integral part of the organization's management system, together with the quality and environmental management systems, if applied and compatible with other related systems. Optimal management can be achieved if the MR-PYRO, quality and environmental systems are congruent and structured on the same integrated system basis, capable of managing them in a homogeneous and coherent way.

The objectives of an effective MR-PYRO, established in accordance with European practice and national legislation, are the following:

- to design principles applicable to all activities of the organization, with emphasis on activities related to pyrotechnic articles in the design of work and production systems taking into account the safety and health of workers;
- organising the conduct of work and the setting of workers' tasks in such a way as to ensure cooperation and communication between all levels in order to comply with occupational safety and health requirements;
- planning occupational safety and health objectives, ensuring control of risks in the working environment, ergonomic design of the work process and promoting a pro-active occupational safety and health culture for the field of occupational pyrotechnic articles;
- designing and implementing processes to ensure the achievement of occupational safety and health objectives and the effectiveness of measures adopted on the basis of system documents and those drawn up under operational intervention conditions;
- ensuring the co-participation of specialists in the establishment and implementation of measures corresponding to the MR-PYRO system.

The decision to introduce a MR-PYRO system is the employer's under the conditions of the applicable legislation. The specific elements of MR-PYRO should not be designed separately from the overall management system, and experienced certified workers should be involved in the development and implementation and should participate in the assessment and design decisions of the system.

Evaluation of the effectiveness of the MR-PYRO system must be validated by objective methods such as external audits leading to certification (e.g. ISO 9001 or combined quality-SSM-environment).

1.3. General principles and specific MR-PYRO concepts

The implementation of an MR-PYRO system must be in line with SR OHSAS 18001:2008 and SR OHSAS 18002:2009 standards as well as compliance with standards harmonized with the technical requirements of Directive 2013/29/EU [3], [4].

The main requirements of an MR-PYRO occupational safety and health management system according to the above standards are the following:

- implementation and maintenance of an occupational safety and health management system (chapter 4.1 - General requirements);
- inclusion in the organization's OH&S policy of a commitment to the achievement of occupational safety and health objectives and continuous improvement of OH&S performance (Ch. 4.2 - OH&S policy);
- implementing and maintaining procedures for hazard identification, risk assessment and for implementing the necessary control measures (Chapter 4.3.1 - Hazard identification, risk assessment and establishment of controls);
- determination of legal and other organization-specific requirements related to occupational safety and health (chapter 4.3.2 - Legal and other requirements);
- setting objectives related to work and health protection for each level of the organization (Chapter 4.3.3 - Objectives and programs);
- defining, documenting and transmitting tasks, responsibilities and competences of personnel for the implementation of the established programs, establishing means of control and verification of the OH&S management system (Chapter 4.4.1 - Resources, functions, responsibility, accountability and authority);
- training, awareness and increasing staff competence (Chapter 4.4.2 - Competence, training, and awareness);
- staff involvement, participation and consultation in this area (Chapter 4.4.3 - Communication, participation and consultation);
- the development of appropriate system documentation (Chapter 4.4.4 - Documentation);
- establishing and maintaining procedures for document and data control (Chapter 4.4.5 - Document control);
- identification of operations, processes and activities involving risks (Chapter 4.4.6 - Operational control);
- introduction and maintenance of plans and procedures for identifying potential sources of accidents or occupational diseases, establishing measures in case of emergency (Chapter 4.4.7 - Emergency preparedness and response capability);
- introduction and maintenance of procedures for regular measurement and verification of the performance of the occupational safety and health system (Chapter 4.5.1 - Performance measurement and monitoring);
- introduction and maintenance of procedures for periodic assessment of compliance with applicable legal requirements (Chapter 4.5.2 - Assessment of compliance);
- introduction and maintenance of procedures for investigating accidents, occupational diseases and non-conformities, establishing corrective and preventive actions (Chap. 4.5.3 - Investigation of incidents, non-conformities, corrective and preventive actions);
- introduction and maintenance of procedures for the control of records (Chapter 4.5.4 - Control of records);
- regular monitoring through the organization's internal audit system (chapter 4.5.5 - Internal audit);
- management review, reassessment and continuous improvement of the system (Chapter 4.6 - Management review).

The implementation of an MR-PYRO system in an organization performing work with pyrotechnic articles category F4 provides the following advantages:

- achieving occupational safety and health by eliminating and/or reducing potential causes of injury and occupational illness, which will result in staff awareness, reduced expenses related to this activity, a good image of the company by customers and authorities;
- control by the organization of the presumed injury hazards and the risks they generate at the place where the specific work is carried out on professional pyrotechnic articles, concerning workers or persons in the area;
- limiting/avoiding incidents and accidents involving the organization's legal liability;
- efficient organization of work with professional pyrotechnic articles on the basis of documentation drawn up in accordance with the law and undertaken by the personnel involved in the activity;

- increasing staff motivation and communication through active participation in the process of continuous improvement and proposals to reduce workplace risks for specific activities;
- improving relations with customers and competent authorities;
- promoting commercial image, marketing and competitiveness through an efficient management system.

An integrated MR-PYRO system, requires the following documents:

- MR-PYRO management manual - is a document that presents the organization's policy and objectives related to occupational health and safety and describes the elements of the organization's own occupational health and safety management system, in accordance with applicable national legislation with the assumption of the SR OHSAS 18001:2008 and similar reference;
- system procedures - documents detailing each requirement of the standard chosen as a reference;
- administrative or operational procedures - documents drawn up to control activities with an impact on occupational health and safety in the use of pyrotechnic articles category F4;
- own occupational safety and health instructions - documents drawn up on the basis of the own technical procedures applicable to each process, workplace and operation;
- specific instructions for safety and health at work - documents drawn up on the basis of the work instructions and specific conditions of execution (based on the requirements of the documentation supplied with the products and which must meet the requirements set out in "Orange Book").

1.4. MR-PYRO core elements and processes

The requirements set out in the current recommended national legislation and the SR OHSAS 18001:2008 standard are based on the implementation and maintenance of a recommended OH&S system within the organization. Implementing this system means being able to demonstrate a certain level of performance and to demonstrate that the elements of the system are implemented at all levels and functions of the organization in order to have a procedural tool for implementation and control appropriate to the activities and processes to be considered [5], [6].

Occupational health and safety management in an organization operating in the field of professional fireworks (category F4) is based on the following basic elements and processes:

Health and safety policy and strategy

The organization's top management must make a statement of principles on the importance of worker safety and health, set basic objectives in the area of occupational fireworks activity (category F4), establish key objectives and provide the resources to achieve them.

The MR-PYRO implementation policy and strategy must include commitments on the duties and functions of management and workers. This should then be documented and approved. The practical application of these rules should be reviewed and, if necessary, updated in the light of findings in the field.

Responsibilities, functions and powers

An MR-PYRO system shall contain responsibilities, functions and competences for occupational safety and health at all levels of the organization and provide for the participation of persons with responsibilities and duties in this area. Personnel engaged in work with pyrotechnic articles must have the necessary competence and knowledge to carry out their assigned functions correctly and be authorized / trained for such work.

Complementary measures to existing national provisions and/or agreements may also be established, but must not violate these national provisions. The main measures must be laid down in writing, notified and made known to those concerned.

Structure of the MR-PYRO scheme

The organizational structure of the MR-PYRO may include, at a minimum, persons performing managerial, executive or supervisory functions, as well as the designation of a person having overall management responsibility for the scheme.

MR-PYRO provides for worker participation in the development and evaluation of the system; MR-PYRO system models should provide incentives for the organization, establish rules for the participation of workers and/or their representatives in the operation of the various elements of the system.

The MR-PYRO should allow linkage to other existing or ongoing management systems and refer to the possibilities of establishing linkages or integration processes.

Internal and external information and cooperation flows

MR-PYRO should establish procedures for internal communication and cooperation within the organization, between hierarchical levels of the organization, to ensure adequate information to staff, and for external cooperation with other entities.

Procedures may also be established for communication and cooperation with external bodies, indicating in particular the purpose and nature of the contacts and the partners involved (contractual partners, authorities, experts, etc.).

It is recommended that the organization publishes its occupational safety and health policy and, where appropriate, the results achieved.

Mainstreaming occupational safety and health

In order to improve occupational safety and health, the organization must establish its own measures which may cover:

- application of procedures for the regular determination of the applicable legal obligations, the additional requirements requested by the authorities, the agreements established between the parties;
- promoting effective prevention and action to improve the safety and health of workers;
- determining, analyzing and, where necessary, modifying operational processes relating to occupational safety and health in relation to work with pyrotechnic products, in order to ensure the protection of workers and exposed persons;
- defining the health and safety requirements to be met during work and disseminating them to personnel; developing procedures for meeting these requirements.

Documentation and document management

The collection and maintenance of all basic documents and projects relating to the obligations, description and effectiveness of MR-PYRO and the fulfilment of the relevant obligations shall be carried out on the basis of procedures. They will also determine how and by whom the MR-PYRO documentation is to be prepared, how it is to be updated and how long the documents are to be kept.

Determination and evaluation of results and improvement of the system

Evaluation procedures (with indicators and evaluation parameters, internal evaluation methods) as well as requirements to be met by the evaluators must be established for the determination and regular evaluation of the MR-PYRO results.

The evaluation procedures must provide for consultation and participation of workers and/or their representatives in the evaluation of the results of the MR-PYRO.

The evaluation must contain proposals for continuous improvement of the MR-PYRO and the results must be known to all workers. On the basis of the evaluation, action plans with measures to improve the system will be established and the effectiveness of these measures will be determined. The management, in collaboration with the workers and/or their representatives, shall carry out the evaluation and the results of the evaluation shall be kept. The audit of the system, carried out on the basis of predetermined evaluation criteria, must reflect the evaluation of the structure, efficiency and results of MR-PYRO and, at the same time, compliance with the legislation in force. The results must indicate the possible organizational causes of the occupational safety and health non-compliance.

Elements to be developed at organizational level and adapted to the characteristics of the organization

On the basis of the European guidelines, the following recommendations can be made regarding the development and implementation of occupational safety and health management systems:

- integrate occupational safety and health management into all company functions;
- harmonize occupational safety and health policy with other policies of the organization (quality, production management, financial management, environmental - if any);
- developing the organization's autonomy in the field of occupational risk prevention through actions such as training, education and further training of staff in occupational safety and health, paying due attention to new risks that arise in the field and applying information tools to promote awareness of these risks;
- to promote a multidisciplinary approach (technical, human, organizational) to occupational safety and health with the help of the disciplines with a specific theme;
- a priori identification and assessment of risks;
- integrating prevention from the design of workplaces, equipment, workstations and working methods. Occupational safety and health must be taken into account from the design or layout of workplaces or the complex work systems they comprise, and will be integrated into both personnel and work methods and processes;
- analysis of occupational accidents and diseases and determination of their causes, with a view to adopting corrective and preventive measures to improve working situations and remedy structural causes with consequences for the health and safety of workers.

In conclusion, monitoring the implementation of these measures is an important element in the success of an effective occupational risk management system.

2. Making specific risk management system documents (MR-PYRO)

In order to apply in practice the principles set out in the model occupational safety and health management system, mock-ups of the occupational safety and health management quality system documents in the field of occupational pyrotechnic articles (category F4) were developed [7], [8].

The development of the system document models in the field of MR-PYRO was done taking into account the adaptation of the application requirements of this management system (proposed by the project), to the organizational and work process particularities specific to the pyrotechnic field, but also with the requirements of the legislation in force in the field of occupational health and safety, namely Law 319/2006 on safety and health at work and the methodological rules for its application, as well as specific legislation (Law 126/1995 on the regime of explosive materials and the Technical Norms of application with subsequent amendments and additions).

The MR-PYRO system documentation may consist of:

- checklist for fulfilling the requirements of the SSM system;
- the SSM management manual, the main document of the system, on the basis of which all other documents are developed;
- system procedures detailing certain provisions of the manual and setting out specific aspects of responsibilities, functions, competences, courses of action, information flows, data records, so as to ensure that the system functions in accordance with the requirements of the legislation and the model and that the general SSM objectives of the economic operator are met.

Checklist of requirements of the SSM management system for the management of activities with professional pyrotechnic articles (category F4)

This checklist is reproduced in the annex and is a working document containing the description of the requirements of the SR OHSAS 18001:2008 standard, providing the possibility to verify/audit compliance with the corresponding requirements of the standard, in order to draw up correct and complete system documents (MC-PYRO-SSM and PS-PYRO-SSM) specific to the professional pyrotechnic field.

SSM Management Manual (MC-PYRO-SSM)

The SSM Management Manual has been developed taking into account:

- the requirements of the applicable legislation on health and safety at work;
- the requirements of the model SSM management system proposed in the paper;
- linking the SSM management system to the existing quality management system in the organization;
- the organizational particularities of the organization.

Instructions for the completion of each point in the layout of this document have also been provided.

The manual contains the "Management Policy Statement on SSM", a document that summarizes and certifies by signature of the management its concerns and proposed objectives in the field of SSM.

The introductory part of the handbook is allocated to: an overview of the organization, the purpose and scope of use and the development and administration of the handbook.

The following outlines the basic aspects corresponding to each element of the system by which compliance with the requirements and the implementation, maintenance and improvement of the proposed management system are ensured.

Professional Pyrotechnics Specific SSM Management System Procedures (PS-PYRO-SSM)

The system procedures are intended to detail the requirements contained in the SSM system manual. These procedures set out responsibilities, courses of action, information flows, data recording procedures, etc. to ensure compliance with the requirements of the model and effective operation of the SSM system. Two main requirements of the model, which seem to be in opposition to each other, have been taken into account when developing the system procedures:

- the volume of documentation to be kept to the minimum necessary to ensure the efficiency of the system;
- the documentation must provide a general and detailed description of the basic elements of the system and the relationships between them.

Thus, the following system procedures specific to the professional pyrotechnic field have been drafted:

- PS-PYRO-SSM-01 "Hazard identification, risk assessment and establishment of controls";
- PS-PYRO-SSM-02 "Assessment of compliance with legal and other requirements";
- PS-PYRO-SSM-03 "Competence, training and awareness";
- PS-PYRO-SSM-04 'Communication';
- PS-PYRO-SSM-05 'Participation and consultation';
- PS-PYRO-SSM-06 "Document control";
- PS-PYRO-SSM-07 'Emergency Preparedness and Response';
- PS-PYRO-SSM-08 "Monitoring and measuring OHSAS performance";
- PS-PYRO-SSM-09 'Incident Investigation';
- PS-PYRO-SSM-10 "Non-compliances, corrective and preventive actions";
- PS-PYRO-SSM-11 "Control of records";
- PS-PYRO-SSM-12 "Internal Audit";
- PS-PYRO-SSM-13 "Management review".

3. Specialized software application of the SSM management system for the management of activities with pyrotechnic articles of entertainment MR-PYRO.EXE 01

Given the premise of access to PC equipment, the following is the program in executable format, written in Visual Basic language, with a schematic diagram in Figure 1, programming logic of the proposed mathematical algorithm for the development of occupational safety and health management system documents [9], [10].

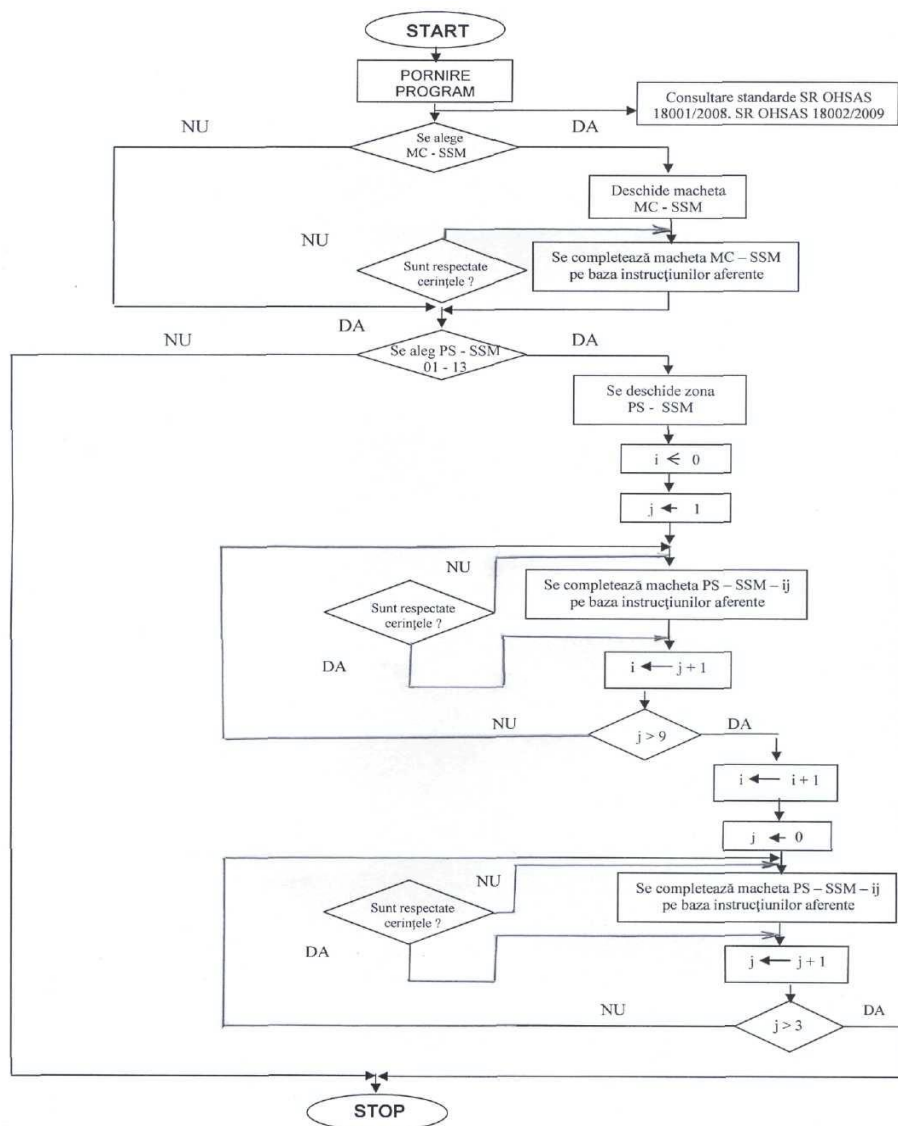


Figure 1. Logic diagram of the program MR-PYRO.EXE 01

The program MR-PYRO.EXE 01 is a working tool used for the operative and procedural elaboration of MR-PYRO system documents by entering data and information related to: legal regulations applicable in the field of PYRO-SSM, objectives in the field of PYRO-SSM, purpose, scope of use, responsibilities for the elaboration and management of the MC-PYRO-SSM manual, implementation, maintenance and improvement of the PYRO-SSM system, modalities of action, information flows, data recording modalities, in order to ensure compliance with the requirements of the model and efficient functioning of the SSM system.

The runtime launch of MR-PYRO.EXE 01 is shown in the screen in Figure 2.



Figure 2. MR-PYRO.EXE 01.- Running the program

By pressing the command button "Pornire program" the software application is launched in execution displaying the main window containing 4 distinct areas. Figure 3 shows the working window where the user has to choose one of the 4 areas, respectively:

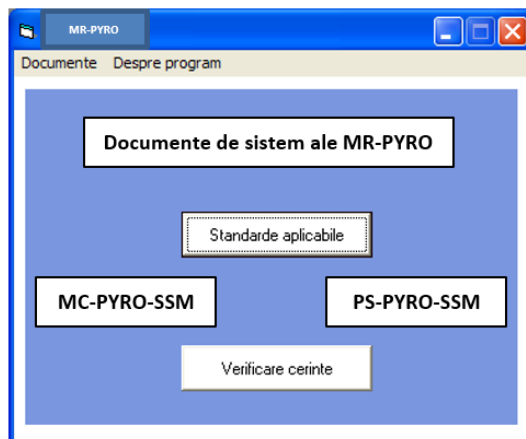


Figure 3. MR-PYRO.EXE.01 working window

The section "Standarde aplicabile", with the applicable standards for the PYRO-MSSM domain (SR OHSAS 18001 :2008 and SR OHSAS 18002 :2009) (figure 4).

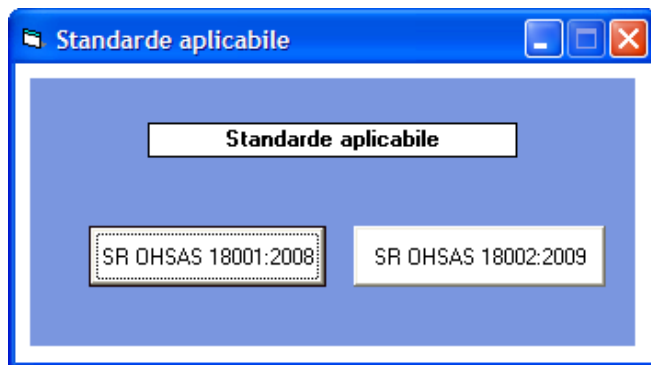


Figure 4. Working window for consulting applicable standards

“MC-PYRO-SSM” area, from where you can access the SSM manual template with instructions for completing each point in its structure (figure 5).

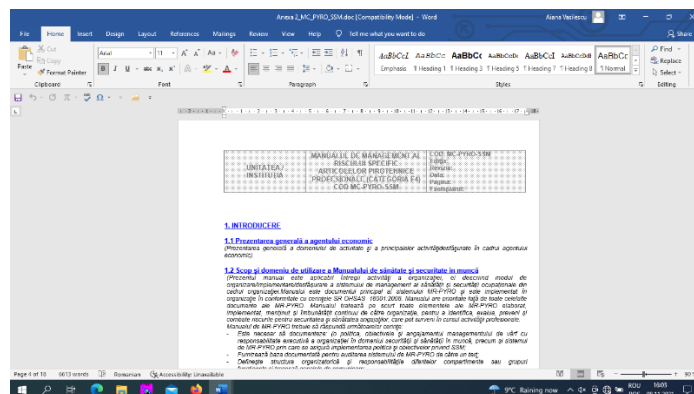


Figure 5. Working window using the MC-PYRO-SSM model

The “PS-PYRO-SSM” section, which allows access to the list of the 13 system procedures, facilitating entry into their templates, which are also provided with instructions for their completion. Given the design formula of the program, the 13 system procedure layouts can be opened/completed either sequentially or in a random way depending on the user's choice (figures 6, 7).

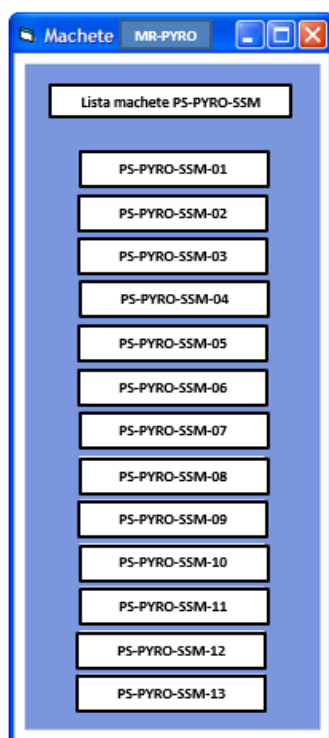


Figure 6. Working window with the list of layouts of the 13 MR-PYRO system procedures

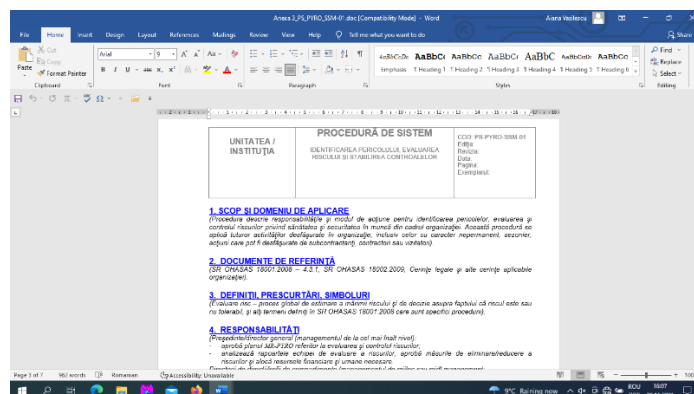


Figure 7. Working window using the procedure model system procedure PS-PYRO-SSM-01

“**Requirements check**” area, which offers the possibility to verify/self-check the fulfilment of the requirements of the SR OHSAS 18001:2008 reference document, in order to draw up the system documents (MC-PYRO-SSM and PS-PYRO-SSM) correctly and completely (fig.8) [11], [12].

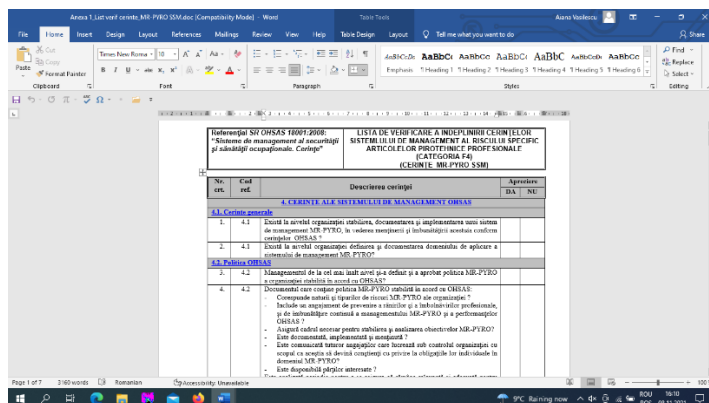


Figure 8 Working window with “Compliance checklist requirements of the SSM management system”

To ensure the security of the information and data contained in the MR-PYRO.EXE 01 program, access to the application carried out through authentication with a uniquely identified password (figure 9).

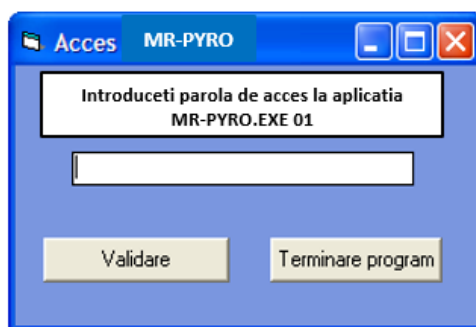


Figure 9. Login window for access to MR-PYRO.EXE 01 application

The MR-PYRO.EXE 01 software application ensures the operational and procedural development of the MSSM system documents based on the analysis and evaluation of the particular way of occurrence of all aspects of occupational safety and health managed at the level of economic operators working in the field of pyrotechnic articles.

The use of this program is not limited, requiring a minimum computing configuration and the use of the appropriate operating system. The data and information required to be entered into the program are those required according to the instructions of the requirements of the MR-PYRO integrated occupational safety and health management system model application guide.

This program is in its first version and allows updating information and upgrading the application whenever significant changes occur in its main documents.

In view of the above arguments, MR-PYRO.EXE 01 can be a viable solution for the operational and procedural solution of occupational safety and health problems, i.e.: planned and documented approach to occupational safety and health problems; definition of areas of responsibility; knowledge and awareness of OSH issues; ensuring a stable, favorable and efficient social climate in the area of assigned human resources; improvement of OSH management with measurable results.

4. Conclusions

- This paper highlights the way of layout of system documents specific to the MR-PYRO system, in order to transpose them into a specialized computer application;
- The software application MR-PYRO.EXE 01 on the implementation of the integrated management system of SSM in the field of pyrotechnic articles in a specialized software, in accordance with the principles and practice of the quality system, is presented in the chapter and includes its descriptive form (logical scheme, access menus and working windows);

- The MR-PYRO.EXE 01 program is a working tool for the MR-PYRO system regarding on: applicable legal regulations in the field of SSM, objectives in the field of SSM, purpose, scope of use, responsibilities for the development and management of the SSM manual, implementation, maintenance and improvement of the SSM system;
- The MR-PYRO.EXE 01 software application must be used for the solve operationally and procedurally the specific problems for the fireworks events regarding ensuring a stable, favorable and efficient social climate in the field of assigned human resource.

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