

Need of an International Code on Explosives and ISEE role in developing it

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Having so many norms and technical content of legislation to deal with is a problem that an explosives engineer has to face, especially when working at an international level. Each country has its own norms and legislation, sometimes even each other region or state, as if the physics of explosions, rock, concrete, and masonry characteristics would change across the borders. Both norms and laws are frequently out of date, being mainly developed at the beginning of the previous century and adjusted, piece by piece, to a technical and political context that is constantly changing, with adjustment being frequently adopted in a hurry, due to a problem arising such as that of international terrorism. Sometime also, norms are not harmonized with those they intend to amend, so required explanations and new adjustments lead to a vicious circle that increases confusion, complexity and depresses the explosive industry.

A similar situation occurred years ago for explosives transportation. Since then, an international code for the "transportation of the dangerous goods - explosives" was summarized in the United Nations "Orange Book." This was published to harmonize legislation all over the world, making possible a safe international transfer of explosives in a market developing at the international level. The adoption of this common code for dangerous goods/explosives transportation became easier as the list of the joining nations increased, because emulation more than comprehension played a role at the political level where the code was to be adopted and incorporated into the national legislation.

The time is now ready for another similar international code for the "use of explosives" in the mining and construction industries, as the "Orange Book" is for the "transportation of explosives." Harmonization will produce a benefit for the industry and for all members of the International Society of Explosives Engineers (ISEE). Instead of wasting time in facing problems which are more "bureaucratic" than technical, explosives engineers could have more time left to deal with real technical problems, increasing quality and quantity of the job being delivered and also profitability, increasing a competitive margin against other mechanical excavation/demolition techniques and technologies.

As the largest international association of explosives engineers, ISEE should promote and maybe directly produce such a harmonization of norms on the use of explosives, by publishing an international code of practice, to be adopted worldwide as a code or even as technical content of national legislations, exactly as it is for the "Orange Book" as A.D.R. (transportation of dangerous goods on road), I.M.D.G. (transportation of dangerous goods on waterways), R.I.G. (transportation of dangerous goods on railroad).

The aim of this article is to review briefly the international situation regarding norms and legislation on the civil use of explosives and to promote, among ISEE members, a discussion on the matter. It is also to propose a program for the compilation of an ISEE database of international norms, as a source for the development of such an international code on the use of explosives in mining and the construction sector as a worldwide replacement of the national norms and legislation.

The Italian and European experience...big deceiving efforts

A collection of the Italian legislation, norms and related explanatory on explosives

Taking advantage of the free time of an old mining engineer colleague and good friend, due to his retirement, we managed to convince him to put together, in a single book, all the legislation, norms and related explanatory notes from the police department and from fire departments of the Italian Ministry of Internal Affairs, from the Ministry of Industry, Ministry of Labor, Ministry of Public Works, court sentences, etc. related to the explosives sector. Our colleague, having served for 25 years as chief of the mining safety department of the Ministry of Industry, and also as a component of the central advising committee for explosives of the police department of the Ministry of Internal Affairs, was well qualified for the task.

We felt the need for the Italian explosives industry, to have a unique source of reference where to find all norms and laws. This is due to their constant modification during the years, starting in 1890, and their integration with the European directives in a huge, confused, "mass" of mandatory specifications, sometimes one contradicting the other. In this situation, the common explosives user and also the local police officer issuing licenses for the use of explosives got "confused." This leads to explosives licensing and control procedures differing from one city to the other. Italian explosives engineers working in the explosives sector, when confronting authorities for licensing, are frequently working with non-so-legal prescriptions and licensing, this due mainly from lack of knowledge from their side and also from the police officers. Suffice to say, that for a stranger, this bureaucracy, overcome by the "usual practice," is overwhelming.

This new book on explosives legislation, extracting, collecting, actualizing, harmonizing and pointing out discrepancies in the European directives, technical content of national laws and explanatory notes (but not including the industry norms which are commonly used in Italy, such as the Italian UNI, the European ISO, the German DIN and the Swiss SN), took one year to be completed and totals more than 700 pages. Reference to the industry norms would have added another 200 pages, for a total of 900.

First checks with the key people of the sector proved that even if there were appreciation for the effort to put together and harmonize the matter in a unique source of information, the main feeling from this book was discouragement because of the "excess" of information. Apart from rare cases, the previous situation remained unchanged, again with confusion and discrepancy against the law in conduct of the authorization procedures and job execution.

The "EuExcert" project experience

We took part in the "EuExcert" project, financed by the European Community, to set a European shared program for education for personnel engaged in the explosives industry in its whole. This project started in 2003, continued in 2006 (EuExcert II) and again in 2009 (EuExNet) with partners from ten European countries and also the European Federation of Explosives Engineers (EFEE) (a fourth project should start soon). The idea for this project arose from a perception and also from evidence after some fatal accidents, that competence in the explosives sector is being eroded (we would say that this could probably be confirmed also for the rest of the world) and many experienced and knowledgeable personnel are retiring or nearing retirement. For the explosives specialists left, activity is increasing at the international level, this to maintain explosives capability, national security, and in sustaining a competitive industry.

What we found when we met with the colleagues in the project was that in each of the member nations, there was a situation similar to the one above described for Italy, with many old norms partially readjusted and not harmonized, in a mass of specifications not always so clear as needed. What we also found, which was surprisingly due to the context of a European project (which was supposed to be aimed in search of common points to join the forces), was an attitude to keep the actual situation steady, with national peculiarities being enhanced instead of minimized, for the search of a sort of national protection from "foreigners."

"Dividi et impera": division makes the explosives industry weak

We would like to stigmatize on the evil of division by quoting the ancient Roman locution: *Dividi et Impera*. Ancient Romans encouraged division and also competition among their neighbors to reduce the risks of their alliance against them. For themselves, they encouraged an opposite attitude, in search of simplicity, cooperation, coherence, uniformity and effectiveness.

We also need thought for the civil explosives industry to adopt this attitude of the ancient Romans.

Our suggestion is that the ISEE community, as the worldwide expression of the civil explosives industry, promote an "Explosives International Code" aimed to simplify and reduce the number of technical codes and norms to refer to, and wish cooperation and coherence, find together a way to achieve this goal which will drive uniformity and effectiveness in operations for the sake of the explosives industry on a global scale.

The UN International Ammunition Technical Guidelines: an example to follow

For an excellent example of how an international code for the civil use of explosives could be developed, reference could be made to the IATG (International Ammunition Technical Guidelines), published by the United Nations Office for Disarmament Affairs (UNODA) together with the United Nations Mine Action Service (UNMAS). They took less than four years to complete, from 2008 to 2011. They were written by qualified expert consultants with the support of international, governmental, and non-governmental organizations. The documents were reviewed by a Panel of seven of the UN Member States. Finally, they were approved by UNODA and UNMAS.

In some 900 pages, the matter (very close to that of the civil use of explosives) is exposed in an exhaustive, simple and clear text, with

formulas, pictures and forms, to constitute a practical and effective international reference for technicians, easily accepted by rulers. The purpose of this guideline was to provide an internationally shared method for the safety and secure management of ammunition. They are structured in 12 volumes addressing the whole life management of ammunition, from nomenclature to risk assessment, from transport to storage and destruction. This constitutes a comprehensive code summarizing, at the highest technical level, the hundreds of thousands of pages of each single national code and legislation put together:

1. **Introduction and Principles of Ammunition Management**
 1. Introduction to Ammunition Technical Guidelines (IATG)
 2. Index of Risk Process Levels
 3. Policy Development and Advice
 4. Terms, Definitions and Abbreviations
 5. UN Explosive Hazard Classification System and Codes
 6. Ammunition Faults and Performance Failures
 7. Bans and Constraints
 8. Formulae for Ammunition Management
2. **Risk Management**
 1. Introduction to Risk Management Principles and Processes
 2. Quantity and Separation Distances
 3. Licensing of Explosive Facilities
 4. Safeguarding of Explosive Facilities
 5. Fire Safety
3. **Ammunition Accounting**
 1. Inventory Management
 2. Lotting and Batching
 3. Import and Export of Ammunition
 4. National Controls over the End-Use and End-User of Internationally Transferred Ammunition
 5. Tracing of Ammunition
4. **Explosive Facilities (Storage) (Field and Temporary Conditions)**
 1. Field and Temporary Storage
5. **Explosives Facilities (Storage) (Infrastructure and Equipment)**
 1. Planning and Siting of Explosives Facilities
 2. Types of Buildings for Explosives Facilities
 3. Traverses and barricades
 4. Safety Standards for Electrical Installations
 5. Vehicles and Mechanical Handling Equipment (MHE) in Explosives Facilities
 6. Radio Frequency Hazard
6. **Explosive Facilities (Storage) (Operations)**
 1. Control of Explosive Facilities
 2. Storage Space Requirements
 3. Storage and Handling
 4. Explosives Packaging and Marking
 5. Specific Safety Precautions
 6. Works Services (Construction and Repair)
 7. Inspection of Explosives Facilities
7. **Ammunition Processing**
 1. Safety and Risk Reduction
 2. Surveillance and Proof
8. **Transport of Ammunition**
 1. Transport of Ammunition
9. **Security of Ammunition**
 1. Security Principles and Systems
10. **Ammunition Demilitarization and Destruction**
 1. Demilitarization and Destruction of Conventional Ammunition

11. Ammunition Accidents, Reporting and Investigation

1. Ammunition Accidents, Reporting and Investigation
2. Ammunition Accident Investigation Methodology
3. EOD Clearance of Ammunition Storage Area Explosions

12. Ammunition Operational Support

1. Ammunition on Multi-National Operations
2. Small Unit Ammunition Storage

A Proposal for ISEE

How could we, at ISEE, achieve this goal? The proposal is to form an "International Committee," with one reference member from each continent being represented at ISEE. One, or better, more than one, national members should be on a "National sub-committee" working together in listing, collecting, digitizing with a common format, all the legislation and norms in force in that country. This should not take more than one year.

Data could be shared in a special ISEE web-based database. The international committee should define, in sequence, titles and draft content of an "ISEE Explosives Code," starting from a "nomenclature" chapter¹. We at ISEE already have a code for "good practice for ground vibration monitoring," but we are missing a unique code for "safe ground vibration thresholds for civil constructions above ground" and "underground." This is needed because each different norm also provides macroscopically different values, with no reason why.

The structure of the IATG code may serve as a reference, since its structure and some of its titles could be followed. A proposed index could be the following:

1. Introduction and Principles of Ammunition Management

1. Introduction to Ammunition Technical Guidelines (IATG) ISEE CODE OF USE OF EXPLOSIVES IN MINING AND CONSTRUCTION ENGINEERING
2. Index of Risk Process Levels
3. Policy Development and Advice
4. Terms, Definitions and Abbreviations
5. UN Explosive Hazard Classification System and Codes
6. Ammunition EXPLOSIVES Faults and Performance Failures
7. Bans and Constraints
8. Formulae for Ammunition EXPLOSIVES Management
9. "Air overpressure safety limits for humans and animals" and the same "in water";

2. Risk Management

1. Introduction to Risk Management Principles and Processes
2. Quantity and Separation Distances FOR EXPLOSIVES DETONATION / ROCK OR CONCRETE BLASTING: "computation of iso-damage area due to explosives accidental explosion" with threshold limits for overpressure in air, primary and secondary fragmentation, ground vibration, gas release and overpressure in water. How many discussions with local authorities and project supervisors, could be saved if safety distances could be set in a code?
3. Explosive Facilities THE USE OF EXPLOSIVES (with minimum requirements in terms of competencies, insurance, equipment, etc.)
4. Safeguarding of Explosive Facilities BLASTING SITES
5. Fire Safety AT BLASTING SITES

3. Ammunition EXPLOSIVES Accounting

1. Inventory Management
2. Lotting and Batching
3. Import and Export of Ammunition EXPLOSIVES
4. National Controls over the End-Use and End-User of Internationally Transferred Ammunition EXPLOSIVES
5. Tracing of Ammunition EXPLOSIVES

4. (...)

- "good practice in the use of explosives for tunneling" the same for "bench blasting," "shaft sinking" and also for "underwater blasting";
- "reporting activities with explosives"; and
- etc.

Each National committee could propose a draft code for each of the above topics, based on the data sampled at the national level. The International committee would review and consolidate them in a single document choosing the best solution/practice.

Conclusion

A barrier to international development of the explosives sector is determined by the huge and frequently confused mass of technical content of legislation dealing with the use of explosives for the mining and construction industries in each single nation which inhibits trans-national work.

A study of thousands of pages of laws and norms may be needed to execute one job, in each single nation.

As the largest international association of Explosives Engineers, the ISEE should pay an important role in reorganizing this situation by the completion of an international code on the use of explosives in the mining and construction industries. This code should summarize and actualize all norms and technical content of the national legislations into a unique document to be adopted at the international level and to make reference to in national legislation. This approach was followed many years ago with success for the transportation of dangerous goods, with the publication of the "Orange book" by the UN. Again, recently, a clear example which could be followed by ISEE is given by the International Ammunition Technical Guidelines whose structure and content seems to be close to that of a code that could be developed for the use of explosives in the mining and construction industry.

References

Affairs, United Nations Office for Disarmament. (2011). International Ammunition Technical Guideline, New York: United Nations.

United Nations. (2011). Recommendations on the Transport of Dangerous Goods-Model Regulations. 17th edition.

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This paper was first written almost two years ago and is included here to further discussion. Interested readers please see www.un.org/disarmament/un-safeguard/

¹ Today someone using explosives is named "blasters" in USA and "shot-firer" in Europe.

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