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Explosives: Developments at United Nations.

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Abstract
An overview of the current work the United Nations Committee of Experts on Transport of Dangerous Goods and Globally Harmonized System of Classification and Labelling of Chemicals with emphasis on the issues that will affect SAFEX members.
An explanation of the workings of the UN system for producing the United Nations Model Regulations and other publications and summary of the latest changes of significance to SAFEX members.
Intended to give SAFEX members some confidence in understanding how their technical expertise can be best leveraged to find a way through the regulatory maze they must deal with, in an environment of diminishing competence and confidence within government agencies.

What's going on at UN
This paper presents a brief overview of the current work the United Nations Committee of Experts on Transport of Dangerous Goods and Globally Harmonized System with emphasis on the issues that will affect SAFEX members.

It includes an explanation of the workings of the UN system for producing the United Nations Model Regulations and other publications.

The introduction will very briefly explain:

What are the United Nations Model Regulations (UNMR), the Manual of Tests and Criteria (MTC), the Globally Harmonized System of Classification and Labelling of Chemicals (GHS)?
How are these documents generated?
How are they implemented?
What is the legality of the documents?
What is their significance for SAFEX members?

The paper then summarises the latest changes including:

Changes to the Manual of Tests and Criteria to consider GHS;
Work on a standard for fibre reinforced plastics (FRP) tanks;
Changes to Test Series 8 (for emulsions);
Structural serviceability of freight containers for explosives;
Electronic Detonators.

Introduction
The United Nations Committee of Experts on Transport of Dangerous Goods and Globally Harmonized System is responsible for producing the Model Regulations for Transport of Dangerous Goods which is the basis for all modal and many national regulations. The TDG Subcommittee is unashamedly conscious of its role facilitating trade as a consequence of its deliberations on safety. This thread will be constant through the issues considered in this paper.

Background - The UN System.
The United Nations Committee of Experts meets biennially in Geneva, at the Palais des Nations.
The Committee Secretariat is part of the United Nations Economic Commission for Europe, but it is responsible to the Economic and Social Council (ECOSOC) of the United Nations.

The Committee is little more than a conduit for decisions on their way to ECOSOC from the Committee's two subcommittees:

- The Subcommittee of Experts on Transport of Dangerous Goods; and
- The Subcommittee of Experts on the Globally Harmonized System of Classification and Labelling of Chemicals.

These two Subcommittees produce the United Nations Model Regulations for the Transport of Dangerous Goods (the Orange Book), the Manual of Tests and Criteria, and the Globally Harmonized System of Classification and Labelling of Chemicals (the Purple Book).

The United Nations Orange Book comprises some brief Recommendations (about 3 pages) which effectively give guidance to regulators on the scope and intent of the Model Regulations.

Annexed to the Recommendations are some 900 pages of Model Regulations, spread over two volumes, which address such things as:

- What are dangerous goods;
- How are they classified;
- How they must be packaged, consigned and transported;
- What standard of containment systems (tanks, packages etc) must be used.

The Orange Book is now at a point where it provides practical guidance for the transport of dangerous goods:

- Across all transport modes (road, rail, sea, air);
- Within nations and across state and national boundaries;
- For countries with large or small economies.

The book is very technical and tries to give detailed guidance on almost every aspect of the safe transport of dangerous goods.

The Purple Book, (GHS) now published as the tenth revision is a completely different format and approach. It is not a model regulation, more a conglomeration of classification criteria for all sorts of chemicals, with associated guidance on risk communication. The classification criteria cover physical, health and environmental hazards, so there is some overlap with the scope of the Orange Book. It is that overlap that this paper will address: Chapter 2.1 of the GHS deals with the classification criteria and hazard communication (labelling) of explosives.

Supplementary to both documents is the Manual of Tests and Criteria. The GHS, though nominally "test method neutral", refers to the Manual of Tests and Criteria for the classification of physical and environmental hazards. This Manual has been the subject of significant changes over the past six years.

Drafting

The process of drafting these books is slow and incremental. Drafting the Orange Book has taken place over some 75 years and 21 revisions. Formal endorsement for the preparation of a Globally Harmonized System of Classification and Labelling of Chemicals was given at the UN Earth Summit in Rio in 1992. The Purple Book, first published in 2003 was ten years in preparation and now, after 20 more years is in its 10th revision.

The drafting process involves two United Nations Subcommittees of Experts, each of which is a body of some 100-200 Experts and Observers. They come from about 30 countries and 60 non-governmental organisations and industry associations. In its simplest form the subcommittees consider proposals for change, vote on whether to accept or reject them and the successful ones result in changes to the documents.

Every two years the Committee of Experts reviews and endorses the decisions of its subcommittees, which are then consolidated and published as the next revised edition.

What are they used for?

The United Nations Orange Book is potentially a ready-made set of regulations and at least a "world's best practice" source of guidance for any nation that wants to classify, transport, import or export dangerous goods safely and economically. The book is drafted in a form that is suitable for adoption into national laws with minimal alteration.

The book is a model for the modal organisations such as the International Maritime Organisation (IMO), which drafts the SOLAS convention that includes the International Maritime Dangerous Goods Code (IMDG Code). The European land transport codes (RID and ADR) are now written in a form that effectively mirrors the United Nations Model Regulations and some nations have taken the same route.

The Purple Book is completely different and cannot be read as a regulation. It is only now being incorporated into national regulations, and in anticipation of that, Australia initiated a review of Chapter 2.1 to avoid some problems with major changes to the labelling requirements for explosives. These changes should appear in the next revision of the Purple Book (2023).

Implementation
The two United Nations documents have no authority as they stand. They come into effect only when adopted by national laws and this may be done in any of several ways:

- Direct adoption (very rare);
- Rewriting into national laws (same format and structure);
- Redrafting into national laws (different format, same intention);
- Incorporating the principles into existing national laws (necessary for GHS).

No country yet seems to have taken the first option; most do options two or three and all must do the complete rewrite for GHS.

What are the impending changes?
The rest of this paper will explain the latest changes including:

- Changes to the Manual of Tests and Criteria to consider GHS
- Work on a standard for FRP tanks
- Changes to Test Series 8 (for emulsions)
- Standards for structural serviceability of freight containers.
- Electronic Detonators.

Changes to the Manual of Tests and Criteria to consider GHS
The Manual of Tests and Criteria has been extensively changed in principle, but very little has been changed in practice.

For the past four years the explosives working group has been redrafting the Manual to make it applicable to users for classification for purposes other than transport. In fact, this reflects what is going on in the real world outside transport. Regulators world-wide use the test results for classification purposes for storage. And industry uses the tests for guidance for assessing risks in processing.

In making the changes, the working group was aware that the classification of an explosive (and therefore the risk it presents) may change significantly with the packaging. However GHS is supposedly based only on the intrinsic hazard of the chemical. This made the redrafting work rather complicated.

<u>So What!</u>
So nothing. From a practical point of view the same tests should apply, however there is one interesting consequence that is set out below.

Work on a standard for FRP Portable Tanks
There is a special working group that has developed standards for FRP Portable Tanks for all classes of dangerous goods. The Australasian Explosives Industry Safety Group (AEISG) has links to world class experts in this field and actively participated in the drafting work.

The key issues for us were to eliminate any differences or unjustified restrictions on explosives transport, which, for some reason is not being supported by US Department of Transportation.

The civilised world does not generally transport much explosives in Portable Tanks, but the need will be there for jurisdictions that classify Ammonium Nitrate Emulsion as 1.5D (eg, Canada).

So What!
The principles AEISG took to the FRP tanks working group are based on the fact that there is little practical difference between a tank of explosives and a freight container or truckload of blasting explosives. Initiate one small portion of the load and there will be a mass explosion of the entire contents. On this basis, there is no justification in principle for excluding explosives of class 1 from the option of transport in tanks.

Changes to Test Series 8 (for emulsions)
It has long been recognised that there are problems with Test Series 8 in the Manual of Tests and Criteria, particularly with the 8 (c) (Koenen) test. Developed for pure chemicals that will react in seconds, by the time ANE has reacted in a Koenen test, the steel is much softened and this results in false positives.

The explosives working group has now accepted that the MBP test can be used to assess the properties of emulsions in cases where an emulsion fails the Koenen test.

So What!
If there were any competence among Competent Authorities, they would grasp this opportunity to apply some common sense and properly assess the properties of explosives in transport and use. For example, it would not be unreasonable to ignore the Koenen test and use MBP test results for setting the parameters for pumping emulsions. Unfortunately, the recent behaviour of the Australian Competent Authorities is not giving the author much hope for optimism.

Structural standards for freight containers
In contrast to the issue of Portable Tanks, where a new standard is being developed which may not apply to explosives, Germany has successfully led a push to standardise the structural requirements for freight containers.

Currently The International Maritime Dangerous Goods (IMDG) Code and the United Nations Model Regulations set quite specific structural guidelines for transporting explosives. There are specific requirements relating to bends, cracks, joins, corrosion, protrusions, and so on. But there are no comparable requirements applicable to other dangerous goods.

Clearly, all freight containers for all dangerous goods should be fit for purpose and be structurally sound. Thus, the guidance and criterial that apply to containers transporting explosives should be applicable to all dangerous goods transport.

Text proposed by Germany was adopted in December 2019. The text sets out guidelines for structural serviceability that will apply to freight containers used for all dangerous goods, with no significant deviations specifically for explosives. There was very wide support for the proposal, but opposition from USA which appeared to be based on data they had collected from inspections of all containers in which they have found only 0.1% are unsatisfactory.

The new text is attached in the appendix.

Electronic Detonators
After several years of argument and discussion it has been agreed that electronic detonators are sufficiently different from other detonators that they should have their own Proper Shipping Name and UN Number. This appeared first in the 21st Rev, (published in July 2019).

Proper Shipping Name: DETONATORS, ELECTRONIC programmable for blasting.

Hazard division	UN No
1.1B	0511
1.4B	0512
1.4S	0513

The deliberations of the explosives working group included consideration of the properties that make electronic detonators unique: their programmability, enhanced safety and enhanced security.

Regulators around the world are now racing headlong at glacial speed to apply the new numbers. They may be in use by the 2023 SAFEX meeting.

Conclusion
Government regulatory officers are becoming less willing to apply technical knowledge and depend more on the recipe book approach to applying regulations.

As members of SAFEX, you will all have a sound safety ethic and a high level of competence and almost certainly a better understanding of the properties of the explosives you are dealing with than the regulators who enforce the laws.

This paper has tried to present an overview of the origins of the global regulations relating to classification, labelling and transporting dangerous goods. The aim was to try to give SAFEX members some confidence to understand how their technical expertise can be best leveraged to find a way through the regulatory maze they must deal with,

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Appendix

Adopted amendments to the United Nations Model Regulations
Structural integrity of freight containers.

Amend 7.1.1.6 to read as follows (deleted text is struck through; new text is underlined):
"7.1.1.6 The interior and the exterior of a cargo transport unit shall be inspected prior to loading to ensure that there is no damage that could affect its integrity or that of the packages to be loaded in it.
The cargo transport unit shall be checked to ensure it is structurally serviceable, that it is free of possible residues incompatible with the cargo and that the interior floor, walls and ceiling, where applicable, are free from protrusions or deterioration that could affect the cargo inside and that freight containers are free of damages that affect the weather-tight integrity of the container, when required.
Structurally serviceable means that the cargo transport unit is free from major defects in its structural components. Structural components of cargo transport units for multimodal purpose are e.g. top and bottom side rails, top and bottom end rails, corner posts, corner fittings and, for freight containers, door sill, door header and floor cross members. Major defects include:
(a) Bends, cracks or breaks in structural or supporting members and any damage to service or operational equipment that affects the integrity of the unit;
(b) Any distortion of the over-all configuration or any damage to lifting attachments or handling equipment interface features great enough to prevent proper alignment of handling equipment, mounting and securing on chassis, vehicle or wagon, or insertion into ships' cells; and, where applicable;
(c) Door hinges, door seals and hardware that are seized, twisted, broken, missing or otherwise inoperative.
NOTE: *For filling portable tanks and multiple-element gas containers (MEGCs), see Chapter 4.2. For filling bulk containers, see Chapter 4.3"*

Consequential amendments
Amend 4.3.1.15 to read as follows (deleted text is strikethrough; new text is underlined):
"4.3.1.15 Before a bulk container is filled it shall be visually examined to ensure it is structurally serviceable, its interior walls, ceiling and floors are free from protrusions or damage that could affect the cargo and that any inner liners or substance retaining equipment are free from rips, tears or any damage that would compromise its cargo retention capabilities. Structurally serviceable means the bulk container does not have major defects in its structural components, such as top and bottom side rails, top and bottom end rails, door sill and header, floor cross members, corner posts, and corner fittings. Major defects include:
(a) Bends, cracks or breaks in the structural or supporting members and any damage to service or operational equipment that affects the integrity of the container;
(b) More than one splice or an improper splice (such as a lapped splice) in top or bottom end rails or door headers;
Any distortion of the overall configuration or any damage to lifting attachments or handling equipment interface features great enough to prevent proper alignment of handling equipment, mounting and securing chassis or vehicle, or insertion into ships' cells; and, where applicable.
(c) More than two splices in any one top or bottom side rail;
(d) Any splice in a door sill or corner post;
(e) Door hinges, door seals and hardware that are seized, twisted, broken, missing, or otherwise inoperative.
(f) Gaskets and seals that do not seal;
(g) Any distortion of the overall configuration great enough to prevent proper alignment of handling equipment, mounting and securing chassis or vehicle, or insertion into ships' cells;
(h) Any damage to lifting attachments or handling equipment interface features; or
(i) Any damage to service or operational equipment.".

Delete 7.1.3.3.1 and renumber 7.1.3.3.2 accordingly.

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