



**Committee of Experts on the Transport of Dangerous Goods
and on the Globally Harmonized System of Classification
and Labelling of Chemicals****Sub-Committee of Experts on the Transport
of Dangerous Goods****Sub-Committee of Experts on the Globally Harmonized
System of Classification and Labelling of Chemicals****Forty-ninth session****Thirty-first session**

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**Explosives and related matters: Review of Chapter
2.1 of the GHS****Joint work with the Sub-Committee of Experts on the
Transport of Dangerous Goods (TDG Sub-Committee)****Revisions to GHS section 2.1.3****Transmitted by the Sporting Arms and Ammunition Manufacturers'
Institute (SAAMI)¹****Introduction**

1. Currently there are various ongoing initiatives to revise the treatment of explosives within the GHS. An informal correspondence group has been working under the leadership of Sweden on a limited revision of classification principles, centering on section 2.1.3 of the GHS (Hazard Communication). Also there is a revision of the Manual of Tests and Criteria (MTC) to integrate it with GHS, led by the Chairman of the Working Group on Explosives of the TDG Sub-Committee. These initiatives have highlighted the need for further work on Chapter 2.1 as a whole.

2. SAAMI presents this proposal to provide an analysis of current relevant topics and possible solutions, but limited to section 2.1.3 of the GHS. It is our intent that this proposal be considered by the Working Group on Explosives. Explosives experts have identified a variety of issues with section 2.1.3 which should be resolved. Given the effectiveness of the current legislative and regulatory systems controlling explosives, simple solutions could address current questions raised by the creation of GHS.

¹ In accordance with the programme of work of the Sub-Committee for 2015–2016 approved by the Committee at its seventh session (see ST/SG/AC.10/C.3/92, paragraph 95, ST/SG/AC.10/C.4/60, annex III and ST/SG/AC.10/42, para. 15).

3. Section 2.1.3 consists of a table and a note. SAAMI proposes one change to the table and a rewrite of the note. This document first gives some background information on explosives, and then discusses each different topic covered by the existing and proposed notes, including “unstable” explosives, inner packagings removed from their outer packaging, manufacturing and GHS classification of explosives and derogations. SAAMI has proposed no change at this time to the portion of the existing note dealing with the relation of Test Series 2 to the safety data sheet (SDS) sections 2 and 9. Work was recently done on Section 9, lead by Germany.

Unique aspects of the explosives classification scheme

4. The regulation of explosives dates back to their creation in the late 1800’s, and the current international regulatory structure, and that of many nations, is mature with great depth and diversity. Explosives are often regulated by dedicated legislation and regulations governing their manufacture, transport, supply and use. In some countries there is a central agency with regulatory authority for all explosives in all sectors, and in such cases expert judgment is available to support the use of discretion to ensure workable requirements. In other countries there may be multiple national agencies involved with different sectors, with some authority residing in local authorities, who do have limited explosives expertise.

5. Separate detailed regimes implemented by different agencies govern the sectors of manufacture, transport, supply and use (all of which include storage). The most significant commonality is the classification derived from the Manual of Tests and Criteria or adaptations of it. Transport and supply and use share a reliance on classifications, while manufacturing is risk based, but there are still impacts from classification. Therefore, the classifications derived from the Manual of Tests and Criteria impact all sectors.

6. Different types of explosives vary to extremes in the level of hazard and risk, with consequences ranging from catastrophic to none. These different hazard levels are regulated according to the degree of risk or hazard they present, and placed into Divisions 1.1 to 1.4. Other classifications are risk based, e.g. Divisions 1.5 and 1.6, i.e. they are not based on intrinsic properties.

7. Unlike other chemicals, explosives classifications are typically performed by government, and are not allowed to be self-classified. Testing is the norm rather than the exception. Also, the controls on mixtures go far beyond normal GHS controls, with each variation subject to further government approval and perhaps testing. It is not necessary to regulate mixtures separately, as self-classification of mixtures is not allowed.

8. The Manual of Tests and Criteria accounts for intrinsic properties, but gives greater precedence to the mitigating effects of packaging and/or incorporation into articles. In the Manual of Tests and Criteria, explosives are classified as prepared for transport. Changes to packaging are often not allowed for transport without new government approvals. Since transport could occur at any time during the life cycle, and the process of getting revised approvals is lengthy and expensive, the original packaging is usually retained until use. Outer packaging may be discarded in retail sale and display. This is acceptable based on quantity limitations and the continuing mitigating effect of the inner packaging.

9. Articles can behave in a substantially less hazardous manner than the substances they incorporate, due to their robust physical nature and encapsulation of the explosive(s). In many scenarios, packaging greatly mitigates the intrinsic properties of an explosive substance or article. For combination packagings the inner packaging often has the most decisive effect, with the outer packaging providing an additional secondary effect. Some examples are trays for primers, tubes for detonators and bottles for propellants. The most

important function of packaging besides containment is to prevent propagation from one explosive to an adjacent one, so that ignitions occur sequentially in an incident, not in mass.

Consequences of classification

10. Divisions 1.1, 1.2 and 1.3 are generally treated as a group. This is not explicitly stated, but is common across different implementations of the Model Regulations on the Transport of Dangerous Goods. This group is generally subjected to stringent controls, and is not viable for mainstream commerce. It requires specialized investments in carriers for transport and buildings for supply. Examples for road transport are: carrier fitness reviews; specialized licenses; specially designed trucks with testing and certifications; specially trained and licensed drivers; no ability for overnight journeys without 2 drivers; security escorts in some countries; security plans and their requirements; and abnormally high insurance only available from specialty insurers. Aircraft carriage is forbidden. Sea transport is severely limited, and when possible, may have costs 10 times the amount required for other goods. Most ports and carriers do not allow them, and if a strategically located port does not allow explosives then commerce is not global and often limited to a region. In supply this group requires dedicated storage buildings and may not be manufactured in normal factories, stored in normal warehouses or sold to the public by normal methods, because these explosives are not allowed in the buildings except in minute quantities. Use is limited to blasting operations, professional fireworks, military and manufacturing into other goods, as primary examples, i.e. not public use. When remanufactured, which is a common activity, the resulting goods are often less hazardous due to incorporation of the explosive into articles, and additional packaging.

11. Division 1.4 “other than S” constitutes a middle group. The restrictions cited above do not apply; it may not require specialized vehicles or insurance, and is generally accepted by normal road carriers. Difficulty is still encountered for ocean journeys. These explosives may not be shipped as cargo on passenger aircraft, but are allowed on cargo aircraft. Storage and retail display quantities are limited, but the quantity restrictions are generally high enough to allow these activities to occur alongside other goods using normal methods in commerce.

12. Division 1.4, compatibility group S goods are the third group. This group most closely approximates the treatment which is applied to other dangerous goods, although still more vigorously controlled. Difficulties are still encountered in sea transport, but usually alternatives can be found. They may be shipped as cargo on passenger aircraft, which is the only form of air transport that can reach lesser developed countries. Many exceptions apply, sometimes based on the division as a whole (e.g. no pictogram in sea transport), or sometimes based on use (e.g. nail gun cartridges), or certain items (e.g. “handheld safe”) or societal determinations (e.g. exclusion of automotive air bags from explosives).

13. SAAMI leaves explanation of the risk-based regimes of Divisions 1.5 and 1.6 to specialists in those fields. However, these tend to not be reliant on packaging. The former are based on insensitivity of the substance, while the latter are based on the insensitivity of the article.

“Unstable explosives” in GHS Table 2.1.2

14. Explosives are classified into six divisions for transport by the test series in the Manual of Tests and Criteria. The tests in Test Series 3 and 4 do not assign a division, but are used to determine whether a product can be transported at all. They assess whether a substance is “too thermally unstable for transport”, or if a substance or article is “too

dangerous for transport” based on ignition sensitivity. These tests are pass/fail. Substances failing Test Series 3 tests for thermal stability, impact and friction sensitivity are not eligible for transport. Articles which fail Test Series 4 may be redesigned and/or repackaged to pass the test as configured for transport.

15. GHS has created a seventh division of explosives, and termed it “unstable explosives”, which accounts for all explosives which are not approved for transport. However, the use of the term “unstable” in supply and use implies that they are unstable for handling at any time other than small scale laboratory research, e.g. they could explode if touched. Perhaps, in the incorporation of the transport scheme into GHS, the phrase “for transport” was simply eliminated. In this particular instance, dissolving the link with transport is undesirable, as the test criteria apply to the transport package. Rather than use the term “unstable”, it might be better to call this division what it is – explosives which are not in a configuration approved for transport.

16. Explosives which fail the stability tests may still be stable. For instance, Test Series 4(b)(ii) is a 12-meter drop test. If the explosive ignites, regardless if the results are benign, e.g. stay within the package, it is a failure. If this was applied to other dangerous goods it would surely cause some undesirable consequences. The purpose of this test, which was lost to most experts but recently discovered, was to prevent ignition when loading and unloading ships, in case a package was dropped (twelve meters was used to approximate the height of a ship above the dock). Explosives can fail this test and present very little hazard in use. They are not unstable and may be handled safely. In retail display, an inner package which might fail the 12-meter drop test may be knocked off a shelf onto the floor with no result, and certainly no result classifiable as 1.1, 1.2 or 1.3. While failure of Test Series 3 would cause more concern, particularly thermal stability, these thresholds for transport may not apply to use, and certainly do not prohibit their use in manufacture.

17. In the past the term “unstable” has never appeared on any labels. If it is now placed on a label, this term would create concern, and generally be overregulated by officials charged with controlling it. It would be impossible to explain that an explosive labelled “unstable” is actually stable and get acceptance by building and fire code authorities.

18. SAAMI proposes to change the name of this division to “In a form not classified for transport”. Since the division name does not appear on labels, it would only be encountered on SDS, and not on packagings. This terminology has the potential to solve most problems for manufacturing and use.

Inner packagings removed from their outer packaging

19. One issue in the current review is the removal of inner packagings from their outer packaging. Since the Manual of Tests and Criteria puts heavy emphasis on the mitigating effects of packaging, this could be a concern. Inner packagings should normally not be removed from their outer packagings until in a place of use (e.g. a blasting site), or purchase by the public. Some transport regulations allow for removal from the outer packagings enroute to use (e.g. the IME SLP 22 magazine on trucks). Another scenario to bear in mind is explosives prepared for use but then temporarily not used and stored.

20. SAAMI’s principle concern is to recognize the needs of retail display. The public selects and purchases explosive products, typically in Division 1.4, after they have been removed from their outer packaging. They take them home and store and use them without the outer packaging. Some examples are small arms ammunition, ammunition handloading components such as smokeless powder and primers, historical firearm propellants, nail gun (fixing) cartridges, fireworks and model rocket motors. These products may have quantity controls in building and fire codes for warehousing, retail display, homes and in factories

which use them for re-manufacture. Diverse requirements and exceptions strive to appropriately apply controls to different products and scenarios. Many of these controls reference the Division 1.4 classification, and a label showing Division 1.1, 1.2 or 1.3 could disqualify a product from this regime. This impact would be too severe and should be avoided.

21. For sectors other than transport, unpackaging and repackaging which are unauthorized for transport are nonetheless acceptable if the warnings are modified as shown in the note above. This practice should be allowed when necessary, but otherwise discouraged, and relabeling requirements would serve as an incentive to keeping the original packaging until use in most circumstances.

22. When inner packagings are partially unpackaged by removal from their outer packagings, the original inners should be retained without alteration, otherwise the warnings must be modified as shown above. Alteration of inner packagings is already an existing issue controlled by supply and use regulation, and should be the primary concern, rather than preventing disposal of the outer packagings in subsequent to partial use; retail display; or use and storage by the public.

23. The current Note 1 to Table 2.1.2 reverts unpackaged or repackaged explosives to warnings representing a Division 1.1 mass explosion hazard. It is silent on inners removed from their outers. It allows the original hazard statements to be retained if they are “shown” to still be accurate, which implies a requirement for testing or analogy to past testing. It has been agreed in the current work to avoid new testing requirements.

24. SAAMI proposes to replace the existing Note 1 with the following text:

***NOTE:** The classification of explosives is normally performed in the transport packaging, and the resulting classification may be packaging dependent. Hence, also the GHS labelling of any inner packaging may in some cases not give a correct description of the behaviour of the substance, mixture or article in question. Explosives in a form other than classified for transport shall have the following label elements:*

- (a) Symbol: exploding bomb;*
- (b) Signal word: “Danger”; and*
- (c) Hazard statement: “explosive”.*

Inner packagings of Division 1.4 explosives in a form classified for transport but absent the transport packaging may be labelled according to Table 2.1.2.

25. This text aligns with regulations currently in effect and would not result in major changes. It might provide a vehicle in the future to improve the clarity of existing regulations.

26. When considering changes to GHS in this regard, the potential impacts of strict implementation by non-expert authorities must be borne in mind. In addition to national regulations, factories and retail locations are also governed by local building and fire codes. Local authorities sometimes use the SDS Section 14 as a prescriptive, sole parameter, rather than Manual of Tests and Criteria classifications or government transport approvals, even though the SDS Section 14 is merely a reflection of these. Local authorities normally regulate without resources to maintain expertise in explosives, and are driven by the perception of liability. Severe hardship already results from overly strict enforcement on factories and retail operations based on SDS Section 14 classifications.

27. Labelling the inner packagings of Division 1.4 explosive with a generic “explosive” statement or with a 1.1, 1.2 or 1.3 classification would increase confusion and liability for local government which already struggles with explosives. In many jurisdictions a stricter

label would result in prohibition of existing safe practices and disruption of commerce. There is no compelling trend of accidents or reasons to change the existing system. Therefore, alternative hazard statements should be avoided except as a deterrent to unnecessary alterations to packaging.

Manufacturing

28. It has been thought that GHS does not apply to manufacturing. However, at least one major GHS-implementing regulation covers manufacturing. While this implementation includes performance-based alternatives to GHS labelling in the workplace for equipment and portable process containers under direct supervision, it generally requires incoming chemicals to retain their GHS labelling until use. Explosives manufacturing frequently relies heavily on the purchase of other explosives as ingredients or components, and these have been placed on the market and bear GHS labels. SAAMI is of the opinion that it is inevitable that provisions will be made for these labels to be retained inside the factory until use, for example driven by enforcement personnel of worker safety authorities around the world, who regularly inspect factories.

29. SAAMI is open to arguments to the contrary. However, absent any clear exception, GHS must be assumed to impact manufacturing. It would provide industry with more stability for GHS to clearly note that it applies to manufacturing, and proactively develop an exceptions system, similar to the one just described. Otherwise a proliferation of differing approaches to manufacturing may occur. Specific text could be developed in the context of the greater re-work of Chapter 2.1.

30. Meanwhile, alternative equivalents to GHS hazard communication are necessary for manufacturing, and SAAMI reflects this for manufacturing in the current work on Section 2.1.3. While important in manufacturing, GHS hazard communication is not the primary basis of safety, as workers are expected to handle the materials in hazardous operations requiring training and expertise. Explosives manufacturing operations are normally subject to performance-based regulations including risk assessments, for example failure modes and effects analyses. Each individual operation is evaluated for probability and consequence of ignition and effects. Engineering controls are instituted, and minimum separation distances from surrounding industry and homes apply. When necessary, in-process classifications may be determined by special test procedures extending beyond those found in the Manual of Tests and Criteria, and quantitative risk assessments may be performed based on sensitivity data. Manufacturing is not a steady state activity, and the hazards change dynamically from one step to another in the process, so a label or SDS may not remain accurate from one step to the next.

31. SAAMI proposes a simple but multi-purpose text to control manufacturing within Section 2.1.3:

“GHS labelling shall not apply in manufacture for those explosives not in a form classified for transport. Risk management regulations govern the manufacture of explosives.”

32. We believe this text aligns with existing major implementations and the intent of GHS. This solution:

- (a) leaves GHS classification in place for manufacturing but eliminates labelling for unpackaged explosives;
- (b) retains labelling requirements for products already placed on the market and purchased until they are removed from their packaging for re-manufacturing; and

- (c) notes that GHS is not the primary regulation for explosives in manufacturing, thereby eliminating jurisdictional issues in current regulations.

Classification of explosives and derogations

33. Test Series 2 is used to determine whether a substance or mixture that is not intended for use as an explosive has explosives properties. It may have ramifications for products that, regardless of intent, are desired to be classified outside of explosives in the regulatory system or by competent authorities.

34. Competent authorities must retain discretion to remove products from the class of explosives, even if they have explosives properties. This could be for societal, security or commercial reasons, or when the predominant hazard is not explosive. These determinations are implemented by competent authorities using expert judgment, and are not self-classified by industry. It is not politically possible for GHS to contravene this by requiring explosives labelling on these products, and therefore an exit should be provided. Examples are mass societal needs like air bags. The European Union moved nail gun (fixing) cartridges into pyrotechnics for practical reasons, even though they are not pyrotechnics. More examples are military ordnance where the predominant hazard is not from explosion, veterinary tranquilizing darts and handheld-safe devices. If a product is called explosive, at least on the label, difficulty will be encountered because public perception equates “explosive” with mass explosion.

35. SAAMI proposes the following text:

“Substances and mixtures that show positive results in Test Series 2 shall be labelled for the explosive properties, as shall articles that contain them, unless classified otherwise by a competent authority.”

Relation of Test Series 2 to Safety Data Sheet sections 2 and 9

36. SAAMI is not proposing a change to the existing portion of the note in section 2.1.3 dealing with SDS. The SDS may still be used to communicate hazards in the workplace, regardless of packaging or intent for transport.

Proposal

37. Subject to possible modification by the Working Group on Explosives, replace GHS Section 2.1.3 with the following text (*new text is underlined; deleted text is struck through*).

“2.1.3 Hazard communication

General and specific considerations concerning labelling requirements are provided in *Hazard communication: Labelling* (Chapter 1.4). Annex 1 contains summary tables about classification and labelling. Annex 3 contains examples of precautionary statements and pictograms which can be used where allowed by the competent authority.

Table 2.1.2: Label elements for explosives

	Unstable Explosive In a form not classified for transport	Division 1.1	Division 1.2	Division 1.3	Division 1.4	Division 1.5	Division 1.6
Symbol	Exploding bomb	Exploding bomb	Exploding bomb	Exploding bomb	Exploding bomb; <i>or</i> 1.4 on orange background ^a	1.5 on orange background ^a	1.6 on orange background ^a
Signal word	Danger	Danger	Danger	Danger	Warning	Danger	<i>No signal word</i>
Hazard statement	Unstable Explosive	Explosive; mass explosion hazard	Explosive; severe projection hazard	Explosive; fire, blast or projection hazard.	Fire or projection hazard	May mass explode in fire	<i>No hazard statement</i>

^a Applies to substances, mixtures and articles subject to some regulatory purposes (e.g. transport)

NOTE:

The classification of explosives is normally performed in the transport packaging, and the resulting classification may be packaging dependent. Hence, also the GHS labelling of any inner packages may in some cases not give a correct description of the behaviour of the substance, mixture or article in question.

Explosives in a form other than classified for transport shall have the following label elements:

- (a) *Symbol: exploding bomb;*
- (b) *Signal word: “Danger”; and*
- (c) *Hazard statement: “explosive”.*

Inner packagings of Division 1.4 explosives in a form classified for transport but absent the transport packaging may be labelled according to Table 2.1.2.

GHS labelling shall not apply in manufacture for those explosives not in a form classified for transport. Risk management regulations govern the manufacture of explosives.

Substances and mixtures that show positive results in Test Series 2 shall be labelled for the explosive properties, as shall articles that contain them, unless classified otherwise by a competent authority.

Substances and mixtures, as supplied, with a positive result in Test Serie 2 in Part I, Section 12, of the UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria, which are exempted from classification as explosives (based on a negative result in Test Series 6 in Part I, Section 16 of the UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria,) still have explosive properties. The user should be informed of these intrinsic explosive properties because they have to be considered for handling – especially if the substance or mixture is removed from its packaging or is

repackaged – and for storage. For this reason, the explosive properties of the substance or mixture should be communicated in Section 2 (Hazard identification) and Section 9 (Physical and chemical properties) of the Safety Data Sheet in accordance with Table 1.5.2, and other sections of the Safety Data Sheet, as appropriate.
