



**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****Fifty-fifth session**

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Item 2 (l) of the provisional agenda

Explosives and related matters: miscellaneous**Removing the net explosives mass documentation
requirement for Division 1.4****Transmitted by the Sporting Arms & Ammunition Manufacturers'
Institute (SAAMI)*****Introduction**

1. Net explosive mass (NEM) is defined in the Model Regulations, glossary of terms, as “the total mass of the explosive substances, without the packagings, casings, etc.” The Model Regulations require the NEM to appear in the transport document. To our knowledge it is not a marking requirement in any international transport regulation.
2. NEM is used in risk management to control the magnitude of a mass explosion, fragments, or fire/over-pressure hazard by limiting the aggregate quantity of explosives in multiple shipments in a given vicinity. For example, NEM limits commonly exist for the quantity of explosives allowed at an explosives pier at a port, which limit the effects of a mass explosion (potentially including all explosives at the pier) to an acceptable level of impact to surrounding infrastructure.
3. There are no limits or requirements linked to the NEM in the Model Regulations. Road, rail, vessel, air (modal) regulation restrictions sometimes include an NEM criterion in a requirement, but these are either related to high hazard explosives outside of Division 1.4, or are niche issues not scientifically based on the NEM.

* In accordance with the programme of work of the Sub-Committee for 2019-2020 approved by the Committee at its ninth session (see ST/SG/AC.10/C.3/108, paragraph 141 and ST/SG/AC.10/46, paragraph 14).

4. By definition, Division 1.4 explosives present no significant hazard, and cannot contribute to a mass explosion. NEM documentation is superfluous for 1.4 explosives, which should not be subject to mass reaction risk management controls, or the resulting impediments to transport. Industry is experiencing delay and denial of shipments related to the NEM, including Division 1.4 explosives. The shipment NEM is requested in advance of transport before shipments are finalized, and shipments may be delayed or denied just on the possibility that NEM limits may be exceeded at a particular transit facility.
5. Explosives have a robust system of classification. It differentiates hazards based on a high level of investment in testing and observation of specific configurations, with competent authority oversight¹. In the field this sophistication is sometimes ignored² and the Model Regulations should not encourage this by including a superfluous requirement that ignores classification differentiations.
6. The Model Regulations exist to promote commerce in dangerous but beneficial goods, as a harmonized cross-boundary approach to prevention of accidents and standardization of controls. As a part of this system, commerce in Division 1.4 explosives should be provided with sufficient controls and facilitated. Otherwise authorities and carriers are beset with undeclared or mis-declared shipments, and the Sub-Committee has to contend with a counter trend to remove Division 1.4 explosives from Class 1 (e.g. into Class 9, and thence sometimes out of dangerous goods altogether) to avoid the stigma and burdensome requirements of high hazard explosives incorrectly applied to Division 1.4.
7. Based on the burden encountered by industry, and the absence of safety benefits, SAAMI proposes to modify the NEM documentation requirement to exclude Division 1.4.

Relevance of the NEM

8. After an explosive is classified based on NEM and other factors, NEM considerations continue to be relevant to explosives which can propagate a reaction from unit to unit, but NEM is no longer relevant to those explosives which have been tested and classified as not propagating in mass. Other safety factors are just as important as the NEM for non-propagating explosives, and the hazard degree of the explosive as presented for transport is established empirically and classified as 1.4 or 1.4S.
9. NEM is relevant to Division 1.1 explosives, as the total quantity present can simultaneously mass explode, and the resulting blast wave and projection distances are calculated with quantity-distance equations based on the total NEM present. Divisions 1.2 and 1.3 do not mass explode in transport, but have the potential to react similarly to Division 1.1 when quantities and potential threats exceed those found in transport (e.g. storage).
10. The Division 1.4 explosive classification is defined in 2.1.1.4 of the Model Regulations as “no significant hazard”, and the inability to mass react is also part of the

¹ IMDG “2.1.3.2 Prior to transport, the classification of all explosive substances and articles, together with the compatibility group assignment and the proper shipping name under which the substance or article is to be transported, shall have been approved by the competent authority of the country of manufacture...”

² Whereas sometimes the explosives classification system may be competently implemented, as is the case for the differentiation of 1.4S explosives in the ICAO TI, this is not always true. For example, the International Maritime Organization guidance to ports in Circular 675 is often not followed in their operational requirements: “12.1 The regulatory authority should grant any exemption necessary from their requirements in the case of explosives in class 1, division 1.4, compatibility group S in accordance with the IMDG Code.”

definition.³ Compartmentalization is the principle basis for differentiating medium and low explosives hazards, and explosives thus configured do not enhance the blast wave if adjacent to a mass explosion of high hazard explosives. Explosive substances and articles classed in Division 1.4 limit the quantity of explosives per unit, and compartmentalize the explosives with packaging and/or article design. For example, small arms ammunition typically consists of 5-10% explosives and 90-95% inert materials. Many Division 1.4 explosive articles are similar, and these designs along with packaging effectively control the explosive hazard.⁴

11. As a matter of practicality, for explosive substances the net weight is the same as the NEM, and the net weight is always marked on the package regardless of regulatory requirements because it is the economic measure. For explosive articles the number of units is the economic measure, not the NEM or net weight⁵ which are not marked.

Usage of the NEM in transport

12. The Model Regulations require the NEM to appear in the transport document⁶, but has no requirements or limits that refer to the NEM.

13. Modal regulations sometimes contain references to NEM, but these would not be impacted by this proposal:

(a) The air mode requirements for dangerous goods are found in the International Civil Aviation Organization's Technical Instructions for the Safe Transport of Dangerous Goods by Air (ICAO TI). The TI mirrors the Model Regulations - there is a documentation requirement, but no limitations or requirements are incurred based on the NEM. The configurations of explosives subject to simultaneous reaction of all the explosives (Divisions 1.1, 1.2, 1.3) are generally not allowed on aircraft.

(b) The vessel mode requirements for dangerous goods are found in the International Maritime Dangerous Goods Code (the IMDG Code):

- (i) The documentation requirement (IMDG 5.4.1.5.1) is identical to the Model Regulations.
- (ii) In 7.1.4.4.5, explosives other than those classified as 1.4S are prohibited on passenger ships. Exceptions are then provided for various compatibility groups of explosives up to 10 kg NEM, no matter what hazard division. This is a small amount, equivalent to a few packages or less, which could be high hazard. Here the use of the NEM versus some other measurement is not of critical importance, as more importantly the division is not restricted.
- (iii) Goods in Division 1.1 or 1.2 of compatibility group B may be stowed in the same hold as substances of compatibility group D provided the

³ Model Regulations 2.1.1.4: "This division comprises substances and articles which present only a small hazard in the event of ignition or initiation during transport. The effects are largely confined to the package and no projection of fragments of appreciable size or range is to be expected. An external fire shall not cause virtually instantaneous explosion of almost the entire contents of the package;"

⁴ Model Regulations, Chapter 2.1 Introductory Note 4: "Class 1 is unique in that the type of packaging frequently has a decisive effect on the hazard and therefore on the assignment to a particular division. The correct division is determined by use of the procedures provided in this Chapter."

⁵ The net quantity is a required marking in air transport, but the NEM is not a required marking.

⁶ Model Regulations "5.4.1.5.1 Total quantity of dangerous goods ... For Class 1 dangerous goods, the quantity shall be the net explosive mass."

net explosive mass of goods of compatibility group B does not exceed 50 kg. This provision does not apply to Division 1.4, and would not be impacted by this proposal.

- (c) The ADR is an international modal regulation for road transport of dangerous goods, which has the following requirements:
 - (i) Per ADR 5.4.1.2.1, the NEM must be documented for each UN number and their combined total.
 - (ii) Some NEM limits apply to tunnels in ADR 1.9.5.2.2. Further restrictions using NEM for tunnels occur in ADR 8.6.4. None of the tunnel restrictions based on NEM apply to Division 1.4 explosives.
 - (iii) An exemption applies to 1.4G fireworks for waivers to explosive vehicle specifications based on an NEM threshold.

Delay and denial

14. Vessel carriers request NEM details to facilitate their bidding process far in advance of a journey, which includes accounting for transit facility quantity limits and what freight may be present at all transit ports at different times. NEM information is not readily available until the order is actually received and entered into computer systems, which sift through small NEM differences in thousands of product codes to generate the NEM data.

15. Booking requests and approvals take two to three weeks while each transit port verifies that the total aggregate maximum threshold for all projected class 1 shipments in the timeframe is not exceeded. These limits can prevent a ship from transiting a port based on the possible presence of other ships and their predicted schedules, cargoes and quantities. If there is any question the shipment is just refused.

16. Shippers are routinely denied bookings for Division 1.4 shipments in maritime transport, and then are limited to the small availability of high cost vessels and routes that will accept high hazard Class 1, if any. This is a significant impediment to commerce.

17. For shippers who are not manufacturers, the NEM of Division 1.4 explosive articles is usually unknown. Acquiring and managing NEM data of thousands of small products with minor variations from multiple manufacturers is unjustifiably burdensome.

18. Whereas these problems are most severe in the vessel mode, unnecessary costs, delay and denial exist in all modes which require NEM documentation for Division 1.4. Requirements for documentation of the NEM can encourage carrier and transit facility policies which limit the transport of Division 1.4 goods beyond the regulations. Minute variations of NEM numbers are scrutinized by various entities in a transport chain to the level of 0.01 or 0.001 kilograms, without regard to how the information will (or will not) be used.

Summary

19. The total amount of non-mass-propagating explosives at any port or on any vessel or aircraft is not relevant to public safety more than any other dangerous good, and does not need to be considered as part of mass explosion calculations.

20. Division 1.4 explosives transport should not be burdened or restricted by NEM rules set forth for Class 1 materials outside the scope of international transport of dangerous goods regulations, and their NEM values should not be required by the Model Regulations on dangerous goods declarations when there is no requirement that uses this information.

Proposal

21. Amend 5.4.1.5.1 of the Model Regulations as follows:

5.4.1.5.1 *Total quantity of dangerous goods*

For Class 1 dangerous goods other than Division 1.4, the quantity shall be the net explosive mass.”
