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Harmonization with the United Nations

Recommendations on the Transport of Dangerous Goods

Amendment of provision 2.2.51.2.2 for fertilizers

Transmitted by the Government of Sweden* **

Summary

Executive summary: Amend provision 2.2.51.2.2, thirteenth indent, to align with the United Nations Model Regulations while keeping the current level of safety.

Related documents: ECE/TRANS/WP.15/AC.1/2017/26/Add.1, report of the Ad Hoc Working Group on the Harmonization of RID/ADR/ADN with the United Nations Recommendations on the Transport of Dangerous Goods.

* In accordance with the programme of work of the Inland Transport Committee for 2016-2017, (ECE/TRANS/2016/28/Add.1 (9.2)).

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Background

1. Amongst the proposed amendments to the nineteenth revised edition of the United Nations Recommendations on the Transport of Dangerous Goods, Model Regulations there are major changes to the provisions relating to ammonium nitrate (AN) based fertilizers¹. In summary, the changes comprise a move of the current composition requirements for classification of AN-based fertilizers as UN number 2067 or 2071 from Special Provision (SP) 307 and 193 to a flowchart in a new Section 39 of the Manual. While the majority of these changes are rather straightforward to incorporate into the RID/ADR/ADN, one important consequential amendment deserves special attention.

2. Provision 2.2.51.2.2 of the RID/ADR/ADN lists substances that are not accepted for carriage in Class 5.1. In the thirteenth indent it is specified that certain fertilizers are not accepted for carriage in this class, except under certain conditions. The provision, which has no correspondence in the Model Regulations, currently reads:

"- fertilizers having an ammonium nitrate content [...] or a content of combustible substances exceeding the values specified in special provision 307 except under the conditions applicable to Class 1."

The function of this provision is to ban the transport of fertilizer compositions that are known to have enhanced explosive properties as Class 5.1 materials.

3. It is well known that mixtures with high amounts of AN with combustible materials are explosive – in fact they have a UN number of their own in Class 1, UN 0222 - and this is the reason why the amount of combustibles allowed in fertilizers classified as UN 2067 is very low (see current SP 307). Furthermore, mixtures with high amounts of AN together with ammonium sulphate have a higher explosive power than AN in itself². In addition, AN is very sensitive to some materials, such as most transition metals (e.g. copper) and chlorides, which can cause it to decompose and lead to its explosion if confined³. It is the transport of these types of fertilizer compositions that provision 2.2.51.2.2 aims at, and justifiably so.

Problem

4. With the changes made to SP 307 in the 20th revised edition of the United Nations Recommendations, the "values" referred to in provision 2.2.51.2.2 no longer exist. They are instead found in various boxes in the new flowchart in Section 39 of the Manual of Tests and Criteria, to which SP 307 of the Model Regulations now refers:

"This entry may only be used for ammonium nitrate based fertilizers. They shall be classified in accordance with the procedure as set out in the Manual of Tests and Criteria, Part III, Section 39."

5. The fertilizer compositions that are currently banned from transport as Class 5.1 material by virtue of provision 2.2.51.2.2 of the RID/ADR/ADN are some of those that, in

¹ See Sections 38 and 39 of the report on the eight session of the Committee of Experts on the Transport of Dangerous Goods and the Globally Harmonized System of classification and Labelling of Chemicals [ST/SG/AC.10/44/Add.2](#)

² See argumentation and reference in paragraph 9(b) of ST/SG/AC.10/C.3/2016/66 submitted to the fiftieth session of the Sub-Committee of Experts on the Transport of Dangerous Goods.

³ See 39.3.5 in Section 39 of the Manual of Tests and Criteria for a more elaborate listing of incompatible materials.

the flowchart of the Manual, lead to boxes with the text “Not within the composition limits of UN 2067 (see 39.4.3)”. Paragraph 39.4.3 of the Manual reads:

“Ammonium nitrate based fertilizers that do not fulfil the requirements for classification as UN No. 2067, can be assigned another suitable UN number in Class 1 or Class 5, Division 5.1, provided that the suitability for transport is demonstrated and this is approved by the competent authority. This may for instance be when contamination has occurred in e.g. an accident, so that the fertilizer can be transported under a suitable UN number e.g. in Class 1 as approved by the competent authority.”

6. Following paragraph 39.4.3, compositions leading to these outcomes in the flowchart would be allowed for transport in Division 5.1, provided that a Competent Authority approves of this (and there are no provisions or guidance regarding on what basis this can be done). Replacing the current provision 2.2.51.2.2 with essentially the wording of paragraph 39.4.3 of the Manual, as has been suggested at the “Harmonization meeting”⁴, would thus make it possible to transport fertilizer compositions with explosive properties in Class 5.1 (which is the same class as fertilizers conforming to UN 2067 are transported in). This would constitute a major reduction of the current safety level that, in our view, is not acceptable.

Solution

7. In order to correctly adjust 2.2.51.2.2 to the new system for classification of AN-based fertilizers in the Model Regulations, and thus retain the existing situation, it is necessary to understand what it currently means. This can only be done by studying the current SP 307 of RID/ADR/ADN in detail, which is done in the Annex to this paper. From that analysis we conclude that compositions leading to the following boxes in the flow chart of Section 39 of the Manual are currently subject to provision 2.2.51.2.2 and thus banned from transport as Class 5.1 materials:

SP 307	Composition exceeding the values of SP 307	Corresponding exit box in flowchart
(a)	≥90% AN if containing >0.2% combustible materials	6
	≥90% AN if containing added matter which is not inert towards AN	4 ⁵
(b)	>70% but <90% AN if containing >0.4% combustible materials, unless AN is mixed with calcium carbonate and/or dolomite and/or mineral calcium sulphate	31
	>80% but <90% AN if containing >0.4% combustible materials if AN is mixed with calcium carbonate and/or dolomite and/or mineral calcium sulphate	31
(c)	Straight N-fertilizers of AN mixed with ammonium sulphate if containing >70% AN	8, 33
	Straight N-fertilizers with >45% but ≤70% AN mixed with ammonium sulphate if containing >0.4% combustible materials	39, for such mixtures only

⁴ The Ad hoc Working Group on the Harmonization of RID/ADR/ADN with the United Nations Recommendations on the Transport of Dangerous Goods, eight session, ECE/TRANS/WP.15/AC.1/2017/26 and Add.1

⁵ Exit box 4 of the flowchart is arrived at if the composition contains “incompatible materials in amounts that could negatively affect the stability of AN”. See further discussion on this in the annex to this document.

The easiest option for adjusting provision 2.2.51.2.2, thirteenth indent, in order to retain the current level of safety, would be to refer to the boxes in the flow chart, i.e.:

- fertilizers with compositions that lead to exit boxes 4, 6, 8, 31 or 33 or, for mixtures of ammonium nitrate with more than 5% ammonium sulphate exit box 39, of the flowchart of paragraph 39.5.1 of the Manual of Tests and Criteria, Part III, Section 39, except under the conditions applicable to Class 1.

8. However, for one type of compositions we think it could perhaps be considered to deviate from the existing situation and allow transport as Class 5.1 material: As regards the restriction of combustible materials for straight-N⁶ mixtures of AN and ammonium sulphate with >45% but ≤70% AN, corresponding to the last row of the above table, it may be questioned whether it is justified to categorically prohibit these from carriage in Class 5.1. While addition of ammonium sulphate does appear to enhance the explosive power of AN at high AN-concentrations⁷, it is not evident to us that such mixtures with AN-concentrations below 70% are more explosive than others at these AN-concentrations upon addition of combustible materials. If allowing also mixtures of AN and ammonium sulphate leading to exit box 39 of the flowchart to be classified and carried in Class 5.1, provided a Competent Authority approves, the wording of 2.2.51.2.2 could be simplified considerably:

- fertilizers with compositions that lead to exit boxes 4, 6, 8, 31 or 33 of the flowchart of paragraph 39.5.1 of the Manual of Tests and Criteria, Part III, Section 39, except under the conditions applicable to Class 1.

Relation to texts suggested at the Harmonization meeting

9. Two suggestions for texts to amend provision 2.2.51.2.2 were considered at the Harmonization meeting⁸. The Secretariat has, however, rightly observed that none of these are correct, and that they would affect fertilizers that are not even classified as dangerous goods. Instead the Secretariat proposes this alternative wording for provision 2.2.51.2.2⁹:

“- ammonium nitrate based fertilizers with compositions that lead to exit boxes 4, 8, 15, 20, 23, 31, 33 or 39 of the flowchart of paragraph 39.5.1 of the Manual of Tests and Criteria, Part III, Section 39, unless they have been assigned a suitable UN number, other than UN No. 2067, in Class 1 or Class 5.1, provided that the suitability for carriage has been demonstrated and that this has been approved by the competent authority, in accordance with paragraph 39.4.3 of the Manual of Tests and Criteria;

- ammonium nitrate based fertilizers with compositions that lead to exit box 6 of the flowchart of paragraph 39.5.1 of the Manual of Tests and Criteria, Part III, Section 39, unless they have been classified in Class 1 regardless of the results when tested in accordance with Tests Series 2 of the Manual of Tests and Criteria, in accordance with paragraph 39.4.4 of the Manual of Tests and Criteria.”

This proposal, however, does not reproduce the current ban on transporting explosive fertilizer compositions, i.e. those leading to boxes 4, 8, 31 and 33, as Class 5.1 material, since it does allow the transport in this class with a Competent Authority approval. The proposal

⁶ “Straight-N” means that the only primary nutrient in the fertilizer is nitrogen (N), in contrast to compound fertilizers where also other primary nutrients (phosphorus (P) and/or potassium (K)) are present.

⁷ See e.g. the review in Section 9.3.3 in Chapter 9 of “Properties of Ammonium Nitrate based fertilizers”, Ph.D. thesis by Harry Kiiski, Faculty of Science, Helsinki University 2009

⁸ See amendments concerning Chapter 2.2 in ECE/TRANS/WP.15/AC.1/2017/26/Add.1

⁹ See annex to ECE/TRANS/WP.15/AC.1/2017/26/Add.1

from the Secretariat does thus not reflect provision 2.2.51.2.2 as currently written in RID/ADR/ADN.

Proposal

10. The Secretariat's text⁹ can, however, be amended to reproduce provision 2.2.51.2.2, in order to essentially maintain the existing situation. Note, however, that this suggestion deviates from the existing situation by allowing straight-N mixtures of $\leq 70\%$ AN with ammonium sulphate that lead to exit box 39 to be carried as Class 5.1 material, see paragraph 5 above. (Text to be added is bold underlined, text to be removed is bold strikethrough.)

- ammonium nitrate based fertilizers with compositions that lead to exit boxes 4, ~~6, 8, 15, 20, 23~~, 31, ~~or 33 or 39~~ of the flowchart of paragraph 39.5.1 of the Manual of Tests and Criteria, Part III, Section 39, unless they have been assigned a suitable UN number, ~~other than UN No. 2067~~, in Class 1 ~~or Class 5.1~~, **provided that the suitability for carriage has been demonstrated and that this has been approved by the competent authority, in accordance with paragraph 39.4.3 of the Manual of Tests and Criteria;**

- ammonium nitrate based fertilizers with compositions that lead to exit boxes ~~4, 8, 15, 20, 23, 31, 33~~ or 39 of the flowchart of paragraph 39.5.1 of the Manual of Tests and Criteria, Part III, Section 39, unless they have been assigned a suitable UN number, ~~other than UN No. 2067~~, in Class 1 ~~or Class 5.1~~, provided that the suitability for carriage has been demonstrated and that this has been approved by the competent authority, **in Class 5.1 other than UN No. 2067 in accordance with paragraph 39.4.3 of the Manual of Tests and Criteria;**

~~—ammonium nitrate based fertilizers with compositions that lead to exit box 6 of the flowchart of paragraph 39.5.1 of the Manual of Tests and Criteria, Part III, Section 39, unless they have been classified in Class 1 regardless of the results when tested in accordance with Tests Series 2 of the Manual of Tests and Criteria, in accordance with paragraph 39.4.4 of the Manual of Tests and Criteria.~~

Note that in this proposed text, the Secretariat's first indent is reproduced twice, once for compositions only allowed in Class 1 and once for compositions additionally allowed in Class 5.1. The last indent of the Secretariat's proposal concerning compositions leading to exit box 6 is implemented in the first indent of our proposal. It is also clarified that the approval of the Competent Authority is only necessary for transport in Class 5.1 by shifting the wording in the second indent. Furthermore, we suggest to delete the reference to 39.4.3 of the Manual since it contains nothing more than what has already been stated, apart from an example.

11. For clarity, the final text to replace current provision 2.2.51.2.2, thirteenth indent, as proposed in paragraph 10, is shown without track changes:

- ammonium nitrate based fertilizers with compositions that lead to exit boxes 4, 6, 8, 31, or 33 of the flowchart of paragraph 39.5.1 of the Manual of Tests and Criteria, Part III, Section 39, unless they have been assigned a suitable UN number in Class 1;

- ammonium nitrate based fertilizers with compositions that lead to exit boxes 15, 20, 23 or 39 of the flowchart of paragraph 39.5.1 of the Manual of Tests and Criteria, Part III, Section 39, unless they have been assigned a suitable UN number in Class 1 or, provided that the suitability for carriage has been demonstrated and that this has been approved by the competent authority, in Class 5.1 other than UN No. 2067;

Alternative proposal

12. The above proposed text could also be amended to incorporate straight-N mixtures of AN with ammonium sulphate which lead to exit box 39 into the first indent, if this is deemed adequate (see paragraph 5 above). While including this would constitute a more precise translation of current provision 2.2.51.2.2, the wording would become rather complicated, e.g.:

- *ammonium nitrate based fertilizers with compositions that lead to exit boxes 4, 6, 8, 31-~~or~~, 33 **or, for mixtures of ammonium nitrate with more than 5% ammonium sulphate, exit box 39** of the flowchart of paragraph 39.5.1 of the Manual of Tests and Criteria, Part III, Section 39, unless they have been assigned a suitable UN number in Class 1;*

- *ammonium nitrate based fertilizers with compositions that lead to exit boxes 15, 20, 23 or, **except for mixtures of ammonium nitrate with more than 5% ammonium sulphate, exit box 39** of the flowchart of paragraph 39.5.1 of the Manual of Tests and Criteria, Part III, Section 39, unless they have been assigned a suitable UN number in Class 1 or, provided that the suitability for carriage has been demonstrated and that this has been approved by the competent authority, in Class 5.1 other than UN No. 2067;*

Concluding remark

13. In the discussions on the precise texts to be included in RID/ADR/ADN 2019 it is important to remember that the RID/ADR/ADN 2017 already deviates from the nineteenth revised edition of the Model Regulations in not allowing certain fertilizer compositions to be carried in Class 5.1. To keep this deviation also in the future thus merely retains the *status quo*, and this for justifiable reasons.

Annex

Analysis of current provision 2.2.51.2.2, thirteenth indent:

Provision 2.2.51.2.2, thirteenth indent, of the RID/ADR/ADN currently reads:

”- fertilizers having an ammonium nitrate content [(...)] or a content of combustible substances exceeding the values specified in special provision 307 except under the conditions applicable to Class 1.”

By looking carefully at the existing Special Provision 307 (SP 307) of the RID/ADR/ADN, it can be understood which these “values” referred to are:

SP 307	Wording	Limit for exceeding the value for AN	Limit for exceeding the value for combustible materials	Limit for exceeding the value for other matter ¹⁰
(a)	Not less than 90 % ammonium nitrate with not more than 0.2% total combustible/organic material calculated as carbon and with added matter, if any, which is inorganic and inert towards ammonium nitrate	Not possible	>0.2%	Theoretically zero for added matter which is not inert to AN
(b) ¹¹	Less than 90% but more than 70% ammonium nitrate with other inorganic materials and not more than 0.4% total combustible/organic material calculated as carbon	90%	>0.4%	
	More than 80% but less than 90% ammonium nitrate mixed with calcium carbonate and/or dolomite and not more than 0.4% total combustible/organic material calculated as carbon	90%	>0.4%	
(c)	Nitrogen type ammonium nitrate based fertilizers containing mixtures of ammonium nitrate and ammonium sulphate with more than 45% but less than 70% ammonium nitrate and not more than 0.4% total combustible/ organic material calculated as carbon such that the sum of the percentage compositions of ammonium nitrate and ammonium sulphate exceeds 70%	70%	>0.4%	

From running various compositions exceeding the above values through the flowchart of Section 39 in the Manual, the exit boxes they end up in are identified. In this way the table in paragraph 7 of the main paper is arrived at.

¹⁰ It is acknowledged that provision 2.2.51.2.2 does not explicitly refer to other values than those for AN and combustibles. However, compositions that contain added matter which is not inert to AN are, in our reading, subject to provision 2.2.51.2.2 if they exceed the value of 90% for AN. Compositions with 90% or more AN which contain added material that is incompatible with AN in such amounts that it could negatively affect the stability of AN should, in our view, not be allowed to be transported as Class 5.1 material. See also exit box 4 of the flowchart in Section 39 of the Manual.

¹¹ For ease of analysis, entry (b) of SP 307 has been split into its two components – one for mixtures with calcium carbonate and/or dolomite and/or mineral calcium sulphate, and one for mixtures with other inorganic materials.