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|  | United Nations | ST/SG/AC.10/C.3/2024/106 | |
| _unlogo | **Secretariat** | | Distr.: General  13 September 2024  Original: English |

**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**

**Sixty-fifth session**

Geneva, 25 November-3 December 2024

Item 3 of the provisional agenda

**Listing, classification and packing**

Classification and transport of UN 2372 (1,2-di-(dimethylamino) ethane)

Transmitted by the expert from Belgium[[1]](#footnote-2)\*\*

Introduction

1. During the sixty-second and sixty-fourth session of the Sub-Committee Belgium, presented informal document [INF.18](https://unece.org/sites/default/files/2023-06/UN-SCETDG-62-INF18e.pdf) and document [ST/SG/AC.10/C.3/2024/46](https://unece.org/sites/default/files/2024-05/ST-SG-AC10-C3-2024-46E.pdf) respectively. In those documents it was explained that there are scientific data showing that UN 2372 (1,2-DI-(DIMETHYLAMINO) ETHANE), which is currently classified in Class 3, packing group (PG) II also has corrosive properties. Hence it was proposed to add corrosivity as a subsidiary hazard for this entry and amend the transport conditions accordingly following the Guiding Principles.

2. During the discussion on [ST/SG/AC.10/C.3/2024/46](https://unece.org/sites/default/files/2024-05/ST-SG-AC10-C3-2024-46E.pdf) at the sixty-fourth session, several comments were received and it was noted in the report that a further analysis of the corrosivity as well as the toxicity hazard was needed. In addition, it was emphasized to be cautious with amending the assigned portable tank codes since this might have a big impact on industry without evidence of a safety problem.

3. After further consultation with interested experts, Belgium brings forward this document with additional proposals to reclassify UN 2372 according to the available scientific data as well as amend the transport conditions accordingly.

I. Corrosivity hazard

4. One comment received during the sixty-fourth session highlighted that there are data available in the European Chemicals Agency (ECHA) database[[2]](#footnote-3) that would lead to a PGI for corrosivity and the question was raised why these data were not taken into account. As different data from different studies that lead to a different packing group are available, Belgium made the choice to consider primarily data in line with the requirements of 2.8.3.2 of the *Model Regulations*. The study set-up of the 2000 study mentioned specifically in [ST/SG/AC.10/C.3/2024/46](https://unece.org/sites/default/files/2024-05/ST-SG-AC10-C3-2024-46E.pdf) is in line with the requirements of OECD Guideline 404 and thus with 2.8.3.2 of the *Model Regulations* (see annex I). It was considered reasonable to give priority to data obtained in line with the requirements of the *Model Regulations* to base our proposal on. This study shows that UN 2372 meets the criteria for inclusion in PGII for corrosivity.

5. It must also be mentioned that according to the precedence of hazards table in 2.0.3.3, Class 3, PGII takes precedence over both Class 8, PGII and PGIII. However, in case UN 2372 is classified in PGI for Class 8, the corrosivity hazard takes precedence and as such UN 2372 would need to be reclassified as a Class 8, PGI substance and the Class 3 flammability would become a subsidiary hazard.

6. Reclassifying UN 2372 as a Class 8, PGI substance would also have a huge impact on the transport conditions since according to the guiding principles, transport in IBCs would no longer be allowed and the portable tank instruction would change from T4 to T10. Thus severely impacting the current practices of industry without any evidence of a safety problem. Before taking such a decision, a very careful and thorough detailed analysis of all available data is necessary. Such analysis, in cooperation with interest experts, is currently being undertaken, the results of which will be provided in an informal document for the 65th session of the Sub-Committee.

7. Nevertheless, this provides yet another piece of evidence that UN 2372 possesses corrosive properties according to the criteria of the *Model Regulations*. Also, it was written in the report of the previous session that the Sub-Committee agreed in principle to the proposal to add corrosivity as a subsidiary hazard. As such, pending further analyses of all available test-data and information, the proposal to add Class 8 as a subsidiary hazard is maintained.

II. Toxicity Hazard

8. Some experts had also suggested during the sixty-second session that there are scientific data available pointing to a toxicity hazard for UN 2372. Nevertheless, as concerns oral toxicity, it was explained in document [ST/SG/AC.10/C.3/2024/46](https://unece.org/sites/default/files/2024-05/ST-SG-AC10-C3-2024-46E.pdf) that there are also more recent data available indicating that UN 2372 is not toxic through the oral route. However, there was still doubt on whether UN 2372 can be toxic by inhalation, especially since not enough data were obtained.

9. During the sixty-fourth session further data on the volatility of UN 2372 as well as further data on the LC50 for inhalation toxicity were provided. A further analysis by interested experts was performed (see annex II) and it was concluded that UN 2372 indeed meets the criteria for toxicity by inhalation of vapours according to 2.6.2.2.4.3 of the *Model Regulations*.

10. In addition, during recent exchanges with national stakeholders emphasis was put to the fact that their parent company in the United States of America had changed their Safety Data Sheet based on the test data for oral toxicity mentioned in the National Center for Biotechnology, United States of America (NCBI) -database[[3]](#footnote-4) (268 mg/kg).

11. National classification experts on the other hand pointed out that the study mentioned in the ECHA-database that resulted in an LD50-value of 550 mg/kg from and hence leading to the conclusion that the substance is not orally toxic, had a 95 % confidence interval of 196.4 -884 mg/kg. As such providing little certainty that UN 2372 is not toxic according to the criteria for oral toxicity in 2.6.2.2.4.1 of the *Model Regulations* (minimal LD50 = 300 mg/kg).

12. Taking into account the additional data on inhalation toxicity provided during the sixty-fourth session of the Sub-Committee, the conflicting data on oral toxicity that are available and doubt on the data showing UN 2372 is not orally toxic, as well as the fact that users are already considering UN 2372 as toxic, it is concluded that UN 2372 indeed possesses toxic properties according to the criteria of the *Model Regulations*.

13. As concerns classification in packing groups for toxicity, the data for oral toxicity point to PGIII and as concerns inhalation toxicity to PGII at most.

14. According to the precedence of hazards table in 2.0.3.3, Class 3 PGII takes precedence over Class 6, PGII and a reclassification to another class for its main hazard is not necessary. In addition, when following the principles outlined in the Guiding Principles adding Division 6.1 as a subsidiary hazard would not result in any other changes to the transport conditions besides changing the assigned portable tank code from T4 to T7, which was already proposed based on the addition of corrosivity as subsidiary hazard.

III. Portable tank instruction

15. In documents [TDG/62/INF.18](https://unece.org/sites/default/files/2023-06/UN-SCETDG-62-INF18e.pdf) and [ST/SG/AC.10/C.3/2024/46](https://unece.org/sites/default/files/2024-05/ST-SG-AC10-C3-2024-46E.pdf) it was proposed to change the assigned portable tank code in column 10 of the Dangerous Goods List for UN 2372 from T4 to T7 as outlined in table 4.3 of the Guiding Principles for a Class 3 PGII substance with a Division 6.1 or Class 8 subsidiary hazard. During the discussions, it was stressed that portable tanks have a long lifetime and hence changing the portable tank code might have a substantial impact on the industry in the absence of any evidence of a safety problem during transport.

16. Further analysis has revealed that the main difference between a T4 and T7 tank is that the minimum test pressure for a T4 tank is 2,65 bar, while the required minimum test pressure for a T7 tank is 4 bar. The other requirements in table in 4.2.5.2.6 (minimum shell thickness, bottom openings and pressure relief devices) are exactly the same for T4 and T7 tanks.

17. During consultation with the tank experts from our inspection bodies, it was explained that changing the tank code from T4 to T7 for these portable tanks would have more consequences than just testing these portable tanks at a higher pressure:

(a) The safety valves would need to be set at a higher opening pressure.

(b) The marking on the tank and tank plate would need to be changed.

(c) A revision of the type approvals would need to be done to ensure that there is no need for a higher wall thickness of the tanks, since the test pressure needs to be taken into account when calculating the wall thickness. Nevertheless, it was also thought that in this case, the standard minimum wall thickness in reference steel according to 6.7.2.4.2 – 6.7.2.4.4 will be the limiting factor.

Nevertheless, it was suggested that five years would be a reasonable transition period for performing the necessary adaptions and revisions. As such, one of the options proposed is to change the tank code assigned to UN 2372 with a transition period of five (+two) years (Proposal 3, option 2).

18. Intersessionally, emphasis was also put on portable tank special provision TP28 which allows a deviation from the test pressure and allows transport in portable tanks with a minimum test pressure of 2,65 bar. This means either T3, T4 or T5 portable tanks, depending on the other portable tank requirements in 4.2.5.2.6. In the specific case of UN 2372, assigning TP28 as a portable tank special provision would leave the possibility to further transport in T4 portable tanks, as is currently required.

19. TP28 is already assigned to several other entries in the dangerous goods list (~80) that have T7 assigned as portable tank instruction and that are either classified in Class 3, PGII (e.g. UN 1224 KETONES, LIQUID, N.O.S.) and even to Class 3 PGI substances (e.g. UN 1863 FUEL, AVIATION, TURBINE ENGINE) as well as a substantial number of substances classified in Division 6.1 (e.g. UN 3250, CHLOROACETIC ACID, MOLTEN, PG II, Class 8 subsidiary hazard) or Class 8 (e.g. UN 2798 PHENYLPHOSPHORUS DICHLORIDE, PGII). TP28 is also assigned to some entries with T8 as portable tank instruction.

20. Even though the Guiding Principles prescribe the use of T7 portable tanks, assigning TP28 to UN 2372 in the dangerous goods list would leave the possibility to further transport UN 2372 in T4 portable tanks. Given the solid safety record of transport of UN 2372, there is no obvious practical reason to strictly forbid transport in T4 portable tanks. In addition, this would also limit the impact on industry after the reclassification of this substance. As such, one of the options proposed is to assign T7 to this substance, but also assign TP28 (Proposal 3, option 1).

21. If the Sub-Committee would be of the opinion that amending the portable tank instruction for UN 2372 to be in line with the Guiding Principles is not a suitable approach, it is alternatively proposed to keep the current portable tank provision T4 and provide a clarification in the Guiding Principles to reflect the reasoning applied (see proposal 3, option 3).

IV. Proposals

A. Proposals 1 and 2

22. Proposal 1: Add corrosivity as a subsidiary hazard for UN 2372.

23. Proposal 2: Add toxicity as a subsidiary hazard for UN 2372.

24. If these proposals are accepted the entry in the Dangerous Goods List for UN 2372 would read as follows (new text in **bold** and **underlined**).

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UN No. | Name and description | Class or division | Subsidiary hazard | UN packing group | Special provisions | Limited and excepted quantities | | Packagings and IBCs | | Portable tanks and bulk containers | |
| Packing instruction | Special packing provisions | Instructions | Special provisions |
| (1) | (2) | (3) | (4) | (5) | (6) | (7a) | (7b) | (8) | (9) | (10) | (11) |
| 2372 | 1,2-DI-(DIMETHYLAMINO)  ETHANE | 3 | **6.1 8** | II |  | 1L | E2 | P001 IBC02 |  | T4 | TP1 |

B. Proposal 3

1. Option 1:

25. Amend the portable tank instruction for UN 2372 from T4 to T7 and introduce portable tank special provision TP28.

26. If proposals 1 and 2, as well as option 1 from proposal 3 are accepted, the entry for UN 2372 in the Dangerous Goods List would read as follows (new text in **bold** and **underlined**, deleted text in **~~bold~~** and **~~stricken trough~~**):

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UN No. | Name and description | Class or division | Subsidiary hazard | UN packing group | Special provisions | Limited and excepted quantities | | Packagings and IBCs | | Portable tanks and bulk containers | |
| Packing instruction | Special packing provisions | Instructions | Special provisions |
| (1) | (2) | (3) | (4) | (5) | (6) | (7a) | (7b) | (8) | (9) | (10) | (11) |
| 2372 | 1,2-DI-(DIMETHYLAMINO)  ETHANE | 3 | **6.1 8** | II |  | 1L | E2 | P001 IBC02 |  | **~~T4~~ T7** | TP1 **TP28** |

2. Option 2:

27. Amend the portable tank instruction for UN 2372 from T4 to T7 and introduce a transitional period of 5 (+2) years in 4.2.6 of the Model Regulations.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UN No. | Name and description | Class or division | Subsidiary hazard | UN packing group | Special provisions | Limited and excepted quantities | | Packagings and IBCs | | Portable tanks and bulk containers | |
| Packing instruction | Special packing provisions | Instructions | Special provisions |
| (1) | (2) | (3) | (4) | (5) | (6) | (7a) | (7b) | (8) | (9) | (10) | (11) |
| 2372 | 1,2-DI-(DIMETHYLAMINO)  ETHANE | 3 | **6.18** | II |  | 1L | E2 | P001 IBC02 |  | **~~T4~~ T7** | TP1 |

28. If proposals 1 and 2, as well as option 2 from proposal 3 are accepted, the entry for UN 2372 in the Dangerous Goods List would read as follows (new text in **bold** and **underlined**, deleted text in **~~bold~~** and **~~stricken trough~~**):

29. Add in 4.2.6 of the Model Regulations the following transitional measure:

“Until 31 December 2031 portable tanks with tank code T4 may be used for the transport of UN2372 1,2-DI-(DIMETHYLAMINO) ETHANE”.

3. Option 3:

30. Keep the currently assigned portable tank instruction (T4) for UN 2372 so that the entry for UN 2372 will stay as proposed in paragraph 18 of this document, if proposals 1 and 2 are accepted.

31. Introduce a new paragraph 3 to part 4, section C of the Guiding principles to accommodate the reasoning applied for this decision:

“3. The Sub-Committee may decide to deviate from the principles outlined in this section for assigning portable tank instructions. A major factor for deciding to deviate from these principles should be experience with safe transport in portable tanks of another type. (e.g. for UN2372, when scientific data showed its corrosive and toxic hazard potential, it was decided to keep T4 assigned based on decades of safe transport without incidents).”

32. Renumber the current paragraph 3 to part 4, section C of the Guiding Principles as paragraph ‘4’.

V. Sustainable Development Goals

33. This proposal contributes to Sustainable Development Goal 12 “Ensure sustainable consumption and production patterns” and more specifically its target 12.4 “Achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.

**Annex I**

Corrosivity studies for UN 2372

|  | *Study report 2000* | *Study report 1989* | *Study report 1988* | *OECD Guideline 404, last update: 2015* |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
| **Test** | DOT skin corrosion test | Skin corrosion screening method | DOT skin corrosion test | In vivo skin corrosion test |
| **Time** | 3 minutes, 1 hour, 4 hours  Exposure terminated after 1 hour (due to severity of  the irritation) | 3 minutes | 1 hour | 3 minutes, 1 hour, 4 hours  If a corrosive effect is observed after any of the three sequential exposures, the test is  immediately  terminated |
| **species** | New Zealand white rabbit  6 cm2 free of hair | New Zealand white rabbit 1x1 inch, free of hair | New Zealand white rabbit  1x1 inch, free of hair | Albino rabbits  6 cm2 free of hair |
| **Nr of animals** | 1 male, 2 females | 3 | 3 | 2 to 3 |
| **Test material** | Anhydrous TMEDA clear colorless liquid  0,5 ml | Anhydrous TMEDA  Clear colorless pale yellow liquid 0,5 ml | Clear colorless pale yellow liquid 0,5 ml | Undiluted liquid 0,5 ml |
| **Controls** | Untreated skin areas of the test animal serve as control | Untreated skin areas of the test animal serve as control | Untreated skin areas of the test animal serve as control | Untreated skin areas of the test animal serve as control |
| **Observation period** | 1 hour, 24 hours | 30 minutes, 24 and 48 hours | 30 minutes, 24 and 48 hours | Observation 14 days, unless corrosion develops at an earlier time point  24, 48, 72 hours |
| **Corrosion def** | Full thickness necrosis in at least one animal | Destruction (= ulceration or necrosis) or irreversible alteration of the tissue | Destruction (= ulceration or necrosis) or irreversible alteration of the tissue | Dermal corrosion is the production of irreversible damage of the skin; namely, visible necrosis through the epidermis and into the dermis, following the application of a test chemical for up to four hours.  Corrosive reactions are typified by ulcers, bleeding, bloody scabs, and, by the end of observation at 14 days, by discoloration due to blanching of the skin, complete areas of alopecia, and scars. |
| **Results** | 3-min-exposure: reading after 1 hour> no indication of corrosivity  Reading after 24 hour > positive indication of corrosivity  1-hour-exposure: reading after 1 hour> no indication of corrosivity,  reading after 24 hour > positive indication of corrosivity, not fully reversible, erythema score 4/4, edema score 2/4  **> Category 1** | 3-min-exposure:  24/48 hours > erythema score 4/4, edema score 2/4  **> Category 1A** | 1-hour-exposure:  30 min/24 h/48 h > erythema score 4/4 not reversible, edema score 1/4 fully reversible in 48 hours (in one rabbit 1/4 after 48 hour)  **> Category 1** |  |

Only reliable without restriction in vivo studies involved (ECHA code 1).

**Annex II**

Inhalation toxicity data

1,2-Di(dimethylamino)ethane (Synonym: N,N,N',N'-tetramethylethylenediamine),

**CAS: 110-18-9, UN 2372**

| *Database* | *ECHA* | | | *PubChem* | *NITE\_CHRIP* | *RTECS* | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Study** | Boynton, 1981 | Durando, 2013 | Hoffmann, 1991 | 1988 | HSDB 2002 | 1988 (See PubChem) | 2003 |
| **animal** | rat | rat | rat | rat |  | rat | rat |
| **Inhalation time** | 1 h | 30 min | 60 min | 4 h | 4 h | 4 h | 4 h |
| **Guideline** | no | no | no | ? | ? | ? | ? |
| LC50 in mg/m3 | > 17900 & < 69100 | < 30180 | 21667 - 22440 | 6253 | 6253 | 6253 | > 5598 |
| LC50 in ppm (ml/m3) | > 3772 & < 12878 | < 6361,3 | > 4567 - 4730 | 1318 | 1318 | 1318 | > 1180 |
| **LC50 in ppm 1 h** | **> 3772 & < 12878** | < 4498\*\*\* | **> 4567 - 4730** | **2636** | **2636** | **2636** | **2360** |
| **Other information** | No | All died | No death | no | no | no | no |
| **GHS\***  3.1.3.3 (4h) | Cat 4/5 | Cat 4 | Cat 4 | Cat 3 | Cat 3 | Cat 3 | Cat 3 |
| **Vapour pressure** | 13,92 hPa at 20 °C  (19,19 hPa at 25 °C, 82,55 hPa at 50°C)  according to OECD 104 | | | 16,7 Hgmm,  ? °C | No data | No data | |
| Saturated vapour conc ml/m3 (ppm) | **13920** | | | **(if it was at 20 °C)**  **2226**  **(if it was at 25 °C >**  **1614)**  **(if it was at 50°C >**  **375)** | **(104 mg/L)\*\***  **21920** | **No data** | |
| **TDG classification**  2.6.2.2.4.3 | PG III/ not DG | PG III  or stricter | As no death observed > not DG | PG III  (PG III)  (not DG) | PG II | Depends on saturated vapour conc.  (using 13920 ppm > both is PG II) | |

DG: dangerous goods

red: calculated (101,325 was simplified as 100)

\* it is harmonised classified as Cat 4 in the original CLP-Regulation (1272/2008) without any RAC Report or any data, which justify this classification.

\*\* we do not know at which temperature was vapour pressure taken, it is usually 20, 25 or 50 °C, and it has a big impact on the saturated vapour conc.:

* if 219 hPa is the vapour pressure at 50 °C, then at 20 °C it is 36,92 hPa, which means 3692 ppm saturated vapour conc, which means PG II
* if 219 hPa is the vapour pressure at 25 °C, then at 20 °C it is 158,85 hPa, which means 15885 ppm saturated vapour conc, which means PG II

\*\*\* ten Berge model with default n=2 for vapour (but if n=3 LC50(1h)=5048 ppm > not DG, and if n=1 LC50(1h)=3180 ppm > as in the table), n: chemical specific component, depends from endpoint, species…, n is between 1 and 3 for about 90% of the chemicals, and typically when extrapolating from shorter to longer exposure period n=1 (or at least smaller than 2)

**Outcome:**

Most used vapour pressure in the literature: 13,92 hPa 20 °C (or 19,19 hPa 25 °C) » saturated vapour conc in ppm: 13920 ppm

Most used LC50 in ppm: 1318/ 4 h » 2636 ppm in 1 h

**» PG II (V ≥ LC50 and LC50 ≤ 3 000 ml/m3**

1. \* A/78/6 (Sect. 20), table 20.5. [↑](#footnote-ref-2)
2. <https://echa.europa.eu/en/registration-dossier/-/registered-dossier/27608/7/4/2/?documentUUID=65c68a58-38bb-4524-9497-30d2925959a7> [↑](#footnote-ref-3)
3. <https://pubchem.ncbi.nlm.nih.gov/compound/8037#section=Adverse-Effects>. [↑](#footnote-ref-4)