



Billing Code: 4910-60-P

DEPARTMENT OF TRANSPORTATION

Pipeline and Hazardous Materials Safety Administration

49 CFR Parts 171, 172, 173, 175, 176, 178 and 180

[Docket No. PHMSA-2017-0108 (HM-215O)]

RIN 2137-AF32

Hazardous Materials: Harmonization with International Standards

AGENCY: Pipeline and Hazardous Materials Safety Administration (PHMSA), Department of Transportation (DOT).

ACTION: Notice of proposed rulemaking (NPRM).

SUMMARY: The Pipeline and Hazardous Materials Safety Administration (PHMSA) proposes to amend the Hazardous Materials Regulations (HMR) to maintain alignment with international regulations and standards by incorporating various amendments, including changes to proper shipping names, hazard classes, packing groups, special provisions, packaging authorizations, air transport quantity limitations, and vessel stowage requirements. These revisions are necessary to harmonize the HMR with recent changes made to the International Maritime Dangerous Goods Code, the International Civil Aviation Organization's Technical Instructions for the Safe Transport of Dangerous Goods by Air, and the United Nations Recommendations on the Transport of Dangerous Goods—Model Regulations. Additionally, PHMSA proposes several amendments to the HMR that would allow for increased alignment with the Transport Canada, Transportation of

Dangerous Goods (TDG) Regulations.

DATES: Comments must be received by [INSERT DATE 60 DAYS FROM DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: You may submit comments by any of the following methods:

- *Federal Rulemaking Portal:* <http://www.regulations.gov>. Follow the online instructions for submitting comments.
- *Fax:* 1-202-493-2251.
- *Mail:* Docket Management System; U.S. Department of Transportation, Docket Operations, M-30, Ground Floor, Room W12-140, 1200 New Jersey Avenue, SE, Washington, DC 20590-0001.
- *Hand Delivery:* U.S. Department of Transportation, Docket Operations, M-30, Ground Floor, Room W12-140, 1200 New Jersey Avenue, SE, Washington, DC 20590-0001 between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

Instructions: Include the agency name and docket number PHMSA-2017-0108 (HM-2150)] or RIN 2137-AF32 for this rulemaking at the beginning of your comment.

Note that all comments received will be posted without change to <http://www.regulations.gov> including any personal information provided. If sent by mail, comments must be submitted in duplicate. Persons wishing to receive confirmation of receipt of their comments must include a self-addressed stamped postcard.

Privacy Act: Anyone is able to search the electronic form of any written

communications and comments received into any of our dockets by the name of the individual submitting the document (or signing the document, if submitted on behalf of an association, business, labor union, etc.). You may review DOT's complete Privacy Act Statement in the Federal Register published on April 11, 2000 (65 FR 19477), or you may visit <http://www.regulations.gov>.

Docket: You may view the public docket through the Internet at <http://www.regulations.gov> or in person at the Docket Operations office at the above address (See ADDRESSES).

FOR FURTHER INFORMATION CONTACT: Steven Webb, International Program or Aaron Wiener, International Program, telephone (202) 366-8553, Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation, 1200 New Jersey Avenue, SE, East Building, 2nd Floor, Washington, DC 20590-0001.

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I. Executive Summary

The Pipeline and Hazardous Materials Safety Administration (PHMSA) proposes to amend the Hazardous Materials Regulations (HMR; 49 CFR parts 171 to 180) to maintain alignment with international regulations and standards by incorporating various amendments, including changes to proper shipping names, hazard classes, packing groups, special provisions, packaging authorizations, air transport quantity limitations, and vessel stowage requirements. This rulemaking project is part of our ongoing biennial process to harmonize the HMR with international regulations and standards.

In this NPRM, PHMSA proposes to amend the HMR to maintain alignment with various international standards. The following are some of the more noteworthy proposals set forth in this NPRM:

- *Incorporation by Reference*: PHMSA proposes to incorporate by reference the newest versions of various international hazardous materials (hazmat) standards, including: the 2019–2020 Edition of the International Civil Aviation

Organization Technical Instructions for the Safe Transport of Dangerous Goods by Air (ICAO Technical Instructions); Amendment 39-18 to the International Maritime Dangerous Goods Code (IMDG Code); the 20th Revised Edition of the United Nations Recommendations on the Transport of Dangerous Goods (UN Model Regulations); Amendment 1 to the 6th Revised Edition of the UN Manual of Tests and Criteria; and the 7th Revised Edition of the Globally Harmonized System of Classification and Labelling of Chemicals (GHS). Additionally, we propose to update our incorporation by reference of the Transport Canada TDG Regulations to include: SOR/2016-95 published June 1, 2016; SOR/2017-137 published July 12, 2017; and SOR/2017-253 published December 13, 2017. Finally, in this NPRM, PHMSA proposes the adoption of updated International Organization for Standardization (ISO) standards.

- *Hazardous Materials Table*: PHMSA proposes amendments to the Hazardous Materials Table (HMT; § 172.101) consistent with recent changes in the Dangerous Goods List of the 20th Revised Edition of the UN Model Regulations, the IMDG Code, and the ICAO Technical Instructions. Specifically, we propose amendments to the HMT to add, revise, or remove certain proper shipping names, hazard classes, packing groups, special provisions, packaging authorizations, bulk packaging requirements, and passenger and cargo aircraft maximum quantity limits.
- *Articles containing dangerous goods*: PHMSA proposes to add a classification

system for articles containing hazardous materials that do not already have a proper shipping name. This proposal would address situations in which hazardous materials or hazardous materials residues are present in articles, and authorize a safe method to transport articles that may be too large to fit into typical packages. Absent these provisions to package and transport these materials safely, these articles may be offered for transport under provisions that do not adequately account for the physical and chemical properties of the substances and may require the issuance of an approval by PHMSA's Associate Administrator for Hazardous Materials Safety.

- *Lithium Battery Test Summary:* PHMSA proposes the inclusion of a lithium battery test summary requirement. The HMR require lithium battery manufacturers to subject their batteries to appropriate UN design tests to ensure they are classified correctly for transport, and develop records of successful test completion. The proposed test summary would include a standardized set of elements that provide traceability and accountability, thereby ensuring that lithium cell and battery designs offered for transport meet the appropriate UN tests.
- *Baggage Equipped with Lithium Batteries:* PHMSA proposes to amend the aircraft passenger provisions for carriage of baggage equipped with lithium batteries intended to power features such as location tracking, battery charging, digital weighing, or motors (sometimes referred to as “smart luggage”). Specifically, baggage equipped with a lithium battery or batteries would be

required to be carried in the cabin of the aircraft unless the battery or batteries are removed.

- *Segregation of Lithium Batteries from Specific Hazardous Materials:* PHMSA proposes requirements to segregate lithium cells and batteries from certain other hazardous materials, notably flammable liquids, when offered for transport or transported on aircraft. PHMSA is taking this action to promote consistency with the ICAO Technical Instructions and a recommendation (A-16-001) from the National Transportation Safety Board (NTSB) stemming from the investigation of the July 28, 2011, in-flight fire and crash of Asiana Airlines Flight 991 incident that resulted in the loss of the aircraft and crew. The investigation report cited as a contributing factor the flammable materials and lithium ion batteries that were loaded together either in the same or adjacent pallets.
- *Alternative criteria for classification of corrosive materials:* PHMSA proposes to include non-testing alternatives for classifying corrosive mixtures that uses existing data on their chemical properties. Currently the HMR require offerors to classify Class 8 corrosive material and assign a packing group based on test data. The HMR authorize a skin corrosion test and various *in vitro* test methods that do not involve animal testing. However, data obtained from testing is currently the only data acceptable for classification and assigning a packing group. These alternatives would afford offerors the ability to make a classification and packing group assignment without the need

to conduct physical tests.

- *Provisions for Polymerizing Substances:* PHMSA is proposing to extend the sunset dates for provisions concerning the transportation of polymerizing substances from January 2, 2019 to January 2, 2021. This additional time will allow PHMSA to finalize research and analyze comments and data concerning the issue submitted to the docket for this NPRM. This information will allow us to have a more comprehensive understanding of polymerizing substances and further consider the most appropriate transport provisions for these materials.

If adopted in a final rule, the amendments proposed in this NPRM will result in minimal burdens on the regulated community. The benefits achieved from their adoption include enhanced transportation safety resulting from the consistency of domestic and international hazard communication and continued access to foreign markets by U.S. manufacturers of hazardous materials. PHMSA anticipates that most of the amendments in this NPRM will result in cost savings and will ease the regulatory compliance burden for shippers engaged in domestic and international commerce, including trans-border shipments within North America.

PHMSA solicits comment from the regulated community on these amendments and others proposed in this NPRM pertaining to: need, benefits, and costs of international harmonization; impact on safety; and any other relevant concerns. In addition, PHMSA solicits comment regarding approaches to reducing the costs of this rule while maintaining or increasing the benefits. In its preliminary analysis, PHMSA

concluded that the aggregate benefits of the amendments proposed in this NPRM justify their aggregate costs. Nonetheless, PHMSA solicits comment on specific changes (i.e., greater flexibility with regard to a particular amendment) that might improve the rule.

II. Background

Federal law and policy strongly favor the harmonization of domestic and international standards for hazardous materials transportation. The Federal hazardous materials law (49 U.S.C. 5101 *et seq.*) directs PHMSA to participate in relevant international standard-setting bodies and requires alignment of the HMR with international transport standards to the extent practicable. Although Federal hazmat law permits PHMSA to depart from international standards to promote safety or other overriding public interest, it otherwise encourages domestic and international harmonization (see 49 U.S.C. 5120).

In a final rule published December 21, 1990 (Docket HM-181; 55 FR 52402), PHMSA's predecessor—the Research and Special Programs Administration (RSPA)—comprehensively revised the HMR for international harmonization with the UN Model Regulations. The UN Model Regulations constitute a set of recommendations issued by the United Nations Sub-Committee of Experts (UNSCOE) on the Transport of Dangerous Goods and the United Nations Sub-Committee of Experts on the Globally Harmonized System of Classification and Labelling of Chemicals (GHS). The UN Model Regulations are amended and updated

biennially by the UNSCOE and serve as the basis for national, regional, and international modal regulations, including the IMDG Code and the ICAO Technical Instructions.

Since publication of the 1990 rule, PHMSA has issued 12 subsequent international harmonization rulemakings.¹ These rulemakings were based on biennial updates of the UN Model Regulations, the IMDG Code, and the ICAO Technical Instructions.

Harmonization becomes increasingly important as the volume of hazardous materials transported in international commerce grows. Harmonization not only facilitates international trade by minimizing the costs and other burdens of complying with multiple or inconsistent safety requirements for transportation of hazardous materials, but it also enhances safety when the international standards provide an appropriate level of protection. PHMSA actively participates in the development of international standards for the transportation of hazardous materials and promotes the adoption of standards consistent with the HMR. When considering alignment of the HMR with international standards, PHMSA reviews and evaluates each amendment on its own merit, its overall impact on transportation safety, and the economic implications associated with its adoption. Our goal is to harmonize with international standards without diminishing the level of safety currently provided by the HMR or imposing undue burdens on the regulated community.

¹ HM-215A [59 FR 67390]; HM-215B [62 FR 24690]; HM-215C [64 FR 10742]; HM-215D [66 FR 33316]; HM-215E [68 FR 44992]; HM-215G [69 FR 76044]; HM-215I [71 FR 78595]; HM-215J [74 FR 2200]; HM-215K [76 FR 3308]; HM-215L [78 FR 987]; HM-215M [80 FR 1075]; and HM-215N [82 FR 15796]

Based on recent review and evaluation, PHMSA proposes to revise the HMR to incorporate changes from the 20th Revised Edition of the UN Model Regulations, Amendment 39-18 to the IMDG Code,² and the 2019–2020 Edition of the ICAO Technical Instructions, all of which become effective January 1, 2019.

In addition, PHMSA proposes to incorporate by reference the newest editions of various international standards. The standards incorporated by reference are authorized for use, under specific circumstances, in part 171 subpart C of the HMR. This proposed rule is necessary to incorporate revisions to the international standards and, if adopted in the HMR, will be effective January 1, 2019.

PHMSA published a final rule under Docket HM–215N [82 FR 15796 (March 30, 2017)] that, among other things, added four new Division 4.1 entries for polymerizing substances to the HMT, and added into the HMR defining criteria, authorized packagings, and safety requirements including, but not limited to, stabilization methods and operational controls. In this prior rulemaking, PHMSA indicated that these changes would be in effect until January 2, 2019. During the interim time period between publication of the final rule and January 2, 2019, PHMSA indicated it would review and research the implications of the polymerizing substance amendments, and readdress the issue in the next international harmonization rulemaking.

On January 19, 2017, a Broad Agency Announcement (BAA)³ was issued

² Amendment 39-18 to the IMDG Code may be voluntarily applied on January 1, 2019; however, the previous amendment remains effective through December 31, 2019.

³ Broad Agency Announcement (BAA) for innovative research and development projects, January 19,

soliciting white papers from those interested in undertaking research into the appropriate temperature controls for polymerizing substances across all package sizes and the impact of gas generation from a polymerizing reaction. Submissions were received and reviewed by a team of experts to verify, in accordance with the terms of the BAA, the technical appropriateness of the proposed work, and the past performance of the submitter. Recommendations were submitted to the PHMSA Research and Development staff on February 14th, 2018. The Research and Development staff is undertaking the necessary next steps to initiate the research. By way of this rulemaking, PHMSA also solicits comments and data from shippers and classifiers of polymerizing substances concerning their experiences operating under the transport provisions applied to polymerizing substances in the HM-215N final rule. Specifically, PHMSA seeks information regarding:

- Whether affected entities have experienced difficulties resulting from differing domestic and international requirements for polymerizing substances (e.g., differing temperature thresholds before temperature control is required in portable tanks and requirements for successfully passing Test Series E prior to offering for transport in a portable tank or IBC);
- The experiences of the regulated community in utilizing Test Series E with polymerizing substances; and
- Whether there are alternative tests that can indicate appropriate responses

when potentially polymerizing substances are heated under confinement.

As this research project is presently in the pre-award phase prescribed in the BAA and will not be completed prior to the expected publication date of a final rule for this NPRM, PHMSA is proposing to extend the sunset dates for provisions concerning the transportation of polymerizing substances from January 2, 2019 to January 2, 2021. This additional time should allow PHMSA to complete its ongoing research project and analyze all comments and data concerning the issue submitted to the docket for this NPRM. This information will increase our comprehension of polymerizing substances and further consider the most appropriate transport provisions for these materials. This new sunset date is proposed in amendments to §§ 172.101, 172.102, 173.21, and 173.124.

III. Incorporation by Reference Discussion Under 1 CFR Part 51

The UN Model Regulations, Manual of Tests and Criteria, and Globally Harmonized System of Classification and Labelling of Chemicals, as well as all of the Transport Canada Clear Language Amendments, are free and easily accessible to the public on the internet, with access provided through the parent organization websites. The ICAO Technical Instructions, IMDG Code, and all ISO references are available for interested parties to purchase in either print or electronic versions through the parent organization websites. The price charged for those not freely available helps to cover the cost of developing, maintaining, hosting, and accessing these standards. The specific standards are discussed in greater detail in the following analysis.

IV. Harmonization Proposals in this NPRM

In addition to various other revisions to the HMR, PHMSA proposes the following amendments to harmonize the HMR with the most recent revisions to the UN Model Regulations, ICAO Technical Instructions, and IMDG Code, as well as several amendments to further align with the Transport Canada TDG Regulations:

- *Incorporation by Reference*: PHMSA proposes to incorporate by reference the newest versions of various international hazardous materials standards, including the 2019–2020 Edition of the ICAO Technical Instructions; Amendment 39-18 to the IMDG Code; the 20th Revised Edition of the UN Model Regulations; amendment 1 to the 6th Revised Edition of the UN Manual of Tests and Criteria; and the 7th Revised Edition of the GHS. Additionally, we propose to update our incorporation by reference of the Transport Canada TDG Regulations to include SOR/2016-95 published June 1, 2016; SOR/2017-137 published July 12, 2017; and SOR/2017-253 published December 13, 2017. Finally, in this NPRM, PHMSA proposes the adoption of updated ISO standards.
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- *Alternative criteria for classification of corrosive materials:* PHMSA proposes to include non-testing alternatives for classifying corrosive mixtures that instead uses existing data on the chemical properties. Currently the HMR require offerors to classify Class 8 corrosive material and assign a packing group based on test data. The HMR authorize a skin corrosion test and various *in vitro* test methods that do not involve animal testing. However, data obtained from testing is currently the only data acceptable for classification and assigning a packing group. These alternatives would afford offerors the

ability to make a classification and packing group assignment without the need to conduct physical tests.

V. Amendments Not Being Considered for Adoption in this NPRM

PHMSA's goal in this rulemaking is to harmonize the HMR with international requirements. We are not striving to make the HMR identical to the international regulations, but rather to remove or avoid potential barriers to international transportation.

PHMSA proposes changes to the HMR based on amendments adopted in the 20th Revised Edition of the UN Model Regulations, the 2019–2020 Edition of the ICAO Technical Instructions, and Amendment 39-18 to the IMDG Code. It is not, however, proposing to adopt all of the amendments made to the various international standards into the HMR.

In many cases, amendments to the international recommendations and regulations are not adopted into the HMR because the framework or structure of the HMR makes adoption unnecessary. In other cases, we have addressed, or will address, the amendments in separate rulemaking proceedings.

The following is a list of significant amendments to the international standards that PHMSA is not currently proposing:

- *Fuel gas containment systems*: The 20th Revised Edition to the UN Model Regulations added a special provision to allow for the transportation of fuel gas containment systems containing certain gases transported for disposal,

recycling, repair, inspection, maintenance, or from where they are manufactured to a vehicle assembly plant. PHMSA does not believe the vehicle specification pressure vessels that are incorporated and authorized by the UN Model Regulations apply to domestic transportation as most fuel gas containment standards addressed are more appropriate for European road and rail regulations. PHMSA invites comment on this amendment in the UN Model Regulations and whether it would benefit industry to include a similar amendment in the HMR.

- *Severely damaged and defective lithium batteries:* The 20th Revised Edition of the UN Model Regulations adopted transportation provisions for damaged and defective cells and batteries of UN Nos. 3090, 3091, 3480 and 3481 liable to rapidly disassemble, dangerously react, or produce a flame, a dangerous evolution of heat, or a dangerous emission of toxic, corrosive, or flammable gases or vapors under normal conditions of transport. In this NPRM, PHMSA is not proposing to adopt changes to the domestic requirements for the treatment of these lithium batteries, as it believes existing packaging and hazard communication requirements in § 173.185(f) sufficiently address consignments of this nature.
- *Road gas elements vehicles:* Amendment 39-18 of the IMDG Code adopted provisions for road gas elements vehicles. These vehicles contain elements (e.g. cylinders, tubes, bundles of cylinders, pressure drums, or tanks) intended for the carriage of gases with a capacity of more than 450 L permanently fitted

to a vehicle and fitted with necessary service equipment. PHMSA believes the HMR provisions authorizing the transportation of Multi-Element Gas Containers (MEGCs) and tube trailers adequately address the transportation of gases in a similar manner.

- *Competency-based training:* PHMSA is seeking public comments on a Competency Based Training approach in this NPRM. The 2017-2018 ICAO Technical Instructions included proposed revisions to their training provisions in Attachment 4,⁴ noting that these provisions would replace the current Part 1; Chapter 4 in the 2019-2020 edition. The provisions presented at the ICAO DGP, and included in the 2017-2018 ICAO Technical Instructions, on utilizing a competency based training approach for dangerous goods have yet to be finalized and adopted. We welcome discussions on improving the quality of employee training and assessment within the scope of the existing training regime. The training provisions as they are currently stated in the HMR are not prescriptive and permit a wide latitude in implementation. Thus, employers can tailor employee training program in a manner that best addresses the job functions performed. Through this flexibility employers can utilize various training methods, including the Competency Based Training approach. To aid the public in developing comments, three documents from ICAO DGP and UNSCOE containing information pertaining to Competency Based Training have been provided in the public docket for this rulemaking.

Any comments received may be utilized to better inform PHMSA's work in various international forums. Below are some thought starters for consideration for your comments:

- If you currently follow a Competency Based Training approach to meet the requirements in Part 172, Subpart H:
 - Do you have suggestions or lessons learned that you would like to share?
 - What information or tools did/do you consider most helpful in implementing a Competency Based Training approach?
 - Have you reviewed the ICAO guidance provided in the Docket? If so, did you find the guidance helpful?
- If you do not follow a Competency Based Training approach to meet the requirements in Part 172, Subpart H:
 - Have you reviewed the ICAO guidance provided in the Docket? If so, did you find the guidance helpful?
 - Are you aware of any barriers to implementing a Competency Based Training approach?

VI. Section-By-Section Review

The following is a section-by-section review of the amendments proposed in this NPRM:

Part 171

Section 171.7

Section 171.7 provides a listing of all voluntary consensus standards incorporated by reference into the HMR, as directed by the “National Technology Transfer and Advancement Act of 1996.” According to the Office of Management and Budget (OMB), Circular A-119, “Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities,” government agencies must use voluntary consensus standards wherever practical in the development of regulations. Agency adoption of industry standards promotes productivity and efficiency in government and industry, expands opportunities for international trade, conserves resources, improves health and safety, and protects the environment.

PHMSA actively participates in the development and updating of consensus standards through representation on more than 20 consensus standard bodies and regularly reviews updated consensus standards to consider their merit for inclusion in the HMR. For this rulemaking, PHMSA evaluated updated international consensus standards pertaining to proper shipping names, hazard classes, packing groups, special provisions, packaging authorizations, air transport quantity limitations, and vessel stowage requirements. It determined that the revised standards provide an enhanced level of safety without imposing significant compliance burdens. These standards have well-established and documented safety histories, and their adoption will maintain the high safety standard currently achieved under the HMR. Therefore, in this NPRM, PHMSA proposes to add and revise the following incorporation by reference materials:

- Paragraph (s)(2) would be added, to incorporate the International Atomic Energy Agency Code of Conduct on the Safety and Security of Radioactive Sources. Section 172.800 references the incorporation by reference of this document; however, this entry does not currently appear in § 171.7. The proposed addition of this paragraph would correct this oversight. The incorporation of this document in § 172.800 provides a list of Category 1 and 2 radioactive sources for which offerors or carriers require a security plan.
- Paragraph (t)(1), which incorporates the *International Civil Aviation Organization* Technical Instructions for the Safe Transport of Dangerous Goods by Air (ICAO Technical Instructions), 2015-2016 Edition, would be revised to incorporate the 2019-2020 Edition. These instructions contain the detailed instructions for the international transport of hazardous materials by air.
- Paragraph (v)(2), which incorporates the *International Maritime Organization* International Maritime Dangerous Goods Code (IMDG Code), Incorporating Amendment 38-16 (English Edition), would be revised to incorporate the 39-18 (English Edition), 2018 Edition. This code contains the detailed instructions for the international transport of hazardous materials by vessel.
- Paragraph (w), which incorporates various *International Organization for Standardization* entries, would be revised to incorporate by reference standards for the specification, design, construction, testing, and use of gas cylinders:

- ISO 11118(E), Gas cylinders—Non-refillable metallic gas cylinders—Specification and test methods would be replaced by ISO 11118:2015(E), Gas cylinders—Non-refillable metallic gas cylinders—Specification and test methods in paragraph (w)(53). The purpose of this standard is to provide a specification for the design, manufacture, inspection, and testing of non-refillable metallic gas cylinders for worldwide safe use, handling, and transport.
- ISO 11120(E), Gas cylinders—Refillable seamless steel tubes of water capacity between 150 L and 3000 L—Design, construction and testing, First edition, March 1999 would be replaced by ISO 11120:2015(E), Gas cylinders—Refillable seamless steel tubes of water capacity between 150 L and 3,000 L—Design, construction and testing in paragraph (w)(62). This standard provides a specification for the design, manufacture, inspection and testing of tubes at the time of manufacture for worldwide usage.
- ISO/TR 11364:2012(E), Gas cylinders—Compilation of national and international valve system/gas cylinder neck threads and their identification and marking system would be added in paragraph (w)(77). The purpose of this standard is to list all known cylinder/valve threads currently used and also threads used in the past and to specify a harmonized identification code and marking system for both cylinders and valves.

- ISO 11623(E), Transportable gas cylinders—Periodic inspection and testing of composite gas cylinders, First edition, March 2002 would be replaced by ISO 11623:2015(E), Transportable gas cylinders—Periodic inspection and testing of composite gas cylinders in paragraph (w)(66). This standard specifies the requirements for periodic inspection and testing and to verify the integrity for further service of hoop-wrapped and fully-wrapped composite transportable gas cylinders, with aluminum-alloy, steel or non-metallic liners or of linerless construction (Types 2, 3, 4, and 5), intended for compressed, liquefied or dissolved gases under pressure, of water capacity from .5 L up to 450 L.
- ISO 14246:2014(E), Gas cylinders—Cylinder valves—Manufacturing tests and examination would be added in paragraph (w)(69). This standard covers the function of a cylinder valve as a closure (defined by the UN Model Regulations).
- ISO 16148:2016(E), Gas cylinders—Refillable seamless steel gas cylinders and tubes—Acoustic emission examination (AT) and follow-up ultrasonic examination (UT) for periodic inspection and testing in paragraph (w)(71). This International Standard describes two methods of AT, defined as Method A and Method B, and a method of follow-up UT. These non-destructive examination techniques are an alternative to conventional testing procedures for cylinders and tubes.

- ISO 17871:2015(E) Gas cylinders — Quick-release cylinder valves — Specification and type testing in paragraph would be added to (w)(72). This standard covers the function of a quick-release cylinder valve as a closure (defined by the UN Model Regulations).
- ISO 21172-1:2015(E), Gas cylinders—Welded steel pressure drums up to 3,000 litres capacity for the transport of gases—Design and construction—Part 1: Capacities up to 1,000 litres would be added in paragraph (w)(75). is to provide a specification for the design, manufacture, inspection, and approval of welded steel gas pressure drums.
- ISO 22434:2006(E), Transportable gas cylinders—Inspection and maintenance of cylinder valves would be added in paragraph (w)(76). This International Standard specifies the requirements for the inspection and maintenance of cylinder valves, including valves with integrated pressure regulators.
- Paragraphs (aa)(1)-(4), which updates 4 existing *Organization for Economic Cooperation and Development* (OECD) guidelines concerning corrosivity testing (Nos. 404, 430, 431, & 435). The references to these standards would be updated to the 2015 versions of the standards.
- Paragraph (bb)(1), which incorporates the *Transport Canada* Transportation of Dangerous Goods Regulations, would add subparagraphs (xx), (xxi), and (xxii), to include SOR/2016-95 published June 1, 2016; SOR/2017-137

published July 12, 2017; and SOR/2017-253 published December 13, 2017, respectively. These proposed additions are to incorporate changes to the *Transport Canada* Transportation of Dangerous Goods Regulations.

- Paragraph (bb)(2) would be added to incorporate by reference Containers for Transport of Dangerous Goods by Rail, a *Transport Canada* standard that was published in 2013. The standard applies to the design, manufacture, maintenance and qualification of tank cars and ton containers and the selection and use of large containers or transport units used in the handling, offering for transport, or transporting of dangerous goods by rail.
- Paragraph (dd)(1), which incorporates the *United Nations Recommendations on the Transport of Dangerous Goods—Model Regulations*, 19th Revised Edition (2015), Volumes I and II, would be revised to incorporate the 20th Revised Edition (2017), Volumes I and II. This standard presents a basic scheme of provisions that allow uniform development of national and international regulations governing the various modes of transport.
- Paragraph (dd)(2)(ii) would be added to incorporate the *United Nations Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria*, 6th Revised Edition, Amendment 1. This standard contains criteria, test methods, and procedures to be used for the classification of hazardous materials according to the UN Model Regulations.

- Paragraph (dd)(3), which incorporates the *United Nations Recommendations on the Transport of Dangerous Goods, Globally Harmonized System of Classification and Labelling of Chemicals* Sixth revised edition (2015), would be revised to incorporate the *United Nations Recommendations on the Transport of Dangerous Goods, Globally Harmonized System of Classification and Labelling of Chemicals (GHS), 7th Revised Edition (2017)*. This standard helps identify the intrinsic hazards found in substances and mixtures and to convey hazard information about these hazards.

Section 171.8

Section 171.8 defines terms generally used throughout the HMR that have broad or multi-modal applicability. In this NPRM, PHMSA is proposing to amend the definition of “UN pressure receptacle” to include pressure drums. Additionally, PHMSA proposes to add a definition for “UN Pressure drum” to mean a welded transportable pressure receptacle of a water capacity exceeding 150 L and not more than 1,000 L (e.g. cylindrical receptacles equipped with rolling hoops, spheres on skids). These amendments provide defining terms related to pressure drums for which ISO 21172-1:2015(E) Gas cylinders — Welded steel pressure drums up to 3,000 litres capacity for the transport of gases — Design and construction —Part 1: Capacities up to 1,000 litres is proposed for incorporation in § 178.71.

Section 171.12

Section 171.12 prescribes requirements for the use of the Transport Canada TDG Regulations. In a March 30, 2017, final rule [HM-215N; 82 FR 15795],

PHMSA amended the HMR to expand recognition of cylinders and pressure receptacles, cargo tank repair facilities, and certificates of equivalency in accordance with the TDG Regulations. The goal of these amendments is to promote flexibility and permit the use of advanced technology for the requalification and use of pressure receptacles; doing so will provide for a broader selection of authorized pressure receptacles, reduce the need for special permits, and to facilitate cross-border transportation of these cylinders. In this NPRM, PHMSA proposes to clarify the recognition of certificates of equivalency issued by Transport Canada. Transport Canada issues equivalency certificates as both a competent authority approval and for an alternative means of compliance with TDG Regulations. PHMSA provides reciprocity for equivalency certificates that are issued by Transport Canada as an alternative to the TDG Regulations; PHMSA does not provide recognition to Canada's competent authority approvals. In this NPRM, PHMSA is proposing to amend paragraph (a)(1) to clarify the extent of reciprocity regarding certificates of equivalency.

Additionally, PHMSA is proposing to amend paragraph (a)(3)(v) to update the standard incorporated by reference to which Canadian rail cars must conform. The existing reference to the Canadian General Standards Board standard 43.147 is replaced with Containers for Transport of Dangerous Goods by Rail (2013).

Part 172

Section 172.101

Section 172.101 contains the HMT and provides instructions for its use. In this NPRM, PHMSA is proposing to revise the instructional text that precedes the HMT for paragraph (e) of this section.

Paragraph (e) of § 172.101 provides instructions for the use of column (4) of the HMT. Column (4) lists the identification number assigned to each proper shipping name. Most identification numbers are preceded by the letters “UN” and are associated with proper shipping names, which may be used for both domestic and international transportation. Some proper shipping names are assigned “NA” or “North American” numbers. As it currently stands, the HMR states that NA numbers are afforded recognition in both the United States and Canada. Furthermore, under § 171.12, the HMR treats transporting hazardous materials to Canada in the same way as domestic transportation. This is problematic, however, because specific dangerous goods are classified differently in the two countries. The Transport Canada Transportation of Dangerous Goods Regulations limit the use of NA numbers on transport documents to materials classified as “Consumer commodity,” and do not allow for documentation of other NA numbers. Therefore, in this NPRM, PHMSA is proposing to revise paragraph (e) to indicate that NA numbers are only recognized for use in the United States.

Hazardous Materials Table (HMT)

In this NPRM, PHMSA is proposing to amend the HMT. Readers should review all changes for a complete understanding of the amendments. For purposes of the Government Printing Office’s typesetting procedures, proposed changes to the

HMT appear under three sections of the Table, “remove,” “add,” and “revise.”

Certain entries in the HMT, such as those with revisions to the proper shipping names, appear as a “remove” and “add.” Proposed amendments to the HMT include the following:

New HMT entries:

- UN3537 Articles containing flammable gas, n.o.s.
- UN3538 Articles containing non-flammable, non-toxic gas, n.o.s.
- UN3539 Articles containing toxic gas, n.o.s.
- UN3540 Articles containing flammable liquid, n.o.s.
- UN3541 Articles containing flammable solid, n.o.s.
- UN3542 Articles containing a substance liable to spontaneous combustion, n.o.s.
- UN3543 Articles containing a substance which emits flammable gas in contact with water, n.o.s.
- UN3544 Articles containing oxidizing substance, n.o.s.
- UN3545 Articles containing organic peroxide, n.o.s.
- UN3546 Articles containing toxic substance, n.o.s.
- UN3547 Articles containing corrosive substance, n.o.s.
- UN3548 Articles containing miscellaneous dangerous goods, n.o.s.

PHMSA proposes to add a classification scheme for articles containing hazardous materials not otherwise specified by name in the HMR that contain hazardous materials of various hazard classes and divisions. This proposal addresses

transportation scenarios where various hazardous materials or hazardous materials residues are present in articles above the quantities currently authorized for dangerous goods in machinery or apparatus. This proposal authorizes safe and secure methods to transport articles that may be too large to fit into typical packagings. Absent provisions to package and transport these materials safely, such articles may be offered for transport under provisions that do not adequately account for the physical and chemical properties of the substances or mode of transport and may require the issuance of an approval by the Associate Administrator for Hazardous Materials Safety.

- UN3535 Toxic solid, flammable, inorganic, n.o.s.

Consistent with the 20th Revised Edition of the UN Model Regulations, this new generic entry addresses toxic solids with a flammable subsidiary risk in Packing Groups I and II.

- UN3536 Lithium batteries installed in cargo transport unit *lithium ion batteries or lithium metal batteries*

This new HMT entry addresses lithium metal and lithium ion batteries installed in a cargo transport unit and designed only to provide power external to the cargo transport unit. The lithium batteries must meet the requirements of § 173.185 and contain the necessary systems to prevent overcharge and over discharge between the batteries. Such units are forbidden for transport on aircraft.

Amendments to column (2) hazardous materials descriptions and proper

shipping names:

Section 172.101(c) describes column (2) of the HMT and the requirements for hazardous materials descriptions and proper shipping names. For the entry “2-Dimethylaminoethyl acrylate,” the word “stabilized” is added to the end, as the substance has been determined to polymerize in certain conditions.

Amendments to column (5) packing group:

The HMT entries for articles “UN3316, Chemical kit” and “UN3316, First aid kit” are revised to remove packing group II and III assignments. This revision would revert the entries to a single row with the packing group column left blank as they existed prior to adding the packing group II and III assignments in a final rule published on January 8, 2015 [Docket No. PHMSA-2013-0260 (HM-215M); 80 FR 1075]. This revision would address situations where materials in the kits are not assigned to a packing group or have packing group I assigned, as permitted by §173.161.

Amendments to column (7) special provisions:

Section 172.101(h) describes column (7) of the HMT, which contains special provisions for each entry in the table. Section 172.102(c) prescribes the special provisions assigned to specific entries in the HMT. The particular modifications to the entries in the HMT are discussed below. See “Section 172.102 special provisions” below for a detailed discussion of the proposed additions, revisions, and deletions to the special provisions addressed in this NPRM.

- Special provision 325. PHMSA proposes to add special provision 325 to the following HMT entries:

UN2912	Radioactive material, low specific activity (LSA-I) <i>non fissile or fissile-excepted</i>
UN2913	Radioactive material, surface contaminated objects (SCO-I or SCO-II), <i>non-fissile or fissile excepted</i>
UN2915	Radioactive material, Type A package <i>non-special form, non fissile or fissile-excepted</i>
UN2916	Radioactive material, Type B(U) package <i>non fissile or fissile-excepted</i>
UN2917	Radioactive material, Type B(M) package <i>non fissile or fissile-excepted</i>
UN2919	Radioactive material, transported under special arrangement, <i>non fissile or fissile excepted</i>
UN3321	Radioactive material, low specific activity (LSA-II) <i>non fissile or fissile-excepted</i>
UN3322	Radioactive material, low specific activity (LSA-III) <i>non fissile or fissile excepted</i>

- Special provision 347. PHMSA proposes to add special provision 347 to the following HMT entries:

UN0349	Articles, explosives, n.o.s.
UN0367	Fuzes, detonating
UN0384	Components, explosive train, n.o.s.

UN0481 Substances, explosive, n.o.s.

- Special provision 368. Special provision 368 is added to the following HMT entry:

UN2908 Radioactive material, excepted package-empty packaging

- Special provision 369. Special provision 369 is revised for clarity and is applicable to the following HMT entry:

UN3507 Uranium hexafluoride, radioactive material, excepted package, *less than 0.1 kg per package, non-fissile or fissile-excepted*

- Special provision 383. Special provision 383 is removed from the following

PG II HMT entries:

UN1133 Adhesives, *containing a flammable liquid*

UN1263 Paint related material *including paint thinning, drying, removing, or reducing compound*

UN1263 Paint *including paint, lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler and liquid lacquer base*

UN1210 Printing ink, *flammable or Printing ink related material (including printing ink thinning or reducing compound), flammable*

UN1866 Resin Solution, *flammable*

- Special provision 387. PHMSA proposes revising special provision 387 to extend the sunset dates for provisions concerning the transportation of polymerizing substances from January 2, 2019, to January 2, 2021.

- Special provision 388. PHMSA proposes to add new special provision 388 to the following HMT entries:
 - UN3090 Lithium metal batteries *including lithium alloy batteries*
 - UN3091 Lithium metal batteries contained in equipment *including lithium alloy batteries*
 - UN3480 Lithium ion batteries *including lithium ion polymer batteries*
 - UN3481 Lithium ion batteries packed with equipment *including lithium ion polymer batteries*

- Special provision 389. PHMSA proposes to add new special provision 389 to the following new HMT entry:
 - UN3536 Lithium batteries installed in cargo transport unit *lithium ion batteries or lithium metal batteries*

- Special provision 391. PHMSA proposes to add new special provision 391 to the following new HMT entries:
 - UN3537 Articles containing flammable gas, n.o.s.
 - UN3538 Articles containing non-flammable, non-toxic gas, n.o.s.

UN3539	Articles containing toxic gas, n.o.s.
UN3540	Articles containing flammable liquid, n.o.s.
UN3541	Articles containing flammable solid, n.o.s.
UN3542	Articles containing a substance liable to spontaneous combustion, n.o.s.
UN3543	Articles containing a substance which emits flammable gas in contact with water, n.o.s.
UN3544	Articles containing oxidizing substance, n.o.s.
UN3545	Articles containing organic peroxide, n.o.s.
UN3546	Articles containing toxic substance, n.o.s.
UN3547	Articles containing corrosive substance, n.o.s.
UN3548	Articles containing miscellaneous dangerous goods, n.o.s.

- Special provision 421. PHMSA proposes revising special provision 421 to extend the sunset dates for provisions concerning the transportation of polymerizing substances from January 2, 2019 to January 2, 2021.
- Special provision A56. Special provision A56 is revised for clarity.
- Special provision A105. PHMSA proposes to revise special provision A105 assigned to the following HMT entry:

UN3363 Dangerous goods in machinery *or* Dangerous goods in

apparatus

- Special provision B136. PHMSA proposes to add new special provision B136 to the following HMT entries:

UN1363 Copra

UN1386 Seed cake, *containing vegetable oil solvent extractions and expelled seeds, with not more than 10 percent of oil and when the amount of moisture is higher than 11 percent, with not more than 20 percent of oil and moisture combined*

UN1398 Aluminum silicon powder, uncoated

UN1435 Zinc ashes

UN2071 Ammonium nitrate based fertilizer

UN2216 Fish meal, stabilized *or* Fish scrap, stabilized

UN2217 Seed cake *with not more than 1.5 percent oil and not more than 11 percent moisture*

UN2793 Ferrous metal borings *or* Ferrous metal shavings *or* Ferrous metal turnings *or* Ferrous metal cuttings *in a form liable to self-heating*

- Portable tank special provisions. PHMSA proposes to revise portable tank special provision TP10 assigned to the following HMT entries:

UN1744 Bromine *or* Bromine solutions

- Special provisions W31 and W32. Special provision W32 is removed from the following PG I HMT entries (unless otherwise noted in table 1) and replaced with Special provision W31:

Table 1	
PROPER SHIPPING NAME	UN NO.
Calcium phosphide	UN1360
Aluminum phosphide	UN1397
Calcium carbide	UN1402
Calcium hydride	UN1404
Cesium <i>or</i> Caesium	UN1407
Metal hydrides, water reactive, n.o.s	UN1409
Lithium aluminum hydride	UN1410
Lithium borohydride	UN1413
Lithium hydride	UN1414
Lithium	UN1415
Magnesium, powder <i>or</i> Magnesium alloys, powder	UN1418
Magnesium aluminum phosphide	UN1419
Rubidium	UN1423
Sodium borohydride	UN1426
Sodium hydride	UN1427
Sodium	UN1428
Sodium phosphide	UN1432
Stannic phosphide	UN1433
Zinc phosphide	UN1714
Potassium borohydride	UN1870

Magnesium hydride	UN2010
Magnesium phosphide	UN2011
Potassium phosphide	UN2012
Strontium phosphide	UN2013
Potassium	UN2257
Aluminum hydride	UN2463
Lithium nitride	UN2806
Water-reactive solid, n.o.s	UN2813 (PG I)
Metallic substance, water-reactive, n.o.s	UN3208
Metallic substance, water-reactive, self-heating, n.o.s	UN3209
Alkali metal amalgam, solid	UN3401
Alkaline earth metal amalgams, solid	UN3402
Potassium, metal alloys, solid	UN3403
Potassium sodium alloys, solid	UN3404

- Special provision W40. Special provision W40 is removed from the following

HMT entries:

UN1398 Aluminum silicon powder, uncoated

UN1403 Calcium cyanamide *with more than 0.1 percent of calcium carbide*

Amendments to column (10) vessel stowage requirements:

Section 172.101(k) explains the purpose of column (10) of the HMT and prescribes the vessel stowage and segregation requirements for specific entries.

Column (10) is divided into two columns: column (10A) [Vessel stowage] specifies the authorized stowage locations on board cargo and passenger vessels, and column (10B) [Other provisions] specifies special stowage and segregation provisions. The meaning of each code in column (10B) is set forth in § 176.84.

Recent revisions to the stowage categories for Class 1 goods greatly simplified the stowage categories, but increased the difficulty in shipping explosives as break bulk cargo. Some shippers have found it difficult to meet the new stowage categories, particularly stowage category 04, which requires shipment on deck in a closed cargo transport unit or under deck in a closed cargo transport unit. Many of the items contained in these shipments are large and robust articles and are difficult to pack in a closed cargo transport unit. This has resulted in unnecessary delays and added expense.

The following table addresses this issue through modification of the stowage categories for individual UN numbers for which under deck stowage was previously permitted prior to Amendment 36-12 of the IMDG Code. Table 2 contains the proposed changes listed in numerical order by UN identification number and additionally lists the proper shipping name, the current column (10A) entry, and the proposed column (10A) entry.

Table 2			
PROPER SHIPPING NAME	UN NUMBER	CURRENT CODE COLUMN (10A)	PROPOSED CODE COLUMN (10A)

Cartridges for weapons, <i>with bursting charge</i>	0005	05	03
Cartridges for weapons, <i>with bursting charge</i>	0006	04	03
Cartridges for weapons, <i>with bursting charge</i>	0007	05	03
Bombs, <i>with bursting charge</i>	0033	05	03
Bombs, <i>with bursting charge</i>	0034	04	03
Bombs, <i>with bursting charge</i>	0035	04	03
Bombs, photo-flash	0037	05	03
Bombs, photo-flash	0038	04	03
Boosters, <i>without detonator</i>	0042	04	03
Bursters, <i>explosive</i>	0043	04	03
Charges, demolition	0048	04	03
Charges, depth	0056	04	03
Charges, shaped, <i>without detonator</i>	0059	04	03
Charges, supplementary explosive	0060	04	03
Cord, detonating, <i>flexible</i>	0065	04	03
Fracturing devices, explosive, <i>without detonators for oil wells</i>	0099	04	03
Cord, detonating <u>or</u> Fuze, <i>detonating metal clad</i>	0102	04	03
Jet perforating guns, charged <i>oil well without detonator</i>	0124	04	03
Mines <i>with bursting charge</i>	0136	05	03
Mines <i>with bursting charge</i>	0137	04	03
Mines <i>with bursting charge</i>	0138	04	03
Projectiles, <i>with bursting charge</i>	0167	05	03
Projectiles, <i>with bursting charge</i>	0168	04	03
Projectiles, <i>with bursting charge</i>	0169	04	03
Rockets, <i>with bursting charge</i>	0180	05	03
Rockets, <i>with bursting</i>	0181	04	03

<i>charge</i>			
Rockets, <i>with bursting charge</i>	0182	04	03
Rockets, <i>with inert head</i>	0183	04	03
Rocket motors	0186	04	03
Sounding devices, explosive	0204	05	03
Warheads, torpedo <i>with bursting charge</i>	0221	04	03
Charges, propelling, for cannon	0242	04	03
Charges, propelling	0271	04	03
Charges, propelling	0272	04	03
Cartridges, power device	0275	04	03
Cartridges, oil well	0277	04	03
Charges, propelling, for cannon	0279	04	03
Rocket motors	0280	04	03
Boosters, <i>without detonator</i>	0283	04	03
Grenades, <i>hand or rifle, with bursting charge</i>	0284	04	03
Grenades, <i>hand or rifle, with bursting charge</i>	0285	04	03
Warheads, rocket <i>with bursting charge</i>	0286	04	03
Warheads, rocket <i>with bursting charge</i>	0287	04	03
Cord, detonating <i>or</i> Fuze, detonating <i>metal clad</i>	0290	04	03
Bombs, <i>with bursting charge</i>	0291	05	03
Grenades, <i>hand or rifle, with bursting charge</i>	0292	05	03
Grenades, <i>hand or rifle, with bursting charge</i>	0293	05	03
Mines <i>with bursting charge</i>	0294	05	03
Rockets, <i>with bursting charge</i>	0295	05	03
Sounding devices, explosive	0296	05	03
Cartridges for weapons, <i>with bursting charge</i>	0321	04	03

Projectiles, <i>with bursting charge</i>	0324	05	03
Cartridges for weapons, blank	0326	04	03
Cartridges for weapons, blank <i>or</i> Cartridges, small arms, blank	0327	04	03
Cartridges for weapons, inert projectile	0328	04	03
Torpedoes <i>with bursting charge</i>	0329	04	03
Torpedoes <i>with bursting charge</i>	0330	05	03
Projectiles, <i>with burster or expelling charge</i>	0346	04	03
Cartridges for weapons, <i>with bursting charge</i>	0348	05	03
Warheads, rocket <i>with bursting charge</i>	0369	05	03
Warheads, rocket <i>with burster or expelling charge</i>	0371	05	03
Sounding devices, explosive	0374	04	03
Sounding devices, explosive	0375	04	03
Cartridges, power device	0381	04	03
Fuzes, detonating, <i>with protective features</i>	0408	04	03
Fuzes, detonating, <i>with protective features</i>	0409	04	03
Cartridges for weapons, blank	0413	04	03
Charges, propelling, for cannon	0414	04	03
Charges, propelling	0415	04	03
Cartridges for weapons, inert projectile <i>or</i> Cartridges, small arms	0417	04	03
Projectiles, <i>with burster or expelling charge</i>	0426	05	03
Projectiles, <i>with burster or expelling charge</i>	0427	05	03
Rockets, <i>with expelling</i>	0436	04	03

<i>charge</i>			
Rockets, <i>with expelling charge</i>	0437	04	03
Charges, shaped, <i>without detonator</i>	0439	04	03
Charges, explosive, commercial <i>without detonator</i>	0442	04	03
Charges, explosive, commercial <i>without detonator</i>	0443	04	03
Cases, combustible, empty, <i>without primer</i>	0447	04	03
Torpedoes <i>with bursting charge</i>	0451	04	03
Charges, bursting, plastics bonded	0457	04	03
Charges, bursting, plastics bonded	0458	04	03
Articles, explosive, n.o.s.	0462	04	03
Articles, explosive, n.o.s.	0463	04	03
Articles, explosive, n.o.s.	0464	04	03
Articles, explosive, n.o.s.	0465	05	03
Articles, explosive, n.o.s.	0466	04	03
Articles, explosive, n.o.s.	0467	04	03
Articles, explosive, n.o.s.	0468	04	03
Articles, explosive, n.o.s.	0469	05	03
Articles, explosive, n.o.s.	0470	04	03
Articles, explosive, n.o.s.	0472	05	03
Rockets, <u>with inert head</u>	0502	04	03

Consistent with changes to Amendment 39-18 of the IMDG Code, PHMSA proposes numerous changes to the special stowage and segregation provisions [Other provisions] indicated in column (10B) of the HMT.

Amendment 39-18 of the IMDG Code amended multiple entries to ensure

proper segregation between acids and both amines and cyanides. Amines react dangerously with acids, evolving heat, and the heat of reaction has the potential to generate corrosive vapors. Cyanides react with acids to generate toxic vapors. However, current vessel segregation requirements are inconsistent. Therefore, PHMSA proposes to apply stowage codes 52, 53, and 58—which require stowage “separated from acids,” “separated from alkaline compounds”, and “separated from cyanides,” respectively—to column 10B of the HMT, as shown in Table 3, below.

Consistent with changes adopted in Amendment 39-18 of the IMDG Code, PHMSA proposes to add existing stowage codes 12 and 25 to entries in the HMT. Vessel stowage code 12 requires keeping the cargo as cool as reasonably practicable. Vessel stowage code 25 requires protecting shipments from sources of heat. PHMSA proposes to add codes 12 and 25 to Nitrocellulose with alcohol *with not less than 25 percent alcohol by mass, and with not more than 12.6 percent nitrogen, by dry mass*, UN 2556. The addition of these two vessel stowage codes will help ensure that nitrocellulose is stowed so as to keep it as cool as practicable during transportation and to avoid possible loss of stabilization material in packages. Additionally, PHMSA proposes to add stowage code 25 to Dipropylamine, UN 2383 consistent with changes adopted in Amendment 39-18 of the IMDG Code.

PHMSA proposes to add vessel stowage codes to multiple HMT entries for uranium hexafluoride. In a previous final rule [Docket No. PHMSA–2015–0273 (HM–215N); 82 FR 15796] a subsidiary hazard of 6.1 was added to the UN 2977 and UN 2978 Uranium hexafluoride entries, and the primary hazard for UN 3507,

Uranium hexafluoride, radioactive material, excepted package was changed from 8 to 6.1. Consequential amendments to the stowage and segregation requirements codes for these materials were not addressed at the time of these changes in the IMDG Code or the HMR. In this NPRM, PHMSA is proposing to add existing vessel stowage code 74 and new vessel stowage code 151 to UN 2977 and UN 2978. Additionally, PHMSA proposes to add new vessel stowage code 152 to UN 3507. Stowage code 74 requires stowage separated from oxidizers. See section by section discussion on proposed changes to § 176.84 for a description of stowage code 151 and 152. These proposed amendments are necessary to ensure appropriate stowage and segregation provisions that account for the subsidiary and tertiary hazards of these commodities.

Finally, we propose to add new stowage provision 154 and assign it to the NA 0123, NA 0494, UN 0494, and UN 0124 jet perforating gun HMT entries. This proposed new stowage provision indicates that notwithstanding the stowage category assigned to the entries in the HMT, jet perforating guns may be stowed in accordance with the provisions of packing instruction US 1 in § 173.62. See the discussion on stowage provision 154 in the § 176.84 section by section portion of this rulemaking.

Table 3		
PROPER SHIPPING NAME	UN NO.	ADDITION(S)
Jet perforating guns, charged <i>oil well, with detonator</i>	NA0124	154
Jet perforating guns, charged <i>oil well, without detonator</i>	UN0124	154
Jet perforating guns, charged <i>oil well, with detonator</i>	NA0494	154
Jet perforating guns, charged, <i>oil well, without detonator</i>	UN0494	154
Dimethylamine, anhydrous	UN1032	52
Ethylamine	UN1036	52

Hydrogen fluoride, anhydrous	UN1052	53, 58
Methylamine, anhydrous	UN1061	52
Trimethylamine, anhydrous	UN1083	52
Amylamines	UN1106 PG II & III	52
n-Butylamine	UN1125	52
Diethylamine	UN1154	52
Diisopropylamine	UN1158	52
Ethyl chloroformate	UN1182	53, 58
Ethylchlorosilane	UN1183	53, 58
Isobutylamine	UN1214	52
Isopropylamine	UN1221	52
Methyl chloroformate	UN1238	53, 58
Methylchlorosilane	UN1242	53, 58
Methyltrichlorosilane	UN1250	53, 58
Propylamine	UN1277	52
Trichlorosilane	UN1295	53, 58
Trimethylamine, aqueous solutions <i>with not more than 50 percent trimethylamine by mass</i>	UN1297 all PG's	52
Trimethylchlorosilane	UN1298	53, 58
Vinyltrichlorosilane	UN1305	53, 58
Cacodylic acid	UN1572	53, 58
Dimethyl sulfate	UN1595	53, 58
Acetic anhydride	UN1715	53, 58
Acetyl bromide	UN1716	53, 58
Acetyl chloride	UN1717	53, 58
Butyl acid phosphate	UN1718	53, 58
Allyl chloroformate	UN1722	53, 58
Allyl iodide	UN1723	53, 58

Allyltrichlorosilane, stabilized	UN1724	53, 58
Aluminum bromide, anhydrous	UN1725	53, 58
Aluminum chloride, anhydrous	UN1726	53, 58
Ammonium hydrogendifluoride, solid	UN1727	53, 58
Amyltrichlorosilane	UN1728	53, 58
Anisoyl chloride	UN1729	53, 58
Antimony pentachloride, liquid	UN1730	53, 58
Antimony pentachloride, solutions	UN 1731 all PG's	53, 58
Antimony pentafluoride	UN1732	53, 58
Antimony trichloride, liquid <i>and</i> solid	UN1733	53, 58
Benzoyl chloride	UN1736	53, 58
Benzyl bromide	UN1737	53, 58
Benzyl chloride <i>and</i> Benzyl chloride <i>unstabilized</i>	UN1738	53, 58
Benzyl chloroformate	UN1739	53, 58
Hydrogendifluoride, solid, n.o.s	UN1740 all PG's	53, 58
Boron trifluoride acetic acid complex, liquid	UN1742	53, 58
Boron trifluoride propionic acid complex, liquid	UN1743	53, 58
Bromine solutions	UN1744 all entries	53, 58
Bromine pentafluoride	UN1745	53, 58
Bromine trifluoride	UN1746	53, 58
Butyltrichlorosilane	UN1747	53, 58
Chloroacetic acid, solution	UN1750	53, 58
Chloroacetic acid, solid	UN1751	53, 58
Chloroacetyl chloride	UN1752	53, 58
Chlorophenyltrichlorosilane	UN1753	53, 58
Chlorosulfonic acid (with or without sulfur trioxide)	UN1754	53, 58

Chromic acid solution	UN1755 all PG's	53, 58
Chromic fluoride, solid	UN1756	53, 58
Chromic fluoride, solution	UN1757 all PG's	53, 58
Chromium oxychloride	UN1758	53, 58
Cupriethylenediamine solution	UN1761 all PG's	52
Cyclohexenyltrichlorosilane	UN1762	53, 58
Cyclohexyltrichlorosilane	UN1763	53, 58
Dichloroacetic acid	UN1764	53, 58
Dichloroacetyl chloride	UN1765	53, 58
Dichlorophenyltrichlorosilane	UN1766	53, 58
Diethyldichlorosilane	UN1767	53, 58
Difluorophosphoric acid, anhydrous	UN1768	53, 58
Diphenyldichlorosilane	UN1769	53, 58
Diphenylmethyl bromide	UN1770	53, 58
Dodecyltrichlorosilane	UN1771	53, 58
Ferric chloride, anhydrous	UN1773	53, 58
Fluoroboric acid	UN1775	53, 58
Fluorophosphoric acid anhydrous	UN1776	53, 58
Fluorosulfonic acid	UN1777	53, 58
Fluorosilicic acid	UN1778	53, 58
Formic acid with more than 85% acid by mass	UN1779	53, 58
Fumaryl chloride	UN1780	53, 58
Hexadecyltrichlorosilane	UN1781	53, 58
Hexafluorophosphoric acid	UN1782	53, 58
Hexamethylenediamine solution	UN1783 all PG's	52
Hexyltrichlorosilane	UN1784	53, 58

Hydrofluoric acid and Sulfuric acid mixtures	UN1786	53, 58
Hydrobromic acid, <i>with more than 49 percent hydrobromic acid</i>	UN1788 all PG's	53, 58
Hydrochloric acid	UN1789 all PG's	53, 58
Hydrofluoric acid	UN1790 all PG's	53, 58
Hypochlorite solutions	UN1791 all PG's	53, 58
Iodine monochloride, solid	UN1792	53, 58
Isopropylacid phosphate	UN1793	53, 58
Lead sulfate <i>with more than 3 percent free acid</i>	UN1794	53, 58
Nitrating acid mixtures	UN1796 all PG's	53, 58
Nitrohydrochloric acid	UN1798	53, 58
Nonyltrichlorosilane	UN1799	53, 58
Octadecyltrichlorosilane	UN1800	53, 58
Octyltrichlorosilane	UN1801	53, 58
Perchloric acid <i>with not more than 50 percent acid by mass</i>	UN1802	53, 58
Phenolsulfonic acid, liquid	UN1803	53, 58
Phenyltrichlorosilane	UN1804	53, 58
Phosphoric acid solution	UN1805	53, 58
Phosphorus pentachloride	UN1806	53, 58
Phosphorus pentoxide	UN1807	53, 58
Phosphorus tribromide	UN1808	53, 58
Phosphorus trichloride	UN1809	53, 58
Phosphorous oxychloride	UN1810	53, 58
Potassium hydrogendifluoride solid	UN1811	53, 58
Propionyl chloride	UN1815	53, 58
Propyltrichlorosilane	UN1816	53, 58

Pyrosulfuryl chloride	UN1817	53, 58
Silicon tetrachloride	UN1818	53, 58
Nitrating acid mixtures, spent	UN1826 all PG's	53, 58
Stannic chloride, anhydrous	UN1827	53, 58
Sulfur chlorides	UN1828	53, 58
Sulfur trioxide, stabilized	UN1829	53, 58
Sulfuric acid with more than 51 percent acid	UN1830	53, 58
Sulfuric acid, fuming <i>with less than 30 percent free sulfur trioxide</i>	UN1831	53, 58
Sulfuric acid, fuming <i>with 30 percent or more free sulfur trioxide</i>	UN1831	53, 58
Sulfuric acid, spent	UN1832	53, 58
Sulfurous acid	UN1833	53, 58
Sulfuryl chloride	UN1834	53, 58
Thionyl chloride	UN1836	53, 58
Thiophosphorylchloride	UN1837	53, 58
Titanium tetrachloride	UN1838	53, 58
Trichloroacetic acid	UN1839	53, 58
Zinc chloride, solution	UN1840	53, 58
Propionic acid <i>with not less than 10% and less than 90% acid by mass</i>	UN1848	53, 58
Perchloric acid <i>with more than 50 percent but not more than 72 percent acid, by mass</i>	UN1873	53, 58
Acetyl iodide	UN1898	53, 58
Diisooctyl acid phosphate	UN1902	53, 58
Selenic acid	UN1905	53, 58
Sludge, acid	UN1906	53, 58
Bromoacetic acid solution	UN1938 all PG's	53, 58
Phosphorus oxybromide	UN1939	53, 58

Thioglycolic acid	UN1940	53, 58
Nitric acid <i>other than red fuming</i>	UN2031 all entries	53, 58
Nitric acid, red fuming	UN2032	53, 58
2-Dimethylaminoethanol	UN2051	52
Phthalic anhydride <i>with more than .05 percent maleic anhydride</i>	UN2214	53, 58
Maleic anhydride	UN2215 all entries	53, 58
Acrylic acid, stabilized	UN2218	53, 58
Benzotrichloride	UN2226	53, 58
Chromosulfuric acid	UN2240	53, 58
Di-n-butylamine	UN2248	52
1,2-Propylenediamine	UN2258	52
Tripopylamine	UN2260	52
Dimethylcarbamoyl chloride	UN2262	53, 58
N,N-Dimethylcyclohexylamine	UN2264	52
Dimethyl-N-propylamine	UN2266	52
Dimethyl thiophosphoryl chloride	UN2267	53, 58
3,3'-Iminodipropylamine	UN2269	52
2-Ethylhexylamine	UN2276	52
Hexamethylenediamine, solid	UN2280 all PG's	52
Isophoronediamine	UN2289	52
Nitrobenzenesulfonic acid	UN2305	53, 58
Nitrosylsulfuric acid, liquid	UN2308	53, 58
Trimethylcyclohexylamine	UN2326	52
Trimethylhexamethylenediamines	UN2327	52
Zinc chloride, anhydrous	UN2331	53, 58
Allylamine	UN2334	52

Butyryl chloride	UN2353	53, 58
Cyclohexylamine	UN2357	52
Diallylamine	UN2359	52
Diisobutylamine	UN2361	52
Dipropylamine	UN2383	25, 52
Isobutyrylchloride	UN2395	53, 58
Isopropylchloroformate	UN2407	53, 58
Dibenzylchlorosilane	UN2434	53, 58
Ethylphenyldichlorosilane	UN2435	53, 58
Methylphenyldichlorosilane	UN2437	53, 58
Trimethylacetyl chloride	UN2438	53, 58
Sodium hydrogendifluoride	UN2439	53, 58
Stannic chloride pentahydrate	UN2440	53, 58
Trichloroacetyl chloride	UN2442	53, 58
Vanadium oxytrichloride	UN2443	53, 58
Vanadium tetrachloride	UN2444	53, 58
Vanadium trichloride	UN2475	53, 58
Iodine pentafluoride	UN2495	53, 58
Propionic anhydride	UN2496	53, 58
Valeryl chloride	UN2502	53, 58
Zirconium tetrachloride	UN2503	53, 58
Ammonium hydrogen sulfate	UN2506	53, 58
Chloroplatinic acid, solid	UN2507	53, 58
Molybdenum pentachloride	UN2508	53, 58
Potassium hydrogen sulfate	UN2509	53, 58
2-Chloropropionic acid	UN2511	53, 58
Bromoacetyl bromide	UN2513	58
Furfurylamine	UN2526	52

Methacrylic acid, stabilized	UN2531	53, 58
Nitrocellulose with alcohol <i>with not less than 25 percent alcohol by mass, and with not more than 12.6 percent nitrogen, by dry mass</i>	UN2556	12, 25
Trichloroacetic acid, solution	UN2564 all PG's	53, 58
Dicyclohexylamine	UN2565	52
Alkylsulfuric acids	UN2571	53, 58
Phosphorus oxybromide, molten	UN2576	53, 58
Phenylacetyl chloride	UN2577	53, 58
Phosphorus trioxide	UN2578	53, 58
Aluminum bromide, solution	UN2580	53, 58
Aluminum chloride, solution	UN2581	53, 58
Ferric chloride, solution	UN2582	53, 58
Alkyl sulfonic acids, solid <i>or</i> Aryl sulfonic acids, solid, <i>with more than 5 percent free sulfuric acid</i>	UN2583	53, 58
Alkyl sulfonic acids, liquid <i>or</i> Aryl sulfonic acids, liquid <i>with more than 5 percent free sulfuric acid</i>	UN2584	53, 58
Alkyl sulfonic acids, solid <i>or</i> Aryl sulfonic acids, solid <i>with not more than 5 percent free sulfuric acid</i>	UN2585	53, 58
Alkyl sulfonic acids, liquid <i>or</i> Aryl sulfonic acids, liquid <i>with not more than 5 percent free sulfuric acid</i>	UN2586	53, 58
Boron trifluoride diethyl etherate	UN2604	53, 58
Triallylamine	UN2610	52
Benzyl dimethylamine	UN2619	52
Chloric acid aqueous solution, <i>with not more than 10 percent chloric acid</i>	UN2626	53
Fluoroacetic acid	UN2642	53, 58
Cyanuric chloride	UN2670	53, 58
3-Diethylamino-propylamine	UN2684	52
N,N-Diethylethylenediamine	UN2685	52

2-Diethylaminoethanol	UN2686	52
Phosphorus pentabromide	UN2691	58
Boron tribromide	UN2692	53, 58
Tetrahydrophthalic anhydrides <i>with more than 0.05 percent of maleic anhydride</i>	UN2698	53, 58
Trifluoroacetic acid	UN2699	53, 58
Butyric anhydride	UN2739	53, 58
n-Propyl chloroformate	UN2740	53, 58
Chloroformates, toxic, corrosive, flammable, n.o.s.	UN2742	53, 58
n-Butyl chloroformate	UN2743	53, 58
Cyclobutyl chloroformate	UN2744	53, 58
Chloromethyl chloroformate	UN2745	53, 58
Phenyl chloroformate	UN2746	53, 58
2-Ethylhexyl chloroformate	UN2748	53, 58
Diethylthiophosphoryl chloride	UN2751	53, 58
Acetic acid, glacial <i>or</i> Acetic acid solution, <i>with more than 80 percent acid, by mass</i>	UN2789	53, 58
Acetic acid solution	UN2790 all entries	53, 58
Batteries, wet, filled with acid, <i>electric storage</i>	UN2794	53, 58
Sulfuric acid with not more than 51% acid	UN2796	53, 58
Phenyl phosphorus dichloride	UN2798	53, 58
Phenyl phosphorus thiodichloride	UN2799	53, 58
Copper chloride	UN2802	53, 58
N-Aminoethylpiperazine	UN2815	52
Ammonium hydrogendifluoride, solution	UN2817 all PG's	53, 58
Amyl acid phosphate	UN2819	53, 58
Butyric acid	UN2820	53, 58
Crotonic acid, solid	UN2823	53, 58

Ethyl chlorothioformate	UN2826	53, 58
Caproic acid	UN2829	53, 58
Phosphorous acid	UN2834	53, 58
Di-n-amylamine	UN2841	52
Boron trifluoride dihydrate	UN2851	53, 58
Hydroxylamine sulfate	UN2865	52, 53, 58
Titanium trichloride mixtures	UN2869 all PG's	53, 58
Selenium oxychloride	UN2879	53, 58
N-Methylbutylamine	UN2945	52
Sulfamic acid	UN2967	53, 58
Radioactive material, uranium hexafluoride <i>non-fissile or fissile-excepted</i>	UN2978	74, 151
Radioactive material, uranium hexafluoride, fissile	UN2977	74, 151
Chlorosilanes, flammable, corrosive, n.o.s	UN2985	53, 58
Chlorosilanes, corrosive, flammable, n.o.s	UN2986	53, 58
Chlorosilanes, corrosive, n.o.s	UN2987	53, 58
Chlorosilanes, water-reactive, flammable, corrosive, n.o.s	UN2988	53, 58
2-(2-Aminoethoxy) ethanol	UN3055	52
Methanesulfonylchloride	UN3246	53, 58
Chloroacetic acid, molten	UN3250	53, 58
Corrosive solid, acidic, inorganic, n.o.s.	UN3260 all PG's	53, 58
Corrosive solid, acidic, organic, n.o.s.	UN3261 all PG's	53, 58
Corrosive liquid, acidic, inorganic, n.o.s	UN3264 all PG's	53, 58
Corrosive liquid, acidic, organic, n.o.s	UN3265 all PG's	53, 58
Chloroformates, toxic, corrosive, n.o.s.	UN3277	53, 58
Chlorosilanes, toxic, corrosive, n.o.s	UN3361	53, 58

Chlorosilanes, toxic, corrosive, flammable, n.o.s	UN3362	53, 58
Formic acid	UN3412 all PG's	53, 58
Boron trifluoride acetic acid complex, solid	UN3419	53, 58
Boron trifluoride propionic acid complex, solid	UN3420	53, 58
Potassium hydrogendifluoride solution	UN3421 all PG's	53, 58
Bromoacetic acid, solid	UN3425	53, 58
Phosphoric acid, solid	UN3453	53, 58
Nitrosylsulphuric acid, solid	UN3456	53, 58
Propionic acid <i>with not less than 90% acid by mas</i>	UN3463	53, 58
Crotonic acid, liquid	UN3472	53, 58
Iodine monochloride, liquid	UN3498	53, 58
Uranium hexafluoride, radioactive material, excepted package, <i>less than 0.1 kg per package, non-fissile or fissile-excepted</i>	UN3507	152

Appendix B to § 172.101:

Appendix B to § 172.101 lists marine pollutants regulated under the HMR.

Based on test data submitted to PHMSA, the USCG, and the IMO, Amendment 39-18 of the IMDG Code was updated to indicate that 1-dodecene is not a marine pollutant.

In this NPRM, PHMSA is proposing to amend the entry for “Dodecene” in the list of marine pollutants in appendix B to § 172.101 to indicate that 1-dodecene is not a marine pollutant, and as a result, shipments of 1-dodecene are not subject to the provisions of the HMR applicable to marine pollutants.

Section 172.102 special provisions:

Section 172.102 lists special provisions applicable to the transportation of specific hazardous materials. Special provisions contain packaging requirements, prohibitions, and exceptions applicable to particular quantities or forms of hazardous materials. In this NPRM, PHMSA proposes the following revisions to § 172.102 special provisions:

- Special provision 132. This special provision prescribes conditions for use of description “UN 2071, Ammonium nitrate based fertilizer, Class 9.” As the composition limits and requirement on self-sustaining decomposition were replaced by a flow chart in sub-section 39.5 of the new Manual of Tests and Criteria, part III, section 39, the corresponding UN Model Regulations special provision 193 was revised by removing the specific conditions and making a reference to the applicable section of the UN Manual of Tests and Criteria. Consistent with these changes to the UN Model Regulations, in this NPRM, PHMSA is proposing to revise special provision 132 by removing the specific conditions applicable to use of this description and clarifying that UN 2071 may only be used for ammonium nitrate-based compound fertilizers and that they must be classified in accordance with the procedure as set out in the Manual of Tests and Criteria, part III, section 39.
- Special provision 150. This special provision prescribes conditions for use of description “UN 2067, Ammonium nitrate based fertilizer, Division 5.1.” As

the composition limits were replaced by a flow chart in sub-section 39.5 of the new Manual of Tests and Criteria, part III, section 39, the corresponding UN Model Regulations special provision 307 was revised by removing the specific conditions and making a reference to the applicable section of the UN Manual of Tests and Criteria. Consistent with these changes to the UN Model Regulations, in this NPRM, PHMSA is proposing to revise special provision 150 by removing the specific conditions applicable to use of this description by clarifying that UN 2067 may only be used for ammonium nitrate-based fertilizers and that they must be classified in accordance with the procedure as set out in the Manual of Tests and Criteria, part III, section 39.

- Special provision 238. Special provision 238 prescribes requirements for neutron radiation detectors containing boron trifluoride. In a final rule published under Docket Number PHMSA 2015–0273 (HM–215N)[82 FR 15795], special provision 238 was revised to align with special provision 373 of the UN Model Regulations. In reformatting the special provision for alignment, several of the preexisting references to paragraphs within the special provision were not revised accordingly. Specifically, in this NPRM, PHMSA is proposing to remove the first instance of the text “a.” in the introductory text as it is not necessary and inadvertently results in two paragraphs with the same letter header. In paragraph e, the references to preceding paragraphs within the special provision are revised from a(1), a(2), and a(3) to a, b, and c, respectively.

- Special provision 325. Consistent with a pre-existing Special provision 325 in the UN Model Regulations, PHMSA proposes to add new special provision 325 to assist shippers of this material by clarifying that in the case of non-fissile or fissile-excepted uranium hexafluoride, the material must be classified as “UN2978 Radioactive material, uranium hexafluoride *non fissile or fissile-excepted*.”. In this NPRM, PHMSA proposes to assign Special provision 325 to the following entries to aid shippers:

UN2912	Radioactive material, low specific activity (LSA-I) <i>non fissile or fissile-excepted</i>
UN2913	Radioactive material, surface contaminated objects (SCO-I or SCO-II), <i>non-fissile or fissile excepted</i>
UN2915	Radioactive material, Type A package <i>non-special form, non fissile or fissile-excepted</i>
UN2916	Radioactive material, Type B(U) package <i>non fissile or fissile-excepted</i>
UN2917	Radioactive material, Type B(M) package <i>non fissile or fissile-excepted</i>
UN2919	Radioactive material, transported under special arrangement, <i>non fissile or fissile excepted</i>
UN3321	Radioactive material, low specific activity (LSA-II) <i>non fissile or fissile-excepted</i>

UN3322 Radioactive material, low specific activity (LSA-III) *non fissile or fissile excepted*

- Special provision 347. Special provision 347 restricts the use of certain HMT entries classed as Division 1.4S explosive materials to those articles successfully passing Test series 6(d) of Part I of the UN Manual of Tests and Criteria. A Division 1.4 explosive is defined as an explosive that presents a minor explosion hazard such that hazardous effects are confined to a package and no projection of fragments of appreciable size or range are expected; and that an external fire must not cause virtually instantaneous explosion of almost the entire contents of a package containing a Division 1.4 explosive. Explosive articles or substances are assigned to Division 1.4, Compatibility Group S (1.4S) if hazardous effects are confined within a package or the blast and projection effects do not significantly hinder emergency response efforts.

Special provision 347 is presently assigned to eight (8) Division 1.4S entries in the HMT including shaped charges, detonators, power device cartridges, detonator assemblies, and plastic bonded bursting charges. Following a review of other Division 1.4S entries, the UN Working Group on Explosives supported applying Special provision 347 to entries for articles and substances whose classification as 1.4S that are generic “not otherwise specified” (n.o.s.) and to UN 0367 (Fuzes, detonating) that are normally package dependent, noting that generic entries normally warrant more

systematic testing. Therefore, in this NPRM, consistent with the UN Model Regulations, PHMSA proposes to add special provision 347 to the following entries:

- UN0349 Articles, explosives, n.o.s.
- UN0367 Fuzes, detonating
- UN0384 Components, explosive train, n.o.s.
- UN0481 Substances, explosive, n.o.s.

PHMSA requests comments on whether this proposed provision—to add special provision 347 to the four entries—is likely to have net benefits.

- Special provision 368. Special provision 368 prescribes requirements for non-fissile or fissile-excepted uranium hexafluoride that must be described as UN3507 or UN2978, as appropriate. Based on an informal working paper submitted at the 50th session of the UN SCOE on the Transport of Dangerous Goods that highlighted potential errors in the 19th revised edition of the Model Regulations, it was agreed that Special provision 368 should have been assigned to “UN 2908, Radioactive material, excepted package – empty packaging” because empty uncleaned packagings containing residues of non-fissile or fissile-excepted uranium hexafluoride should be classified under UN3507 or UN2978 as appropriate. Therefore, in this NPRM, PHMSA proposes to assign special provision 368 to the following entry to aid shippers:
 - UN2908 Radioactive material, excepted package – empty packaging.

- Special provision 369. Special provision 369 prescribes requirements for UN3507, Uranium hexafluoride, radioactive material, excepted package, *less than 0.1 kg per package, non-fissile or fissile-excepted.* In this NPRM, PHMSA proposes to revise the first sentence of the special provision for editorial clarity by replacing the words “a radioactive material and corrosive subsidiary risk” with “radioactivity and corrosive subsidiary risks.”
- Special provision 383. PHMSA proposes to remove special provision 383 which allows certain high viscosity flammable liquids, when offered for transportation by motor vehicle, to be reassigned to Packing Group III when packaged in UN metal drums with a capacity not exceeding 220 L (58 gallons). Proposed amendments to § 173.121 in this NPRM, if adopted, would provide a larger capacity package, additional packaging options, and more modes of transport (all modes except air). PHMSA believes these amendments to § 173.121 provide more regulatory relief than the existing provisions of special provision 383, and thus are proposing the deletion of special provision 383 and the removal of the special provision from the HMT for those entries to which it is assigned.
- Special provision 388. Consistent with the UN Model Regulations, PHMSA proposes to add new special provision 388, which prescribes requirements for lithium batteries containing both primary lithium metal cells and rechargeable

lithium ion cells that are not designed to be externally charged and for which the existing provisions for lithium batteries do not adequately address. Such batteries must meet the following conditions: (1) The rechargeable lithium ion cells can only be charged from the primary lithium metal cells; (2) Overcharge of the rechargeable lithium ion cells is precluded by design; (3) The battery has been tested as a primary lithium battery; and (4) Component cells of the battery must be of a type proved to meet the respective testing requirements of the UN Manual of Tests and Criteria, part III, subsection 38.3. Lithium batteries conforming to special provision 388 must be assigned to UN Nos. 3090 or 3091, as appropriate. When such batteries are transported in accordance with § 173.185(c), the total lithium content of all lithium metal cells contained in the battery must not exceed 1.5 g and the total capacity of all lithium ion cells contained in the battery must not exceed 10 Wh.

- Special provision 389. In conjunction with the new HMT entry “UN3536, Lithium batteries installed in cargo transport unit *lithium ion batteries or lithium metal batteries,*” PHMSA proposes to add new special provision 389, which prescribes requirements for lithium ion batteries or lithium metal batteries installed in a cargo transport unit and designed only to provide power external to the cargo transport unit. As explained in working paper submitted at the 48th session of the UN SCOE on the Transport of Dangerous Goods:

“these units generally consist of banks of lithium ion or lithium metal batteries, electrically connected and with the necessary battery management systems, which are secured to racks, cabinets, or similar structures which, in turn, are securely attached to the interior structure of closed cargo transport units (typically either freight containers or freight vehicles). Thus, in effect, the closed cargo transport unit is the casing for a very large lithium battery. These battery systems are used in a variety of electric grid and similar applications, such as storage of energy generated by farms of large wind turbines, and also as a source for emergency power”

This proposed special provision which captures many of the safety elements included in previous approvals issued by PHMSA would specify that the lithium batteries must meet the requirements of § 173.185(a) and contain the necessary systems to prevent overcharge and over discharge between the batteries. The batteries inside the cargo transport unit are not subject to marking or labelling requirements of part 172 subparts D and E of this subchapter. The cargo transport unit shall display the UN number in a manner in accordance with § 172.332 of this subchapter and be placarded on two opposing sides.

The batteries must be securely attached to the interior structure of the cargo transport unit (e.g., by means of placement in racks, cabinets, etc.) in such a manner as to prevent short circuits, accidental operation, and significant

movement relative to the cargo transport unit under the shocks, loadings, and vibrations normally incidental to transport. Further, hazardous materials necessary for the safe and proper operation of the cargo transport unit (e.g., fire extinguishing systems and air conditioning systems), must be properly secured to or installed in the cargo transport unit and are not otherwise subject to this subchapter. Lastly, hazardous materials not necessary for the safe and proper operation of the cargo transport unit must not be transported within the cargo transport unit.

- Special provision 391. As part of the classification and packaging framework for “Articles containing dangerous goods” proposed in this rulemaking, PHMSA proposes to add new special provision 391, which prohibits articles containing certain high-hazard materials of Division 2.3, Division 4.2, Division 4.3, Division 5.1, Division 5.2, or Division 6.1 (substances with a inhalation toxicity of Packing Group I) and articles containing more than one of the following hazards from being offered for transport or transported , except under conditions approved by the Associate Administrator for Hazardous Materials Safety: (1) Gases of Class 2; (2) Liquid desensitized explosives of Class 3; or (3) Self-reactive substances and solid desensitized explosives of Division 4.1.

- Special provision 422. PHMSA proposes revising special provision 422 to remove the transition period authorizing lithium battery Class 9 labels conforming to requirements in place on December 31, 2016 to continue to be used until December 31, 2018.
- Special provision A56. Special provision A56 prescribes requirements for radioactive materials with subsidiary hazards when transported by aircraft. In this NPRM, PHMSA proposes to revise special provision A56 consistent with the revisions made to special provision A78 in the 2019-2020 ICAO Technical Instructions. Specifically, the revisions provide guidance for when the subsidiary risk of a radioactive material is explicitly forbidden for transport on either a passenger or cargo-only aircraft.
- Special provision A105. PHMSA proposes to revise special provision A105, which prescribes requirements for the air transport of machinery or apparatus containing hazardous materials as an integral element of the machinery or apparatus. Where the quantity of hazardous materials contained as an integral element in machinery or apparatus exceeds the limits permitted for air transport in § 173.222, and the hazardous materials meet the provisions of § 173.222 for other than air transport, the machinery or apparatus may be transported by aircraft only with the prior approval of the Associate Administrator for Hazardous Materials Safety.

- Special provision B136. Consistent with the 20th Revised Edition of the UN Model Regulations, PHMSA proposes to add new special provision B136 that authorizes non-specification closed bulk bins for the following solid substances:

UN1363 Copra

UN1386 Seed cake, *containing vegetable oil solvent extractions and expelled seeds, with not more than 10 percent of oil and when the amount of moisture is higher than 11 percent, with not more than 20 percent of oil and moisture combined*

UN1398 Aluminum silicon powder, uncoated

UN1435 Zinc ashes

UN2071 Ammonium nitrate based fertilizer

UN2216 Fish meal, stabilized *or* Fish scrap, stabilized

UN2217 Seed cake *with not more than 1.5 percent oil and not more than 11 percent moisture*

UN2793 Ferrous metal borings *or* Ferrous metal shavings *or* Ferrous metal turnings *or* Ferrous metal cuttings *in a form liable to self-heating*

- Portable tank special provisions

PHMSA proposes to revise Portable Tank Special Provision TP10 to authorize a three-month extension for the transportation of bromine portable tanks for the purposes of performing the next required test—after emptying, but before cleaning.

- Special provisions W31 and W32. Special provision W32 currently requires non-bulk packagings to be hermetically sealed, except for solid fused material. Amendment 39-18 of the IMDG Code removed the qualifying text from the equivalent special packaging provision. Discussions at the International Maritime Organization noted that when a substance evolves in contact with water flammable gases at the rate and quantity meeting the classification requirements for a Division 4.3 material, that there is no safety justification to permit their transportation in packagings which are not hermetically sealed. In Amendment 39-18, the text “except for solid fused material” was removed from special packing provision PP31 in packing instruction P403. PHMSA agrees, and in this NPRM we are proposing deleting special provision W32 and assigning W31, which requires non-bulk packagings to be hermetically sealed regardless of the form of the material.
- Special provision W40. Special provision W40 prohibits the use of non-bulk bags. This requirement typically applies to solid substances in Packing Group II. Consistent with changes made in Amendment 39-18 of the IMDG Code,

PHMSA is proposing that Special provision W40 be removed from the following HMT entries:

UN1396 (PG III) Aluminum powder, uncoated

UN1398 Aluminum silicon powder, uncoated

UN1403 Calcium cyanamide *with more than 0.1 percent of calcium carbide*

UN1405 (PG III) Calcium silicide

U3208 (PG III) Metallic substance, water-reactive, n.o.s.

Additionally, PPHMSA is proposing to add special provision W40 to the following HMT entries:

UN1405 (PG II) Calcium silicide

UN3208 (PG II) Metallic substance, water-reactive, n.o.s.

Section 172.203

Section 172.203 prescribes additional description requirements for shipping papers. In this NPRM, PHMSA proposes to require, in revised § 172.203(o), that the words “TEMPERATURE CONTROLLED” be added to the proper shipping name if not already indicated in the HMT, when appropriate. This proposed amendment would provide notice to those in the transport chain that a material is being offered under temperature control. Additionally, PHMSA proposes to add polymerizing substances to the list of types of materials paragraph (o) additional documentation requirements apply to.

Section 172.407

Section 172.407 prescribes specifications for hazard communication labels. Consistent with changes made in Amendment 39-18 of the IMDG Code and the 2019-2020 ICAO Technical Instructions, PHMSA is proposing to amend paragraph (c)(1) to remove the requirement that the width of the solid line forming the inner border of labels must be at least 2 mm. Additionally, we are proposing to amend the requirement that the solid line inner border, currently required to be 5 mm inside and parallel to the edge, to include the word “approximately” before 5 mm. These changes provide flexibility for minor labeling variations that do not have an appreciable impact on transportation safety. Finally, paragraph (c)(1)(iii) which contains a transitional exception allowing for labels in conformance with the requirements of 49 CFR 172.407(c)(1) (revised as of October 1, 2014) to continue to be used until December 31, 2018, is removed and reserved.

Section 172.514

Section 172.514 prescribes placarding requirements and exceptions for a bulk packaging containing a hazardous material. The general placarding requirements prescribe that bulk packagings are to be placarded on each side and each end. Due to the form and shape (e.g., round) of flexible bulk containers it is impractical to require placards on each side and each end. Consistent with the IMDG Code, in this NPRM, PHMSA is proposing to allow flexible bulk containers to be placarded in two opposing positions.

Section 172.604

Section 172.604 prescribes requirements for emergency response telephone

numbers. Paragraph (d) identifies materials for which an emergency response telephone number is not required when offered for transportation. In a March 30, 2017 final rule [HM-215N; 82 FR 15795], PHMSA harmonized the HMR with international regulations by adopting separate HMT entries for internal combustion engines based on the fuel, i.e., engine, internal combustion, flammable liquid powered and engine, internal combustion, flammable gas powered. Previously, a single HMT entry covered all engines. At that time, we did not amend § 172.604(d)(2) to ensure that “engines, internal combustion” offered under any of the new proper shipping names would continue to be excepted from the emergency response telephone requirements of § 172.604. In this NPRM, PHMSA proposes amending paragraph (d)(2) to list all possible proper shipping names for engines per the original intent.

Section 172.800

Section 172.800 prescribes the requirements for developing and implementing plans to address security risks related to the transportation of hazardous materials in commerce. During review of existing references that are incorporated by reference in the HMR it was noted that the IAEA Code of Conduct Category 1 and 2, while referenced in paragraph (b)(15) was not appropriately incorporated by reference (see § 171.7). In this NPRM, PHMSA is proposing to incorporate by reference the IAEA Code of Conduct on the Safety and Security of Radioactive Sources into paragraph (b)(15). Furthermore, we are proposing to revise a reference to known radionuclides in forms listed as RAM-QC by the Nuclear Regulatory Commission, to Nuclear Regulatory Commission, Category 1 and Category 2 radioactive materials as listed in

Table 1, Appendix A to 10 CFR Part 37. Lastly, we are listing the reference to Highway Route Controlled Quantities separately in this paragraph. This proposed amendment does not require the creation and retention of security plans by any new individuals, but simply incorporates by reference the appropriate IAEA reference and clarifies the existing requirement.

Part 173

Section 173.2a

Section 173.2a outlines classification requirements for materials having more than one hazard. PHMSA is proposing to amend paragraph (a) to indicate the appropriate classification precedence for the new “Articles” HMT entries proposed in this NPRM. This change will give guidance to offerors and shippers using the new HMT entries numbers that do not conform to a single hazard class.

Section 173.6

Section 173.6 provides authorization for certain hazardous materials meeting the definition of a material of trade (MOT) to be transported by motor vehicle in conformance with this section and be excepted from all other requirements of this subchapter if certain quantity limitations, packaging provisions, and hazard communication requirements are met. In two recent rulemakings [HM-218H; 81 FR 35483] and [HM-215N; 82 FR 15795] PHMSA removed packing group assignments from Column (5) of the HMT for all organic peroxides (Division 5.2), self-reactive substances (Division 4.1), explosives (Class 1), and articles containing hazardous materials. This removal of an indication of packing group for these materials and

articles has led to questions on the ability of these materials and articles to utilize the MOTs exceptions provided in § 173.6. Further, in this NPRM the addition of twelve new proper shipping names for articles is proposed. These proposed new proper shipping names are also not assigned a packing group. See “Section 172.101 Hazardous Materials Table (HMT)” for a detailed discussion of this proposal.

It was not the intention of these previous rulemakings or this NPRM to exclude these materials and articles from the ability to utilize the MOTs exceptions, provided the hazardous materials within the articles comply with the existing quantity limitations and other transport provisions of § 173.6. In this NPRM, PHMSA proposes to add a new paragraph (a)(7) to clarify that materials and articles for which Column (5) of the Hazardous Materials Table in § 172.101 does not indicate a packing group are authorized to utilize the MOTs exceptions as applicable, and indicate the appropriate quantity limits applicable to those materials in articles. In addition, PHMSA proposes to revise paragraph (b)(3) to clarify the securement requirement for the transportation of articles under the MOTS exceptions.

The packaging section 173.232 proposed in this NPRM for the new proper shipping names for articles requires packaging at the Packing Group II performance level. Non-specification packaging and transportation unpackaged is also authorized.

In addition, the two previous rulemakings removed packing groups from all organic peroxides (Division 5.2), self-reactive substances (Division 4.1), explosives (Class 1), and the specific articles indicated in Table 4 below. All articles and materials for which a packing group was recently removed from the HMT, the

corresponding section referenced in Column (8) of the §172.101 Table requires either packaging meeting Packing Group II or III performance level requirements or non-specification packaging is authorized. Thus, PHMSA believes clarifying that materials and articles that are not assigned a Packing Group in the HMT are eligible to utilize the MOTs exception, and indicating that the appropriate quantity limit for these materials and articles based on the PG II or PG III levels shown in § 173.6(a)(1)(ii) or as shown in § 173.6(a)(3) for articles containing Division 4.3 materials is appropriate to remove any doubt concerning MOTs applicability to these materials and articles.

Table 4

PROPER SHIPPING NAME	UN NUMBER	CLASS/DIVISION
Ammunition, tear-producing, non-explosive, without burster or expelling charge, non-fuzed	UN2017	6.1
Ammunition, toxic, non-explosive, without burster or expelling charge, non-fuzed	UN2016	6.1
Batteries, containing sodium	UN3292	4.3
Lithium ion batteries <u>including lithium ion polymer batteries</u>	UN3480	9
Lithium ion batteries contained in equipment <u>including lithium ion polymer batteries</u>	UN3481	9
Lithium ion batteries packed with equipment <u>including lithium ion polymer batteries</u>	UN3481	9
Lithium metal batteries <u>including lithium alloy batteries</u>	UN3090	9
Lithium metal batteries contained in equipment <u>including lithium alloy batteries</u>	UN3091	9
Lithium metal batteries packed with equipment <u>including lithium alloy batteries</u>	UN3091	9
Mercury contained in manufactured articles	UN3506	8
Oxygen generator, chemical (<u>including when contained in associated equipment, e.g., passenger service units (PSUs), portable breathing equipment (PBE), etc.</u>)	UN3356	5.1
Safety devices, <u>electrically initiated*</u>	UN3268	9
Tear gas candles	UN1700	6.1

Section 173.62

Section 173.62 outlines specific packaging requirements for explosives. In paragraph (c), in the Table of Packing Methods, Packing Instruction US 1 containing packing instructions for jet perforating guns, PHMSA is proposing to increase the maximum authorized amount of explosive contents per tool pallet and cargo vessel compartment from 90.8 kg to 95 kg. These limits are consistent with a provision added to Amendment 39-18 of the IMDG Code authorizing jet perforating guns to be transported to or from offshore oil platforms, mobile offshore drilling units, and other offshore installations in offshore well tool pallets, cradles, or baskets. PHMSA notes that the amendments adopted in section 7.1.4.4.5 of Amendment 39-18 of the IMDG Code require both ends of jet perforating guns to be protected by means of steel end caps. PHMSA is not proposing to adopt this additional requirement for steel end caps noting the safe transportation record of these explosive articles under the existing requirements of the HMR.

Section 173.121

Section 173.121 provides criteria for the assignment of packing groups to Class 3 materials. Paragraph (b) provides criteria for viscous flammable liquids of Class 3 (e.g., paints, enamels, lacquers, and varnishes) to be placed in packing group III on the basis of their viscosity, coupled with other criteria. Consistent with recent changes to the IMDG Code, PHMSA is proposing to amend paragraph (b)(1)(iii) to authorize a packaging capacity up to 450 L (119 gallons), an increase from the presently authorized 30 L. A working paper submitted to the IMO Sub-Committee on

Carriage of Cargoes and Containers (CCC), noted that both the UN Model Regulations and The European Agreements Concerning the International Carriage of Dangerous Goods by Road (ADR) and Rail (RID) allow receptacles up to 450 L, and that due to the nature of viscous materials (e.g. lower flow rate in the event of damage to a receptacle, and lower levels of solvent vapors) which present a lower fire risk than non-viscous flammable liquids there has been a history of safe transport of these materials by road and rail since the introduction of the provision. The working paper also explained that:

“Recognizing that global transport of dangerous goods is inherently multi-modal, the harmonization of the IMDG Code with other modes will aid trade and reduce incidents of non-compliance due to misunderstandings. At the point of packing, the manufacturer will not know which route (by road/rail/inland waterway or sea) the package will take. This leads to the possibility of accidental consignment by sea of packages between 30 and 450 litres.”

This proposed change would increase the allowed volume of viscous liquids in a single package and would be applicable to all modes except for air. Specifically, in this NPRM, PHMSA is proposing to increase the packaging limits for viscous flammable liquids of packing group II material that may be placed in packing group III. For transport by vessel, PHMSA proposes an increase from 30 L to 450 L. For transport by rail and highway, PHMSA proposes an increase from 100 L to 450 L. Consistent with the ICAO Technical Instructions, the packaging quantity limits to air will remain 30 L for passenger aircraft and 100 L for cargo aircraft.

Section 173.124

Section 173.124 contains definitions for Class 4, Divisions 4.1, 4.2, and 4.3. In this NPRM, PHMSA is proposing to amend paragraph (a)(4)(iv) to extend the sunset dates for provisions concerning the transportation of polymerizing substances from January 2, 2019, to January 2, 2021. See the background section of this rulemaking for a more detailed discussion on polymerizing substances.

Section 173.127

Section 173.127 provides a definition and criteria for the assignment of packing groups for Division 5.1 Oxidizers. A new Section 39 in the UN Manual of Tests and Criteria was introduced containing all provisions for the classification of ammonium nitrate based fertilizers. As a consequence of the new section, existing text in both the Manual and the Model Regulations was amended or removed to avoid duplicative provisions in both publications. In this NPRM, PHMSA is proposing to revise the classification criteria for solid ammonium nitrate based fertilizers by requiring that they are classified in accordance with the procedures prescribed in the UN Manual of Tests and Criteria, Part III, Section 39. These proposed changes are not intended to result in changes to the current classification provisions for ammonium nitrate fertilizers, but rather consolidate the provisions for ease of use and prevent inadvertent misclassification.

Section 173.134

Section 173.134 provides definitions and exceptions for infectious substances. Consistent with the UN Model Regulations, PHMSA is proposing to revise the

definition for “patient specimen” in paragraph (a)(4) by removing redundant references to humans and animals.

Section 173.136

Section 173.136 provides the definition for corrosive materials. In the UN Model Regulations, the definition for corrosive materials was revised to align with the current text in Chapter 3.2 of the UN GHS and the Organization for Economic Cooperation and Development (OECD) Test Guidelines for Testing of Chemicals. PHMSA is proposing to amend the definition in paragraph (a) for a corrosive material by replacing the text “full thickness destruction” with “irreversible damage.”

Section 173.137 and Appendix I to Part 173

Section 173.137 prescribes the requirements for assigning a packing group to Class 8 materials. Currently the HMR require offerors to classify Class 8 corrosive material and assign a packing group based on test data. The HMR authorize a skin corrosion test and various *in vitro* test methods that do not involve animal testing. However, data obtained from either currently authorized tests is generally the only data acceptable for classification and assignment of a packing group. In this NPRM, consistent with changes to the UN Model Regulations, PHMSA proposes to include alternative packing group assignment methods for making a corrosivity classification determination for mixtures that do not involve testing. These proposed amendments include bridging principles and a calculation method for the classification of mixtures.

In a new paragraph (d), PHMSA proposes creating an alternative, tiered approach to classification and packing group assignment depending on how much

information is available about the mixture itself, similar mixtures, and/or the mixture's ingredients. When sufficient data is available on similar mixtures to estimate skin corrosion hazards for bridging, the bridging principle method may be used to classify and assign a packing group. When no bridging data is available, the more conservative calculation method may be used. This tiered approach ensures an appropriate level of safety in situations where reliable data may not be available. These alternatives for classifying corrosive mixtures allow offerors the ability to make a classification and packing group assignment without having to conduct physical tests.

Additionally, the new corrosivity classification methods are much more closely aligned with those found in the UN GHS. However, not all GHS corrosivity classification methods were incorporated in the new UN Model Regulations corrosivity requirements. For example, the use of extreme pH values to assign corrosivity were not addressed in the UN Model Regulations, and as such are not proposed in this NPRM. Consistent with the proposed change to the definition of a corrosive material in § 173.136, PHMSA is proposing to replace all instances of the text "full thickness destruction" with "irreversible damage." PHMSA is also proposing to add a new appendix I to part 173, containing a flow chart for use with the calculation method.

Finally, PHMSA is proposing to update the four existing OECD Guidelines currently incorporated by reference in this section to their 2015 versions (Test Nos. 404, 430, 431, and 435). OECD Guideline 404 and OECD Guideline 435 contain

minor variations in the types of information to be recorded as a part of the test report in relation to the previously incorporated versions. OECD Guideline 430 and OECD Guideline 431 were updated to include a reference to a developed document on integrated approaches to testing and assessment. OECD Guideline 431.

Section 173.159

Section 173.159 prescribes requirements applicable to the transportation of electric storage batteries containing electrolyte acid or alkaline corrosive battery fluid (i.e., wet batteries). Consistent with the UN Model Regulations, PHMSA is proposing several editorial amendments in paragraphs (a) and (d) to specify that electrically non-conductive packaging materials must be used and that contact with other electrically conductive materials must be prevented.

Section 173.185

Section 173.185 prescribes requirements for lithium cells and batteries. The introductory paragraph defines terms as used in this section. In this NPRM, PHMSA is proposing to clarify in the introduction that a single cell battery is considered a “cell” and must be transported in accordance with the requirements for cells. In § 173.185(a), the HMR describe UN cell and battery design testing, general cell and battery design safety requirements, and packaging requirements. In this NPRM, PHMSA proposes to amend § 173.185(a) to include a lithium cell and battery test summary with a standardized set of elements. Manufacturers and subsequent distributors of lithium cells and batteries manufactured after June 30, 2003, must make this information available to others in the supply chain. This action is intended to

provide subsequent distributors and consumers the information necessary to ensure that lithium cells and batteries offered and reoffered for transport meet the appropriate UN design tests. This test summary is intended to provide a signal to users that the battery is from a legitimate and compliant source, and allowing those in the transport chain to more easily identify non-counterfeit products. PHMSA, believes that potential ancillary benefits from this proposed lithium battery test summary include; a reduction in shipments of counterfeit cells and batteries, incremental safety gains in transport and use due to an increase in the use of batteries that are of a tested and approved type, and additional benefits received by consumers from a higher quality battery (e.g. a higher capacity factor, slower decay rate, longer life expectancy, better warranties, more reliable customer service).

PHMSA developed a guidance document to assist manufacturers and distributors with understanding and implementing this requirement. The guidance includes an explanation of the requirement, a sample test summary, and questions and answers. A copy of this guidance is available in the docket for this rulemaking.

PHMSA requests comments on the usefulness of the guidance material and comments to improve its clarity and additional questions to add to the guidance.

The HMR in § 173.185(b) require lithium cells and batteries to be packed in inner packagings in such a manner as to prevent short circuits, including movement which could lead to short circuits. These inner packagings must be placed in an outer package conforming to the requirements of part 178, subparts L and M, at the Packing Group II performance level. PHMSA proposes several amendments to § 173.185(b)

to update and clarify various provisions. PHMSA proposes to amend § 173.185(b)(2)(ii) to specify that lithium cells and batteries including lithium cells or batteries packed with, or contained in, equipment, must be packaged in a manner that prevents damage caused by movement or placement within the package. The current text requires lithium batteries to be packaged in a manner to prevent movement. This could be interpreted as to require no movement within the package. This proposed amendment would minimize ambiguity in the current requirements and only prohibit movement that leads to damage within the package.

Further, PHMSA proposes to amend § 173.185(b)(3)(i) to specify that inner packagings must be separated from *electrically* conductive materials. This proposed change is based on revisions to the UN Model Regulations that revised the existing requirement that inner packagings separate lithium cells and batteries from conductive materials to require separation from “electrically conductive” materials. PHMSA proposes to amend § 173.185(b)(6) to clarify the provisions for the use of large packagings. Currently, large packagings are authorized for the transport of a single battery including a battery contained in equipment. This amendment would clarify that large packagings are limited to a single battery or to a single item of equipment. This acknowledges that a single item of equipment may contain one or more batteries. Finally consistent with revisions to the ICAO Technical Instructions, PHMSA proposes to add a new paragraph (b)(7) to prohibit the placement of lithium batteries in the same outer packaging as substances and articles of the following classes and divisions: Class 1 (explosives) other than Division 1.4S; Division 2.1 (flammable

gases); Class 3 (flammable liquids); Division 4.1 (flammable solids); or Division 5.1 (oxidizers) when offered for transport or transported by aircraft. PHMSA is proposing this action to promote consistency with the ICAO Technical Instructions and in response to a recommendation (A-16-001) from the National Transportation Safety Board (NTSB) stemming from the investigation of the July 28, 2011, in-flight fire and crash of Asiana Airlines Flight 991 that resulted in the loss of the aircraft and crew. The investigation report cited as a contributing factor the flammable materials and lithium ion batteries that were loaded together either in the same or adjacent pallets. Logically, if the materials are not allowed to be stowed in the same or adjacent pallets, segregation within the same package also would result in decreased risk in the event of a fire.

From our experience with public comments on this issue related to ICAO and the UN, PHMSA understands it is not common industry practice nor a desired option for US shippers to pack lithium batteries with other hazardous materials in the same outer package. There appears to be limited US market interest in this type of packing configuration. Therefore, PHMSA expects codifying this provision to have negligible negative implications to US shippers while leveling the playing field by applying the provision to non-US originating shipments imported into the US.

Section 173.185(c) of the HMR describes provisions for the carriage of up to eight small lithium cells or two small lithium batteries per package with alternative hazard communication that replaces the Class 9 label with a lithium battery mark. Additional conditions for the transport of small lithium cells and batteries by air are

contained in § 173.185(c)(4). In this NPRM, PHMSA proposes several amendments to § 173.185(c)(2), (c)(3), and (c)(4) to align the HMR with the UN Model Regulations and the ICAO Technical Instructions, address the hazards associated with placing lithium batteries next to other hazardous materials, and clarify specific provisions. PHMSA proposes to amend § 173.185(c)(2) to except equipment that is robust enough to protect lithium batteries from damage or short circuit from the requirement to be packaged. The current regulations provide an exception from the requirement for the package to be rigid, but otherwise requires the equipment to be placed into a package. This proposed amendment would remove an unnecessary requirement to package otherwise robust equipment that protect lithium batteries from damage or short circuits. This proposal further aligns the HMR with the UN Model Regulations provisions found in special provision 188 for packaging of lithium cells batteries and equipment. PHMSA proposes to add a new § 173.185(c)(3)(iii) to require that when packages of lithium cells or batteries required to bear the lithium battery mark are placed in an overpack, the lithium battery mark must either (1) be clearly visible through the overpack; or (2) the lithium battery mark must also be affixed on the outside of the overpack, and the overpack must be marked with the word “OVERPACK” in lettering at least 12 mm (0.47 inches) high. PHMSA proposes to amend § 173.185(c)(4)(ii) to adopt an “OVERPACK” marking minimum size requirement consistent with the proposed requirement for surface transport in § 173.185(c)(3)(iii). PHMSA proposes to clarify the limits for spare batteries in § 173.185(c)(4)(iv) to state that up to “two spare sets” of cells or batteries can be

placed in a package with equipment. For the purposes of this paragraph, a spare set is equal to the number of individual spare cells or batteries required to power each piece of equipment. For example, if a single item of equipment requires two lithium batteries to operate, a maximum of four additional batteries (two spare sets) may be placed in the package provided the package continues to meet the other conditions of § 173.185(c). PHMSA proposes to add a new § 173.185(c)(4)(v) to specify that for air transport, lithium cells and batteries may not be placed in the same package as other hazardous materials. Further, packages containing small lithium cells and batteries must not be placed into an overpack with packages containing Class 1 (explosives) other than Division 1.4S, Division 2.1 (flammable gases), Class 3 (flammable liquids), Division 4.1 (flammable solids) or Division 5.1 (oxidizers). Each of the remaining sub-paragraphs in § 173.185(c)(4) would be renumbered and remain unchanged. PHMSA is proposing this action to promote consistency with the ICAO Technical Instructions and in response to a recommendation (A-16-001) from the National Transportation Safety Board (NTSB) stemming from the investigation of the July 28, 2011, in-flight fire and crash of Asiana Airlines Flight 991 that resulted in the loss of the aircraft and crew. The investigation report cited as a contributing factor the flammable materials and lithium ion batteries that were loaded together either in the same or adjacent pallets. Logically, if the materials are not allowed to be stowed in the same or adjacent pallets, segregation within the same package also would result in decreased risk in the event of a fire.

Section 173.185(d) of the HMR describes provisions for the transport of

lithium cells and batteries for disposal or recycling. In this NPRM, PHMSA proposes to authorize the use of certain rigid large packagings to transport a single large battery or a single large item of equipment. This will provide additional packaging options to transport large batteries and equipment that by nature of their size or shape cannot fit into a non-bulk package. The UN Model Regulations do not include large packagings as an option for lithium batteries shipped for disposal or recycling. Nevertheless, PHMSA expects that large batteries and equipment would potentially require large packagings. Like the authorizations for the use of large packagings elsewhere in § 173.185, PHMSA would authorize the use of a large packaging for a single large battery or a single item of equipment containing batteries. PHMSA proposes to separate the existing § 173.185(d) into separate subparagraphs (d)(1) and (2) to accommodate these amendments.

Section 173.185(e) of the HMR describes provisions for the transport of low production and prototype lithium cells and batteries including equipment. In this NPRM, PHMSA proposes an editorial amendment to the § 173.185(e) introductory paragraph to clarify that the “transported for purposes of testing” condition applies to prototype cells and batteries and that both low production and prototype lithium cells and batteries may be contained in equipment. PHMSA also proposes an editorial amendment to paragraphs (e)(1) and (2) to specify that cushioning material must be electrically non-conductive instead of the existing “non-conductive” requirement. In addition, PHMSA proposes a new paragraph (e)(4) to authorize the use of certain rigid large packagings to transport a single large battery or a single large item of equipment.

This will provide additional packaging options to transport large batteries and equipment that by nature of their size or shape cannot fit into a non-bulk package. Each of the remaining sub-paragraphs in § 173.185(e) would be renumbered and remain unchanged.

Section 173.185(f) of the HMR describes provisions for the transport of lithium batteries that have been damaged or identified by the manufacturer as being defective for safety reasons, and that have the potential of producing a dangerous evolution of heat, fire, or short circuit (e.g., those being returned to the manufacturer for safety reasons). PHMSA proposes an editorial amendment to § 173.185(f)(2) to specify that cushioning material must be electrically non-conductive, which would harmonize the HMR with the international standards. PHMSA also proposes to amend § 173.185(f)(3) to clarify the provisions for the use of large packagings. Currently, large packagings are authorized for the transport of a single battery including a battery contained in equipment. This amendment would clarify that large packagings are limited to a single battery and to a single item of equipment. This acknowledges that a single item of equipment may contain one or more batteries.

Section 173.218

Section 173.218 contains packaging requirements for shipments of stabilized fish meal and fish scrap. Stabilization of fish meal and fish scrap by applying antioxidants is required in order to offer the material under a Class 9 stabilized proper shipping name. Historically, the IMDG Code and the HMR only reference one antioxidant—ethoxyquin—by name although other antioxidants exist. In response to

testing performed by the International Fishmeal and Fish Oil Organization (IFFO)⁵ that indicated that concentrations of 50 ppm (mg/kg) of ethoxyquin, 100 ppm (mg/kg) of butylated hydroxytoluene (BHT), and 250 ppm (mg/kg) of tocopherol-based antioxidant are effective in stabilizing fish meal, the UN and the IMO adopted allowances for the use of two additional antioxidants (butylated hydroxytoluene and tocopherols) and a reduction in the required ethoxyquin concentration at time of shipment from 100 ppm to 50 ppm.

In this NPRM, PHMSA is proposing to amend paragraph (c) of this section to lower the required ethoxyquin level at the time of shipment in bulk in freight containers for transportation by vessel from 100 ppm to 50 ppm and to specify acceptable levels of for butylated hydroxytoluene (100 ppm) and for tocopherols (250 ppm) in shipments of fish meal or fish scrap transported by vessel in bulk in freight containers. Reducing the required minimum concentration of ethoxyquin and permitting the use of additional antioxidants would potentially reduce cost, add flexibility while maintaining an equivalent level of safety.

Section 173.220

Section 173.220 prescribes transportation requirements and exceptions for internal combustion engines, vehicles, machinery containing internal combustion engines, battery-powered equipment or machinery, and fuel cell-powered equipment or machinery.

Special provision 135 is assigned to the HMT entries for certain vehicles. It

⁵ <https://www.unece.org/fileadmin/DAM/trans/doc/2016/dgac10c3/ST-SG-AC.10-C.3-2016-82e.pdf>

specifies that if a vehicle is powered by both a flammable liquid and a flammable gas internal combustion engine, it must be consigned under the entry “Vehicle, flammable gas powered.” Special provision 135 does not, however, clearly indicate that a flammable gas powered vehicle must also comply with the requirements applicable to the quantity of flammable liquid in the fuel tank in addition to all of the applicable provisions for flammable gas-powered vehicle. Consistent with the ICAO Technical Instructions, PHMSA proposes to clarify in a new paragraph (b)(2)(ii)(C) that if a vehicle is powered by a flammable liquid and a flammable gas internal combustion engine, the flammable liquid fuel tank requirements of paragraphs (b)(1) of this section must also be met.

In this NPRM, PHMSA is proposing to make an editorial amendment to the requirements for vehicles powered by lithium batteries in paragraph (d). Specifically, we are clarifying that when a lithium battery is removed from the vehicle and is packed separately from the vehicle in the same outer packaging, the package must be classified as “UN 3481, Lithium ion batteries packed with equipment” or “UN 3091, Lithium batteries packed with equipment,” and is not eligible for classification as “UN3171, Battery-powered vehicle *or* Battery-powered equipment.” This clarification is a result of a working paper submitted at the 26th Meeting of the ICAO Dangerous Goods Panel (ICAO DGP/26) concerning the carriage of battery powered vehicles such as “e-bikes” and it addresses instances where a shipper removes the lithium battery from the battery powered vehicle and subsequently packs the battery in a separate packaging which is then placed with the vehicle in the same outer

packaging. Although this was the result of an amendment to the ICAO Technical Instructions, we believe that it provides clarification of a preexisting requirement for all modes of transport.

Section 173.222

Section 173.222 specifies the requirements for dangerous goods in machinery or apparatus. During the course of reviewing provisions associated with the new HMT entries for “Articles containing hazardous materials, n.o.s.,” PHMSA found that the quantity limits prescribed in § 173.222 are inconsistent with certain international standards. The current authorized quantity of hazardous materials in one item of machinery or apparatus are as follows: 1 kg for solids; 0.5 L for liquids, and 0.5 kg for Division 2.2 gases. These quantity limits are consistent with the ICAO Technical Instructions; however, they are not aligned with the UN Model Regulations or the IMDG Code. Special provision 301 of the UN Model Regulations and the IMDG Code authorize up to the limited quantity amount for each item of dangerous goods contained in the machinery or apparatus.

In a previous final rule published on March 5, 1999 [Docket No. RSPA-98-4185 (HM-215C); 64 FR 10741] PHMSA’s predecessor agency, the Research and Special Projects Administration (RSPA), aligned the HMR with the ICAO Technical Instructions by adding “Dangerous goods in machinery *or* Dangerous goods in apparatus” to the HMT. The proper shipping name was assigned identification number “NA8001,” special provision 136 was added for directions on class assignment, and § 173.222 was added containing requirements applicable to the new entry. In the HM-

215C rulemaking, RSPA stated that upon the assignment of a UN identification number, it would revise the entry accordingly [81 FR 53935]. This was accomplished in the 11th revised edition of the UN Model Regulations, in which identification number UN3363 and Class 9 were assigned to this entry. The ICAO Technical Instructions were amended to be consistent with the UN Model Regulations. Subsequently, the HMR was updated accordingly in a final rule published on June 21, 2001 [Docket No. RSPA-2000-7702 (HM-215D); 66 FR 33315]. While the HMR were amended to incorporate the identification number and Class 9 designation, the quantity limit was not amended to allow up to the limited quantity amount authorized by the UN Model Regulations; therefore, the ICAO quantity limits were retained for all modes of transport.

In the 20th Revised Edition of UN Model Regulations and Amendment 39-18 of IMDG Code, the new “Articles containing hazardous materials, n.o.s.” entries apply to articles which contain only hazardous materials that exceed the permitted limited quantity amount for UN3363. The ICAO addressed the difference between the quantity authorized in the Technical Instructions and both the UN Model Regulations and the IMDG Code by amending ICAO special provision A107. The revised special provision A107 indicates that where the quantity of dangerous goods contained as an integral element in machinery or apparatus exceeds the limits permitted by ICAO Technical Instructions Packing Instruction 962 (same as the existing HMR authorization), and the dangerous goods meet the provisions of Special Provision 301 of the UN Model Regulations, the machinery or apparatus may be transported as

UN3363 only with the prior approval of the appropriate authority of the State of Origin and the State of the Operator under the written conditions established by those authorities.

In order to more closely align with the UN Model Regulations and IMDG Code, for other than air transportation, PHMSA is proposing to increase the quantity limits for liquids and solids in paragraph (c) up to the limited quantity amount prescribed in the corresponding section of Part 173 referenced in Column (8A) of the §172.101 Table. Without this amendment, the HMR would differ from the UN Model Regulations and IMDG Code for application of the new “Articles, n.o.s.” entries, and an approach used by the ICAO Technical Instructions would be necessary for all modes. The authorized quantity for gases would remain unchanged for all modes of transport.

Section 173.224

Section 173.224 establishes packaging and control and emergency temperatures for self-reactive materials. The Self-Reactive Materials Table in paragraph (b)(7) of this section specifies self-reactive materials authorized for transportation without first being approved for transportation by the Associate Administrator for Hazardous Materials Safety, as well as requirements for transporting these materials. In paragraph (b)(7), PHMSA proposes to add a new entry “Phosphorothioic acid, O-[(cyanophenyl methylene) azanyl] O,O-diethyl ester” to the Self-Reactive Materials Table. In addition, a new “Note 5” assigned to this entry would be added to the list following the table.

Paragraph (c) of this section prescribes requirements for new self-reactive materials, formulations, and samples. In paragraph (c)(4), PHMSA proposes to authorize small samples of certain potentially explosive or self-reactive substances when transported for testing purposes. These substances usually consist of organic molecules which are active ingredients, building blocks, or intermediates for pharmaceutical or agricultural chemicals. The molecules of the substances often carry functional groups listed in tables A6.1 and/or A6.2 in Annex 6 (Screening Procedures) of the UN Manual of Tests and Criteria, that would indicate explosive or self-reactive properties; however, these substances are not designed to be explosives of Class 1. This amendment is necessary because during the early development phase of a new product, complete test data is often unavailable but the substances must be transported for further testing. The provisions proposed in paragraph (c)(4) prescribe applicability criteria and packaging conditions for these substances to be transported as samples for the purpose of testing. These criteria and packaging conditions are based on submissions to the UNSCOE on the Transport of Dangerous Goods showing the effectiveness of the packaging method proposed in this NPRM.

Consistent with the UN Model Regulations, PHMSA is proposing to revise paragraph (b)(4) to authorize the transportation of self-reactive substances packed in accordance with packing method OP8 (non-bulk packaging authorization) where transport in IBCs or portable tanks is permitted in accordance with § 173.225, provided that the control and emergency temperatures specified in the instructions are complied with. This proposed change allows materials that are authorized in bulk

packagings to also be transported in appropriate non-bulk packagings.

Section 173.225

Section 173.225 prescribes packaging requirements and other provisions for organic peroxides. The UN Model Regulations continually update their Organic Peroxide Table based on data submitted by governments and industry groups with consultative status to account for new peroxides and formulations that have become commercially available. Consistent with revisions to the UN Model Regulations, PHMSA proposes to revise the Organic Peroxide Table in paragraph (c) by adding the entries: “Di-(4-tert-butylcyclohexyl)peroxydicarbonate [as a paste],” “Diisobutryl peroxide [as a stable dispersion in water],” and “1-Phenylethyl hydroperoxide.” We propose to revise the Organic Peroxide IBC Table in paragraph (e) to maintain alignment with the UN Model Regulations by adding new entries for “Cumyl peroxyneodecanoate, not more than 52%, stable dispersion, in water,” “2,5-Dimethyl-2,5-di(tert-butylperoxy)hexane, not more than 52% in diluent type A,” “3,6,9-Triethyl-3,6,9-trimethyl-4,7-triperoxonane not more than 27% diluent type A,” and “tert-Amyl peroxy-2-ethylhexanoate, not more than 62% in a diluent type A” and by adding a type 31HA1 IBC authorization to the existing entry for “tert-Butyl hydroperoxide, not more than 72% with water.”

In addition, consistent with the UN Model Regulations, PHMSA is proposing that organic peroxides may also be transported packed in accordance with packing method OP8 where transport in IBCs or portable tanks is permitted, provided that the control and emergency temperatures specified in the instructions are complied with.

Section 173.232

New section 173.232 prescribes requirements for articles not otherwise specified by name in the HMR that contain hazardous materials of various hazard classes and divisions. This proposal addresses situations in which hazardous materials or hazardous materials residues are present in articles in quantities greater than the amounts authorized for dangerous goods in machinery or apparatus. This proposal authorizes a safe method to transport articles that may be too large to fit into typical packages. Absent these provisions to package and transport these materials safely, these articles may be offered for transport under provisions that do not adequately account for the physical and chemical properties of the substances and may require the issuance of an approval by PHMSA's Associate Administrator for Hazardous Materials Safety. PHMSA believes this will be especially beneficial to new articles coming to market as they would no longer require an approval or an amendment to the Hazardous Materials Table to authorize transport.

Section 173.301b

Section 173.301b describes additional requirements when shipping gases in UN pressure receptacles. In paragraph (c)(1), PHMSA is proposing to incorporate ISO 17871:2015 containing specification and type testing requirements for quick release cylinder valves. In paragraph (d)(1), PHMSA is phasing out ISO 13340:2001, Transportable gas cylinders – Cylinder valves for non-refillables cylinders – Specification and prototype testing, which can be utilized until December 31, 2020.

ISO 13340:2001 is being phased out because the applicable valve standard in ISO 13340:2001 has been incorporated into ISO 11118: 2015.

Section 173.304b

Section 173.304b contains additional requirements for shipment of liquefied compressed gases in UN pressure receptacles. In this NPRM, consistent with a change made by in the 20th Revised Edition of the UN Model Regulations, PHMSA is proposing to amend paragraph (b)(5) by replacing “liquid phase” with “liquefied gas” and “compressed” with “compressed gas” to better describe the phases of the material being stored and to align with the UN language.

Section 173.422

Section 173.422 contains additional requirements for excepted packages containing Class 7 (radioactive) materials. Shipments of excepted packages containing Class 7 materials are not required to meet the general shipping paper requirements found in the HMR. Amendments 39-18 of the IMDG Code adopted a requirement that vessels carrying these excepted packages include information concerning these packages (e.g., UN ID Number and location on board the vessel) on the Dangerous Cargo Manifest (DCM). Historically, the HMR has not required any documentation to accompany shipments of excepted packages containing radioactive material when offered for transportation by vessel. In this NPRM, PHMSA proposes to amend the DCM requirements in § 173.60 to require information about these shipments to be included in the DCM carried aboard the vessel. Without a

corresponding amendment to § 173.422 to require the information to be provided to the vessel operator, the vessel operator would not have the information available that would be required to be included on the DCM.

In this NPRM, PHMSA proposes to add a new paragraph (f) that would require excepted packages of radioactive materials offered for transportation by vessel to have a special transport document such as a bill of lading, air waybill, or other similar document that includes the UN identification number for the material being offered, the name and address of the consignor and consignee, and a container packing certificate, in accordance with the requirements in § 176.27. This proposed amendment provides for the conveyance of necessary information to the vessel operator for creation of the DCM.

Part 174

Section 174.50

Section 174.50 prescribes regulations for the movement of nonconforming or leaking packages by rail. Under the HMR, no person may offer for transportation or transport a bulk hazmat packaging (typically a tank car) by rail unless that packaging is marked, represented, maintained, reconditioned, repaired, and retested in accordance with the HMR (§ 171.2(g)). However, § 174.50 authorizes the movement of a non-conforming bulk hazmat package moved by rail when: (1) the movement is necessary to reduce or eliminate an immediate threat or harm to human health or the environment; or (2) the movement is approved by the Federal Railroad Administration's (FRA's) Associate Administrator for Railroad Safety.

Approvals issued by FRA's Associate Administrator for Railroad Safety are commonly referred to as One-Time Movement Approvals (OTMAs).⁶ Transport Canada issues similar approvals for the movement of non-conforming bulk hazmat packages and tank cars, which are referred to as Temporary Certificates. Historically, for movements of non-conforming tank cars from Canada to or through the United States, the offeror would have to obtain both an OTMA from FRA and a Temporary Certificate from Transport Canada. These applications initiate administrative processes and safety reviews by both governments that nearly always result in the same conclusion. Since the safety analysis used to evaluate Temporary Certificates in Canada is similar to the safety analysis used to evaluate OTMAs by FRA, the requirement to obtain two government approvals for a cross border movement provides no additional safety benefit and is redundant and burdensome. Thus, to facilitate cross border trade, for movements to or through the United States from Canada, PHMSA proposes to amend the regulation to recognize Temporary Certificates issued by Transport Canada. This amendment would reduce the duplicative requirement to apply for both an OTMA from the United States and a Temporary Certificate from Canada, should the non-conforming package need to be transported over the United States-Canadian border.

On July 12, 2007, Transport Canada published, "Regulations Amending the Transportation of Dangerous Goods Regulations (International Harmonization Update,

⁶ On October 7, 2014 FRA issued guidance on One-Time Movement Approvals titled *One-Time Movement Approval Procedures, HMG-127*.

2016).” In this publication, Transport Canada indicated that recognition of OTMA may be included in a future amendment. This amendment aims to facilitate international transportation and at the same time ensures the safety of people, property, and the environment. Finally, for low-risk movements of non-conforming tank cars, Transport Canada authorizes the one-time movement without the need to obtain a temporary certificate (see TP-14877). For clarification, such movements under the TDG Regulations are already authorized by § 171.12, provided the movements are compliant with all applicable requirements in the TDG Regulations and § 171.12.

Part 175

Section 175.10

Section 175.10 specifies the conditions for which passengers, crew members, or an operator may carry hazardous materials aboard an aircraft. Consistent with revisions to the ICAO Technical Instructions, in this NPRM, PHMSA is proposing several revisions to this section.

PHMSA proposes to revise paragraph (a)(2) to account for lighters powered by lithium batteries (e.g., laser plasma lighters, tesla coil lighters, flux lighters, arc lighters, and double arc lighters). The assigned provisions would be consistent with a combination of the existing requirements applicable to portable electronic devices powered by lithium batteries and battery powered portable electronic smoking devices. Specifically, each lithium battery must be of a type which meets the requirements of each test in the UN Manual of Tests and Criteria, Part III, Subsection 38.3 and must

not exceed the size limits authorized for portable electronic devices. Recharging of the devices and/or the batteries on board the aircraft is not permitted consistent with the requirements for portable electronic smoking devices. In addition, lithium battery powered lighters without a safety cap or means of protection against unintentional activation are prohibited in carry-on baggage, checked baggage, and as when carried on one's person.

PHMSA proposes to revise paragraph (a)(3), to authorize medical devices containing radioactive material fitted externally as the result of medical treatment, consistent with the ICAO Technical Instructions. In addition, the reference to implanted medical devices containing lithium batteries would be removed. For medical devices containing lithium batteries (including those implanted, externally fitted, or carried by passengers or crew members) the quantity limits provided in (a)(18)(i) or (ii) apply, as applicable.

PHMSA proposes to revise paragraph (a)(14) for consistency with the ICAO Technical Instructions and other paragraphs in this section. The first sentence is revised to clarify that the paragraph is applicable to battery powered heat-producing devices rather than "electrically powered" articles. For lithium battery powered devices, quantity limits would be added in new paragraphs (i) and (ii) consistent with the existing requirements applicable to portable electronic devices powered by lithium batteries and battery powered portable electronic smoking devices. The requirements for spare batteries would be revised to reference the provisions for spare batteries in paragraph (a)(18).

PHMSA proposes to revise paragraph (a)(15) by adding a new paragraph (vi) to separate and clarify the handling requirements applicable to each “non-spillable” and “dry sealed” batteries both presently prescribed in paragraph (v). PHMSA also proposes to add a new paragraph (vii) to authorize passengers with restricted mobility to carry a spare non-spillable or dry sealed battery for their mobility aid. Presently, spare lithium batteries are permitted for passengers with lithium battery-powered mobility aids; this was deemed acceptable for mobility aids equipped with non-spillable or dry sealed batteries.

PHMSA proposes to amend provisions for carriage of wheelchairs or other mobility aids equipped with a lithium ion battery by removing the requirement that “collapsible” mobility aids necessitate removal of the battery. The intent of the existing requirement was to allow the removal of the batteries from lightweight collapsible mobility aids when these do not afford any protection to the batteries. However, the existing text in both the HMR and ICAO Technical Instructions can be construed to mean that if the battery was designed to be removable from the mobility aid, that it must be removed in all circumstances, even when adequate protection to the batteries is provided. In cases when the batteries are adequately protected, it is preferable that they remain installed in the mobility aid; however, there may be situations when that is not possible or safe to do so and in these cases the batteries must be removed. Therefore, in this NPRM, PHMSA is proposing to amend (a)(17)(v) by removing the word “collapsible” and clarifying that when the wheelchair or mobility aid does not provide adequate protection to the battery, that the battery must

be removed and handled in accordance with the existing conditions prescribed in (a)(17)(v)(A) through (E).

PHMSA proposes to amend the provisions for carriage of personal electronic devices (PEDs) containing lithium batteries to address safety concerns related to recent security restrictions requiring passengers to carry personal electronic devices in checked baggage. Consistent with the ICAO Technical Instructions, § 175.10(a)(18) would be revised to require that when portable electronic devices powered by lithium batteries are in checked baggage, they must be completely powered off and protected to prevent unintentional activation or damage.

PHMSA proposes to revise the carriage requirements for battery-powered portable electronic smoking devices in paragraph (a)(19). The 2015-2016 Edition of the ICAO Technical Instructions incorporated provisions prohibiting passengers and crew from carrying such devices in checked baggage or recharging them in the cabin, and requiring that any spare batteries be protected from short circuit. In a working paper submitted by the United States at ICAO DGP/26 meeting, it was reported that even after the prohibition, ten incidents involving these devices were documented between May 2015 and May 2017. As described in the working paper, seven of the incidents occurred inside a passenger aircraft and three occurred inside an airport. These incidents typically involved the electronic smoking device while it was being transported in carry-on baggage, with the suspected cause of the majority of these incidents being the accidental activation of the device. Specifically, in this NPRM, PHMSA is proposing to align the HMR with the ICAO Technical Instructions by

requiring passengers or crew to take effective measures for preventing accidental activation of the heating element of the device when transporting such devices in carry-on baggage on board passenger aircraft. Examples of effective measures include, but are not limited to: removing the battery from the electronic smoking device; separating the battery from the heating coil; placing the electronic smoking device into a protective case; using a protective cover, safety latch, or locking device on the electronic smoking device's heating coil activation button; and electronics or technology in the device designed to prevent accidental activation, such as those requiring the electronic smoking device to be powered on before the heating coil button can be activated. In most electronic smoking devices, the battery can either be easily removed or easily separated from the heating element.

PHMSA proposes to add a new paragraph (a)(26) that would amend the passenger provisions for carriage of baggage equipped with lithium batteries (e.g., smart baggage) intended to power features designed to make travel easier, such as location tracking, PED battery charging, short range wireless connections, digital weighing, or motors. To address concerns that passengers would check baggage containing lithium batteries (e.g., power banks) despite existing requirements that articles whose primary purpose is to provide power to another device be carried as spare batteries in the cabin as carry-on baggage, the ICAO Technical Instructions were amended to require that passengers remove lithium batteries from baggage they intend to check, in accordance with the provisions for spare batteries. Specifically, baggage equipped with a lithium battery or batteries would be required to be carried as carry-on

baggage, unless the battery or batteries are removed from the baggage. Once the battery or batteries are removed from baggage intended to be checked, the battery or batteries must be carried in the cabin in accordance with the provisions for spare batteries prescribed in paragraph (a)(18). This restriction in checked baggage would not apply to baggage containing lithium metal batteries with a lithium content not exceeding 0.3 grams, or lithium ion batteries with a Watt-hour rating not exceeding 2.7 Wh.

Section 175.33

Section 175.33 establishes requirements for shipping papers and for the notification of the pilot-in-command when hazardous materials are transported by aircraft. In paragraph (a)(11), applicable to “UN 1845, Carbon dioxide, solid (dry ice),” PHMSA proposes that the text “hold” be replaced with the word “cargo compartment.” This would be consistent with use of the term “compartment” in other areas of the HMR and ICAO Technical Instructions. Consistent with revisions to the ICAO Technical Instructions, in paragraph (a)(13)(i), PHMSA proposes to include the airport at which the lithium batteries will be unloaded on the information to the pilot-in-command when a summary is used for lithium batteries. Including the airport at which the batteries will be unloaded is consistent with the authorization to use a summary instead of the default information to the pilot in command for “UN 1845, Carbon dioxide, solid (dry ice).”

Section 175.78

Section 175.78 prescribes the stowage compatibility of hazardous materials

offered for transportation by aircraft. Consistent with international standards, in a March 30, 2017, final rule [HM-215N; 82 FR 15795], PHMSA added new Class 3 HMT entry “UN 3528,” applicable to the fuel contained in engines and machinery powered by Class 3 flammable liquids. In accordance with the segregation requirements prescribed in this section, engines and machinery classified under the new UN 3528 entry in Class 3 are required to be segregated from dangerous goods with a primary or subsidiary hazard of Division 5.1. Prior to the addition of the UN 3528 HMT entry, such engines and machinery were classed in Class 9 and therefore not required to be segregated from Division 5.1 materials. The packing requirements by air for UN 3528 require engines to be drained and the tank caps fitted securely. These precautions ensure that there is only a negligible amount of residual fuel remaining. There is no indication that, as prepared for transport, UN 3528 poses any more hazard now that would require these items to be segregated than when these items were previously identified as a Class 9. Therefore, in this NPRM, PHMSA is proposing to add an exception from the segregation requirement by adding a “Note 3” to the paragraph (b) Segregation Table and adding a new paragraph (c)(8) stating that materials consigned under UN 3528 need not be segregated from packages containing hazardous materials in Division 5.1.

Consistent with the ICAO Technical Instructions, PHMSA is proposing to require that packages and overpacks containing lithium cells and batteries that bear the Class 9 label must not be stowed on an aircraft next to, in contact with, or in a position that would allow interaction with, packages or overpacks containing other hazardous

materials in Class 1 (other than Division 1.4S), Division 2.1, Class 3, Division 4.1 and Division 5.1. Specifically, the current paragraph (b) would be reformatted into two paragraphs. A new paragraph (b)(2) would be added to prescribe the segregation requirements applicable to lithium cells and batteries. The existing Segregation Table would be revised by adding the necessary columns and rows representing hazard classes not presently in the Table. These changes to the Table would indicate that hazardous materials in the classes described above must be segregated from packages and overpacks containing lithium cells or batteries prepared in accordance with § 173.185(b)(3) and (c)(4)(vi). PHMSA is proposing this action to promote consistency with the ICAO Technical Instructions and in response to a recommendation (A-16-001) from the National Transportation Safety Board (NTSB) stemming from the investigation of the July 28, 2011, in-flight fire and crash of Asiana Airlines Flight 991 that resulted in the loss of the aircraft and crew. The investigation report cited as a contributing factor the flammable materials and lithium ion batteries that were loaded together either in the same or adjacent pallets.

Part 176

Section 176.30

Section 176.30 prescribes requirements for DCM's, lists, or stowage plans required to be carried aboard vessels transporting hazardous materials. In this NPRM, PHMSA is proposing to add a new paragraph (a)(9) to require that DCMs include information on shipments of excepted packages containing Class 7 materials. For

shipments of excepted packages containing Class 7 material only the UN identification number, the name and address of the consignor and the consignee, and the stowage location of the hazardous material on board the vessel would be required to be entered on the DCM, list, or stowage plan carried aboard the vessel.

Section 176.84

Section 176.84 prescribes the meanings and requirements for numbered or alphanumeric stowage provisions for vessel shipments listed in column (10B) of the § 172.101 HMT. The provisions in § 176.84 are broken down into general stowage provisions, which are defined in the “table of provisions” in paragraph (b), and the stowage provisions applicable to vessel shipments of Class 1 explosives, which are defined in the table in paragraph (c)(2). In a previous final rule [Docket No. PHMSA–2015–0273 (HM–215N); 82 FR 15796], a subsidiary hazard of 6.1 was added to the UN 2977 and UN 2978 uranium hexafluoride entries, and the primary hazard for UN 3507, Uranium hexafluoride, radioactive material, excepted package was changed from 8 to 6.1. Consequential amendment to the stowage and segregation requirements codes for these materials were not addressed at the time of these changes in the IMDG Code or the HMR. In this NPRM, we propose to create new stowage provisions that clarify what segregation requirements apply to shipments of uranium hexafluoride.

PHMSA proposes to create a new stowage provision 151 and assign it to the UN 2977 and UN 2978 uranium hexafluoride entries. This new stowage provision will require segregation for Class 7 materials to apply to uranium hexafluoride shipped under these two UN numbers.

Additionally, consistent with Amendment 39-18 of the IMDG Code, PHMSA proposes to create a new stowage provision 152 and assign it to UN 3507, Uranium hexafluoride, radioactive material, excepted package. This proposed new stowage provision requires segregation as for Class 8, but excepts segregation in relation to Class 7 materials. This exception to the general segregation requirements between Class 8 and Class 7 materials allows shipments of excepted packages of uranium hexafluoride to be stowed in close proximity to shipments of fully regulated uranium hexafluoride.

Based on changes to the IMDG Code to address the appropriate segregation requirements for shipments of uranium hexafluoride, PHMSA proposes to create a new stowage provision 153 and assign it to the UN 2977 and UN 2978 uranium hexafluoride HMT entries. This proposed new stowage provision requires these materials to be stowed “separated longitudinally by an intervening complete compartment or hold from” Divisions 1.1, 1.2, and 1.5.

Based on changes to the IMDG Code to provide additional flexibility in the stowage requirements for jet perforating guns, PHMSA proposes to create a new stowage provision 154 and assign it to the NA 0123, NA 0494, UN 0494, and UN 0124 jet perforating gun HMT entries. This proposed new stowage provision indicates that, notwithstanding the stowage category assigned to the entries in the HMT, jet perforating guns may be stowed in accordance with the provisions of packing instruction US 1 in § 173.62. These jet perforating guns are currently assigned to stowage categories “02” and “04.” Both stowage categories require

stowage in closed cargo transport units. The inclusion of new stowage provision 154 clarifies that regardless of the stowage category assigned, jet perforating guns offered in accordance with US 1 in § 173.62 are not required to be offered for transport or transported in closed cargo transport units.

Part 178

Section 178.71

Section 178.71 prescribes specifications for UN pressure receptacles. Consistent with the UN Model Regulations, PHMSA proposes to amend paragraphs (d)(2), (i), (j), and (q)(12), to reflect the adoption of the latest ISO standards for the design, construction, and testing of gas cylinders and their associated service equipment. In paragraph (d)(2), PHMSA is proposing to phase out ISO 13340:2001, which is authorized for valves manufactured until December 31, 2020, and to incorporate by reference ISO 14246:2014 (E) “Gas cylinders — Cylinder valves — Manufacturing tests and examination”, which addresses initial inspection and testing requirements for valves. ISO 13340:2001 is being phased out because the applicable valve has been incorporated into ISO 11118:2015. In paragraph (f), PHMSA is proposing to amend the title of the paragraph to include pressure drums and to add ISO 21172-1:2015(E), “Gas cylinders — Welded steel pressure drums up to 3 000 litres capacity for the transport of gases — Design and construction —Part 1: Capacities up to 1 000 litres” in new paragraph (f)(4). A note was added to the UN Mode Regulations that authorizes welded steel gas pressure drums with dished ends convex to pressure to be used for the transport of corrosive substances provided all

applicable additional requirements are met, irrespective of section 6.3.3.4 of this standard which prohibits such use. Therefore, PHMSA is proposing the same deviation from the ISO standard in (p).

In addition, in paragraph (i), PHMSA is proposing to phase out ISO 11118:1999 “Gas Cylinders for Non-refillable Metallic Gas Cylinders,” which is authorized until December 31, 2022, and to replace it with new standard, ISO 11118:2015. In paragraph (j), PHMSA is proposing to phase out ISO 111120:1999, “Gas Cylinders for Refillable Seamless Steel Tubes,” which is authorized until December 31, 2022, and to replace it with ISO 111120:2015. In paragraph (q)(12), PHMSA is incorporating ISO/TR 11364, “Gas cylinders -- Compilation of national and international valve stem/gas cylinder neck threads and their identification and marking system” to specify a harmonized identification code and marking system for both cylinders and valves.

Section 178.75

Section 178.75 prescribes specifications for MEGCs. In paragraph (d)(3)(v), PHMSA is proposing to phase out ISO 11120:1999, which is authorized for construction and testing of receptacles of MEGCs until December 31, 2020, and to authorize the new, updated standard ISO 11120:2015. Changes to the new edition of this standard include the addition of an annex outlining typical chemistry groupings for seamless steel tubes, the addition of nickel chromium molybdenum steel, the modification of ultrasonic examination provisions, and revisions to the provisions for the design of tubes for embrittling gases.

Section 178.601

Section 178.601 prescribes the general requirements for test procedures for non-bulk packagings and packages. A test report must be prepared and made available to a user of a packaging or a DOT representative upon request. In this NPRM, PHMSA is proposing to require in paragraph (l)(2)(viii) that the test report for plastic packagings that are subject to the hydraulic pressure test must include the temperature of the water used for the test. Tests with different water temperatures applied to one design type can produce different test results (pass or fail). This action is consistent with amendments to the UN Model Regulations.

Section 178.801

Section 178.801 prescribes the general requirements for test procedures of an IBC containing a hazardous material. A test report for an IBC must be prepared and made available to a user of a packaging or a DOT representative upon request. In this NPRM, PHMSA is proposing to require in paragraph (l)(2)(viii) that the test report for rigid plastics and composite IBCs that are subject to the hydraulic pressure test must include the temperature of the water used for the test. Tests with different water temperatures applied to one design type can produce different test results (pass or fail). The inclusion of the temperature of the water used for the test will allow for tests that more accurately simulate the original design type testing when such additional testing is performed.

Section 178.810

Section 178.810 prescribes the requirements for an IBC drop test. In

paragraph (c)(1), PHMSA proposes to clarify that the same IBC or a different IBC of the same design type may be utilized for the required drop tests.

Part 180

Section 180.207

Section 180.207 prescribes requirements for requalification of UN pressure receptacles. In March 2017, PHMSA published a final rule under Docket HM-215N [82 FR 15796 (March 30, 2017)]. In this rule, PHMSA amended the HMR to expand recognition of cylinders and pressure receptacles, cargo tank repair facilities, and certificates of equivalency in accordance with the Transport Canada TDG Regulations. The goal of these amendments is to promote flexibility and permit the use of advanced technology for the requalification and use of pressure receptacles, to provide for a broader selection of authorized pressure receptacles, reduce the need for special permits, and to facilitate cross-border transportation of these cylinders. In the HMR in § 171.12 (a)(4) permit the transportation of a cylinder authorized by Transport Canada TDG Regulations to, from, or within the United States. In HM-215N, PHMSA amended (a)(4)(ii) to authorize the use of Canadian manufactured cylinders. Specifically, PHMSA authorized the transportation of CTC, CRC, BTC, and TC cylinders that have a corresponding DOT specification cylinder prescribed in the HMR. HM-215N did not remove or amend existing requirements for DOT specification cylinders; rather, PHMSA is providing that a shipper may use either a DOT specification cylinder or a TC cylinder, as appropriate.

In this NPRM, PHMSA proposes to clarify the amendments in HM-215N and

allow for the requalification of “CAN” marked UN cylinders in the United States. Cylinders marked with the letters “CAN” for Canada as a country of manufacture or a country of approval may be requalified in the United States, provided the requirements in §§178.69, 178.70, and 178.71, as applicable, are met. This amendment aims to facilitate international transportation, while ensuring the safety of people, property, and the environment

Consistent with changes to the UN Model Regulations, PHMSA proposes to revise paragraph (d)(1) to incorporate ISO 16148:2016, which addresses the requalification of seamless steel cylinders and tubes. This proposed addition will allow the internal inspection and hydraulic pressure test for seamless steel ISO cylinders and tubes to be replaced by non-destructive testing methods identified in ISO 16148:2018. Additionally, in paragraph (d)(4), PHMSA is proposing to phase out ISO 11623:2002, which is authorized for inspection and testing of composite UN cylinders until December 31, 2020, and authorizing the new standard, ISO 11623:2015. Finally, PHMSA proposes adding new paragraph (d)(6) to incorporate inspection and maintenance requirements for cylinder valves performed during requalification, as found in ISO 22434:2006 “Transportable gas cylinders — Inspection and maintenance of cylinder valves.” Changes to the revised standard include; up-to-date terminology particularly for the various types of composite cylinders, up-to-date normative references for steel and aluminum-alloy liner materials, and an update of some photographs to provide sharper examples of damage.

VII. Regulatory Analyses and Notices

A. Statutory/Legal Authority for this Rulemaking

This proposed rule is published under the statutory authority of Federal hazardous materials transportation law (49 U.S.C. 5101 *et seq.*). Section 5103(b) of Federal hazmat law authorizes the Secretary of Transportation to prescribe regulations for the safe transportation, including security, of hazardous materials in intrastate, interstate, and foreign commerce. This proposed rule would amend regulations to maintain alignment with international standards by incorporating various amendments, including changes to proper shipping names, hazard classes, packing groups, special provisions, packaging authorizations, air transport quantity limitations, and vessel stowage requirements. To this end, the proposed rule amends the HMR to more fully align with the biennial updates of the UN Model Regulations, the IMDG Code, and the ICAO Technical Instructions.

The following external agencies were consulted in the development of this rule:

- Federal Aviation Administration;
- Federal Motor Carrier Safety Administration;
- Federal Railroad Administration; and
- U.S. Coast Guard.

Section 49 U.S.C. 5120(b) of Federal hazmat law authorizes the Secretary to ensure that, to the extent practicable, regulations governing the transportation of

hazardous materials in commerce are consistent with standards adopted by international authorities. This rule proposes to amend the HMR to maintain alignment with international standards by incorporating various amendments to facilitate the transport of hazardous material in international commerce. To this end, as discussed in detail above, PHMSA proposes to incorporate changes into the HMR based on the 20th Revised Edition of the UN Model Regulations, Amendment 39-18 to the IMDG Code⁷, and the 2019–2020 Edition of the ICAO Technical Instructions, which become effective January 1, 2019. The large volume of hazardous materials transported in international commerce warrants the harmonization of domestic and international requirements to the greatest extent possible.

B. Executive Order 12866, Executive Order 13563, and DOT Regulatory Policies and Procedures

This notice is not considered a significant regulatory action under section 3(f) of Executive Order 12866 (“Regulatory Planning and Review”) and, therefore, was not reviewed by the Office of Management and Budget. This notice is not considered a significant rule under the Regulatory Policies and Procedures of the Department of Transportation (44 FR 11034).

Cost-Reducing Aspects of Harmonization

General Harmonization Benefit: Given current available information, PHMSA has

⁷ Amendment 39-18 to the IMDG Code may be voluntarily applied on January 1, 2019; however, the previous amendment remains effective through December 31, 2019.

developed an estimate of the avoided compliance costs of harmonization, and discusses and requests comment on additional benefits.

To estimate the benefits to affected industries from avoided compliance costs, PHMSA relies on a benefit-transfer value of the hazard communication cost savings utilized in previous PHMSA international harmonization rulemakings⁸, based on an Occupational Safety and Health Administration (OSHA) study. The original rulemaking harmonized U.S. regulations with international standards so that industry did not have to adhere to two separate hazard communication systems.⁹ This value—\$0.001 per dollar of hazardous materials output—is based on OSHA’s estimate of the costs for industry to comply with the revised Hazard Communication Standard¹⁰ and an estimate of the value of hazardous material in trade. The savings then accrue to all exporters, who would otherwise incur these costs of hazard communication.

Using this estimate of the avoided hazard communication costs, PHMSA estimated the potential benefits to exporters of harmonizing the HMR with international standards. PHMSA relied on the 2012 Bureau of Economic Analysis’

⁸PHMSA’s harmonization rulemakings, HM-215M: Hazardous Materials: Harmonization with International Standards (RRR), Final Rule, 80 FR 1075, January 8, 2015 and HM-215N: Hazardous Materials: Harmonization with International Standards (RRR), 82 FR 15796, March 30, 2017

⁹ Department of Transportation, Pipeline and Hazardous Materials Safety Administration. Hazardous Materials: Harmonization with International Standards (RRR), Final Rule, 78FR 987, January 7, 2013; p. 1023.

¹⁰ OSHA’s estimate relied on comparing the costs of complying with the revised Hazard Communication Standard to the overall output of hazardous materials. The study measured four cost elements: revisions to labels and safety data sheets, additional training, additional management activities, and printing of color packaging. PHMSA determined that only the first three cost elements were relevant for harmonization purposes, and estimated the value of these costs as a fraction of the total value of hazardous materials produced in the United States to determine the \$0.001 per dollar of hazardous materials output.

(BEA) International Accounts Products for Detailed Goods Trade Data to value industry imports and exports.¹¹

PHSMA updated our estimate of value of hazardous materials involved in international trade by using U.S. trade in goods seasonally adjusted, Census-based total gross imports, and gross exports in the fuels and lubricants, chemicals, and medicinal/dental/pharmaceutical products industries for the 2016, the most recent year available.

- Gross imports: \$343.431 billion.
 - Fuels and lubricants: \$162.077 billion.
 - Chemicals: \$69.655 billion.
 - Medicinal/dental/pharmaceutical products: \$111.700 billion.
- Gross exports: \$269.518 billion.
 - Fuels and lubricants: \$112.462 billion.
 - Chemicals: \$103.779 billion.
 - Medicinal/dental/pharmaceutical products: \$53.277 billion.
- Gross imports plus gross exports: \$612.949 billion.

For estimating benefits of this topic, according to the 2012 CFS, commodities worth \$13,852,143 million were transported in the U.S. in 2012, of which \$2,334,425 million worth were hazardous (or 16.9 percent).¹² However, the 16.9 percent

¹¹ Bureau of Economic Analysis, U.S. Department of Commerce, U.S. Trade in Goods (IDS-0008), available at: http://www.bea.gov/international/detailed_trade_data.htm

¹² U.S. Department of Transportation & U.S. Department of Commerce (2015). Hazardous Materials

proportion (of total shipment values classed as hazardous materials) estimated may have had a high-side bias due to the variety of different classes of products classified as hazardous. The percentage of shipments properly classified as hazardous is likely lower, particularly for medicinal/dental/pharmaceuticals (for this analysis PHMSA assume 10 percent).

Multiplying this \$613 billion (rounded) figure by 10 percent (the estimated proportion of annual trade in these three industries that are hazardous products) by the average hazard communication cost per dollar of hazardous materials produced in the United States (\$0.001) results in an estimate of benefits of \$61.2 million (rounded) annually. Over the ten-year analysis period from 2019 to 2028, this equates to a net present value of \$431 million to \$522 million, using a 7 percent and 3 percent discount rate, respectively.

Because it is difficult to directly compare the scope and nature of changes made in the OSHA rule with those made by PHMSA in each HM-215 rulemaking series, the estimates developed should be considered illustrative of very rough and highly uncertain impacts of general harmonization. Given the high degree of uncertainty in these estimates, due to the inability of PHMSA to align provisions in this rule, and their potential impacts, with the OSHA rule we use to draw our estimate from, we do not consider these quantified cost savings, averted costs, or benefits. PHMSA requests comments on the general harmonization benefit methodology utilized as well as any qualitative or quantitative information that our stakeholders can

2012 Economic Census, Transportation, 2012 Commodity Flow Survey, available at: <https://www.census.gov/econ/cfs/2012/ec12tcf-us-hm.pdf> [see Table 1a]

provide on the impact of general harmonization to their operations.

Corrosivity Classification: Current regulations require shippers to classify Class 8 materials to a packing group based on animal test data or to utilize authorized in vitro test methods. However, these regulations require that data obtained from the testing qualify as the only acceptable data for the classification and assignment to a packing group. The proposed addition of § 173.137(d) provides alternative packing group assignment methods to classify corrosive mixtures that does not involve physical testing. The proposed tiered approach to classification and packing group assignment depends on how much information is available for the mixture itself, similar mixtures, and/or its ingredients. Specifically, the proposed amendments include the following methods of classification for mixtures: dilution, batching, criteria for substantially similar mixtures, and a calculation method using existing data for the component substances of the mixture.

PHMSA expects there to be cost savings to shippers of mixtures that chose to classify their materials using the new classification options instead of traditional testing methods (e.g. in-vitro or in-vivo). Traditional skin corrosion testing involving animals costs approximately \$1,800. Whereas, the alternative in-vitro tests range from \$500 to \$850^{13,14}, with a median cost of \$675. The new classification methods for mixtures are faster and demonstrate an equivalent level of safety at a much lower cost.

¹³ Humane Society International. Costs of Animal and Non-Animal Testing.
http://www.hsi.org/issues/chemical_product_testing/facts/time_and_cost.html

¹⁴ These skin corrosion tests are named the Draize rabbit skin test for \$1,800, EpiDerm human skin model in vitro test for \$850, and the CORROSITEX membrane barrier for \$500.

PHSMA expects that many shippers of Class 8 materials will use the new regulatory flexibility to utilize the lower cost, non-testing alternatives.

These non-test methods have varying degrees of time required for determination of a classification. Methods such as dilution and batching are relatively straight forward and require minimal time to arrive at a classification determination. Methods such as bridging and calculation require more time to arrive at a classification determination. PHMSA does not have a reliable estimate of the time to perform these non-test classification methods. For the purposes of this analysis, we have utilized the most time-consuming calculation method. To arrive at a classification determination using the calculation method the person performing the calculation must utilize data on the known components of the mixture, and using a formula arrive at a number that correlates to an assignment of a packing group. PHMSA assumes that data on components of a mixture will generally be available, and that performing this calculation takes approximately 3 hours to complete. Utilizing a weighted hourly wage of \$79.06¹⁵, PHMSA estimates a cost of \$237.18 for performing the calculation method to arrive at a corrosivity classification determination. The median cost of currently authorized in-vitro and in-vivo testing is \$1,237.5. This represents a cost savings of \$1,000.32 per test.

PHSMA is challenged in monetizing total cost savings due to a lack of data

¹⁵ Occupation labor rates based on 2017 Occupational and Employment Statistics Survey (OES) for “Chemical Engineers (17-2041)” in the Chemical Manufacturing industry. The hourly mean wage for this occupation (\$54) is adjusted to reflect the total costs of employee compensation based on the BLS Employer Costs for Employee Compensation Summary, which indicates that wages for civilian workers are 68.3 percent of total compensation (total wage = wage rate/wage % of total compensation).

describing baseline conditions, including a breakdown of the types of hazardous materials that make up the 2012 CFS total flow estimates and the total number of traditional tests industry currently conducts annually to comply with § 173.137. In addition, PHSMA does not have enough information to predict how this proposed rulemaking will change industry behavior. Absent more definitive data, PHMSA assumes 500 to 3,000 new mixtures tested per year. If all of these mixtures use the new non-testing methods, and cost savings equal \$1,000.32 per test, total industry cost savings could equate to \$0.4 to \$3.9 million dollars per year. PHSMA seeks comment if these numbers represent an accurate estimate of new mixtures tested annually.

Costs of Harmonization

Please see the RIA for this rulemaking—a copy of which has been placed in the docket—for detailed analysis of the costs of various amendments proposed in this NPRM. Additionally, where noted below, please see the Paperwork Reduction Act section of this rulemaking for a detailed discussion of applicable proposals.

Requiring 6(d) testing for certain explosives: PHMSA believes that requiring additional tests will result in greater costs for manufacturers of explosives presently approved for transport under UN0349, UN0367, UN0384, or UN0481. Please see the Paperwork Reduction Act section of this rulemaking for a detailed discussion of these estimated costs.

Lithium Battery Test Summary: PHMSA believes that the proposed creation of a lithium cell or battery test summary and the proposed requirement for

subsequent distributors to make the test summary available will result in costs to cell and battery manufacturers, as well as subsequent distributors. Please see the Paperwork Reduction Act section of this rulemaking for a detailed discussion of these estimated costs.

Net Benefit

Based on the discussions of benefits and costs provided above, PHMSA estimates discounted net cost savings at 3 percent discount rate of approximately \$97,000 - \$2.2 million per year and at 7 percent discount rate of approximately \$60,000 - \$2.1 million per year. Please see the complete RIA for a more detailed analysis of the costs and benefits of this proposed rule.

C. Executive Order 13771

This proposed rule has been analyzed in accordance with Executive Order 13771 (“Reducing Regulation and Controlling Regulatory Costs”) and is likely to result in an E.O. 13771 deregulatory action, as it will result in cost savings (see above for discussion of the Benefits and Costs of Harmonization).

D. Executive Order 13132

This proposed rule has been analyzed in accordance with the principles and criteria contained in Executive Order 13132 (“Federalism”). It preempts State, local, and Indian tribe requirements, but does not propose any regulation that has substantial direct effects on the States, the relationship between the national government and the

States, or the distribution of power and responsibilities among the various levels of government. Therefore, the consultation and funding requirements of Executive Order 13132 do not apply.

The Federal hazmat law (49 U.S.C. 5101 *et seq.*) contains an express preemption provision (49 U.S.C. 5125(b)) that preempts State, local, and Indian tribe requirements on certain covered subjects, as follows:

- (1) The designation, description, and classification of hazardous material;
- (2) The packing, repacking, handling, labeling, marking, and placarding of hazardous material;
- (3) The preparation, execution, and use of shipping documents related to hazardous material and requirements related to the number, contents, and placement of those documents;
- (4) The written notification, recording, and reporting of the unintentional release in transportation of hazardous material; and
- (5) The design, manufacture, fabrication, inspection, marking, maintenance, recondition, repair, or testing of a packaging or container represented, marked, certified, or sold as qualified for use in transporting hazardous material in commerce.

This proposed rule addresses covered subject items (1), (2), (3), (4), and (5) above and preempts State, local, and Indian tribe requirements not meeting the “substantively the same” standard. This proposed rule is necessary to incorporate changes adopted in international standards, effective January 1, 2019. If the proposed changes are not adopted in the HMR, U.S. companies—including numerous small

entities competing in foreign markets—would be at an economic disadvantage because of their need to comply with a dual system of regulations. The changes in this proposed rulemaking are intended to avoid this result. Federal hazmat law provides at 49 U.S.C. 5125(b)(2) that, if DOT issues a regulation concerning any of the covered subjects, DOT must determine and publish in the *Federal Register* the effective date of Federal preemption. The effective date may not be earlier than the 90th day following the date of issuance of the final rule and not later than two years after the date of issuance. PHMSA proposes that the effective date of Federal preemption be 90 days from publication of a final rule in this matter.

E. Executive Order 13175

This proposed rule was analyzed in accordance with the principles and criteria contained in Executive Order 13175 (“Consultation and Coordination with Indian Tribal Governments”). Because this proposed rule does not have tribal implications, and does not impose substantial direct compliance costs, the funding and consultation requirements of Executive Order 13175 do not apply.

F. Regulatory Flexibility Act, Executive Order 13272, and DOT Procedures and Policies

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires an agency to review regulations to assess their impact on small entities, unless the agency determines that a rule is not expected to have a significant economic impact on a

substantial number of small entities. This proposed rule facilitates the transportation of hazardous materials in international commerce by providing consistency with international standards. It applies to offerors and carriers of hazardous materials, some of whom are small entities, such as chemical manufacturers, users and suppliers, packaging manufacturers, distributors, and training companies. As previously discussed under “Executive Order 12866,” the amendments in this proposed rule should result in net cost savings and ease the regulatory compliance burden for shippers engaged in domestic and international commerce, including trans-border shipments within North America.

Many companies will realize economic benefits as a result of these amendments. Additionally, the changes effected by this NPRM will relieve U.S. companies, including small entities competing in foreign markets, from the burden of complying with a dual system of regulations. Therefore, PHMSA expects that these amendments will not, if promulgated, have a significant economic impact on a substantial number of small entities. However, PHMSA solicits comments on the anticipated economic impacts to small entities.

This proposed rule has been developed in accordance with Executive Order 13272 (“Proper Consideration of Small Entities in Agency Rulemaking”) and DOT’s procedures and policies to promote compliance with the Regulatory Flexibility Act to ensure that potential impacts of draft rules on small entities are properly considered.

G. Paperwork Reduction Act

PHMSA is proposing to revise the approved information collections under the following Office of Management and Budget (OMB) Control Numbers: OMB Control No. 2137-0018, “Inspection and Testing of Portable Tanks and Intermediate Bulk Containers;” OMB Control No. 2137-0034, “Hazardous Materials Shipping Papers & Emergency Response Information;” OMB Control No. 2137-0557, “Approvals for Hazardous Materials;” OMB Control No. 2137-0572, “Testing Requirements for Non-Bulk Packaging (Formerly: Testing Requirements for Packaging);” OMB Control No. 2137-0559, “Rail Carriers and Tank Car Tank Requirements, Rail Tank Car Tanks - Transportation of Hazardous Materials by Rail.”

OMB Control Number 2137-0018, “Inspection and Testing of Portable Tanks and Intermediate Bulk Containers”

PHMSA estimates this rulemaking will result in an increase in burden due to the proposed requirement to indicate the water temperature during a hydraulic pressure test for rigid plastics and composite IBCs. PHMSA does not estimate an increase in the number of respondents or responses, because the proposed amendment only adds burden for respondents already pressure testing rigid plastics and composite IBCs. PHMSA estimates that it will take an average of 1 additional minute to add the additional information to the test report. This information collection, currently accounts for 20 respondents completing 100 test reports per year at 6 minutes per response. Increasing the burden time to 7 minutes per response increases the burden

by 33 hours. At a mean hourly wage of \$38.77¹⁶, it is estimated to increase annual salary costs by \$1,279.41. PHMSA does not anticipate this requirement to affect out-of-pocket expenses.

Annual Increase in Number of Respondents: 0.

Annual Increase in Number of Responses: 0.

Annual Increase in Burden Hours: 33.

Annual Increase in Salary Costs: \$1,279.41.

Annual Increase in Burden Costs: \$0.

OMB Control Number 2137-0034, "Hazardous Materials Shipping Papers & Emergency Response Information"

PHMSA estimates that this NPRM will result in an overall increase in burden attributed to the proposed requirement to create a test summary for lithium cells and batteries manufactured after June 30, 2003. As currently proposed, lithium cell or battery manufacturers will need to create a test summary for all of the previously manufactured lithium cells and batteries. Following the publication of the final rule, PHMSA will revise the annual burden, as a test summary will only need to be created following manufacture of a new lithium cell and battery. Because this NPRM accounts for previously manufactured lithium cells and batteries, PHMSA believes

¹⁶ Occupation labor rates based on 2017 Occupational and Employment Statistics Survey (OES) for "First-line supervisors of transportation and material moving workers, except aircraft cargo handling (53-1048)" in the Plastics and Rubber Products Manufacturing industry. The hourly mean wage for this occupation (\$26.48) is adjusted to reflect the total costs of employee compensation (i.e., benefits) based on the BLS Employer Costs for Employee Compensation Summary, which indicates that wages for civilian workers are 68.3 percent of total compensation (total wage = wage rate/wage % of total compensation).

that the burden will substantially decrease for subsequent years after a final rule goes into effect.

PHMSA identified 73 domestic lithium cell or battery manufacturers per U.S. Census' Annual Survey of Manufactures (ASM) (NAICS code 335912)¹⁷. PHMSA looked at publicly available company websites for 35 domestic companies known to manufacture lithium cells or batteries. Of the 35 domestic lithium cell or battery manufacturers websites that were reviewed, 14 provided product information (e.g. specification sheets or safety data sheets) for specific lithium cells or batteries the company currently manufactures or sells. Based on the information provided on these 14 company websites, the mean number of lithium cells and batteries currently manufactured by these domestic manufacturers is 32. Based on the uncertainties noted below, PHMSA estimates that the number of batteries and cells currently manufactured—that were tested between June 30, 2003 and the estimated date of a final rule publication—by each domestic lithium cell or battery manufacture to be 80 per manufacturer (32 lithium cells or batteries manufactured x 2.5). Therefore, 5,840 new test summaries must be created for lithium cells or batteries (73 manufacturers x 80 lithium cells or batteries).

The time to create a test summary is estimated conservatively at 30 minutes per document. PHMSA personnel obtained various existing test reports for lithium cells and batteries and completed sample test summary documents utilizing these test

¹⁷ 2015 County Business Patterns. "Geography Area Series: County Business Patterns by Legal Form of Organization." 2016 Annual Survey of Manufactures. "Annual Survey of Manufactures: General Statistics: Statistics for Industry Groups and Industries: 2016 and 2015

reports with an average time to complete of 13 minutes. In these exercises, the test reports contained almost all the information required for completion of the test summary. PHMSA expects this to be the case for most test summaries and assumes that test reports will be readily available for most design types, but to account for the procuring of any missing information where required, we have estimated the test summary completion time to be 30 minutes. Therefore, PHMSA estimates that this proposal will increase burden by 2,920 hours (5,840 test reports x 30 minutes).

To determine the projected salary cost for preparing new test summaries, PHMSA estimates a mean hourly wage rate of approximately \$67.03¹⁸ for a total of \$195,721.76 in salary cost (2,920 burden hours x \$67.03). PHMSA does not estimate any out-of-pocket expenses for the creation of the test summary.

Uncertainties:

- Information on company websites generally only accounts for battery and cells that are currently actively offered for sale by the company. The proposed TS requirement would be applicable to all batteries and cells manufactured after June 30, 2003. Thus, the canvassing of domestic manufacturer websites does not account for these previously made cells and batteries.
- While several websites did show component cells for sale, others did not. It is difficult to know if some battery manufacturers that only list completed

¹⁸ Occupation labor rates based on 2017 Occupational and Employment Statistics Survey (OES) for “Electrical Engineers (17-2070)” in the Other Electrical Equipment and Component Manufacturing industry. The hourly mean wage for this occupation (\$45.78) is adjusted to reflect the total costs of employee compensation (i.e., benefits) based on the BLS Employer Costs for Employee Compensation Summary, which indicates that wages for civilian workers are 68.3 percent of total compensation (total wage = wage rate/wage % of total compensation).

batteries on their websites also make their own cells.

- Canvassing searched 14 domestic lithium battery cell and battery manufacturers (out of an estimated 73). Companies that did not provide individual product listings were not included in our calculations. However, the companies that were researched do constitute a representative sample of lithium cell and battery manufacturers making cells and batteries for automobiles, military, medical, and portable electronic devices.

Annual Increase in Number of Respondents: 73.

Annual Increase in Number of Responses: 5,840.

Annual Increase in Burden Hours: 2,920.

Annual Increase in Salary Costs: \$195,721.76.

Annual Increase in Burden Costs: \$0.

This test summary requirement is also anticipated to increase the burden for recordkeeping requirements. As detailed in the proposed requirements, the test summary must be made available, including to subsequent distributors, upon request. For the purposes of this analysis PHMSA assumes that in order to make a test summary available manufacturers and downstream distributors of lithium cells and batteries will likely choose the alternative that results in the least amount of recordkeeping burden possible. PHMSA believes this least burdensome method would be to provide links to battery manufacturer websites where the information will

be made available. This assumption presumes that infrastructure such as website storage capacity and upkeep are available and existing costs for cell and battery manufacturers and distributors. Each of these actions requires one recordkeeping action per test summary for cell and battery manufacturers and one record for each link generated by downstream distributors.

To attempt to quantify the burden hours and salary costs for this proposed recordkeeping requirement, PHMSA examined entities in NAICS codes for battery retailers, wholesalers, and merchants (NAICS 453998 & 423610) and identified the percentage of entities in each NAICS industry that is involved in distributing batteries based on the sub-NAICS product series information provided in the 2012 Economic Census by Industry. PHMSA multiplied this percent by the more recent, 2016 County Business Patterns estimate of the total number of entities to estimate the number of potentially impacted respondents. Based on these calculations, PHMSA estimates that 5,644 downstream distributors of lithium cells and batteries comprised of product manufacturers and distributors/retailers, in addition to the 73 domestic manufacturers identified above could be subject to additional recordkeeping requirements as a result of this proposal. We further estimate that product manufacturers utilize cells and batteries from an average of 5 different cell or battery manufacturers. Lastly, we estimate that distributors and retail outlets utilize cells and batteries from an average of 20 cell or battery manufacturers. See table 5 for a breakdown of the lithium cell and battery supply chain, the number of estimated entities, and the number of estimated test summaries that are required to be made available.

Table 5		
<u>Supply Chain</u>	<u>Number of Respondents</u>	<u>Individual Recordkeeping Responses</u>
Cells/Batteries to product manufacturers	73	5,840
Product manufacturers to distributors/retailers	5,224	26,120
Distributors/retailers to customer	420	8,400
Total	5,790	40,360

PHMSA estimates that ensuring test summaries are available will take 5 minutes utilizing the electronic methods noted above. This results in a total recordkeeping requirement of 3,363.33 annual burden hours (40,360 responses x 5 minutes). At an estimated mean annual salary wage of approximately \$67.03¹⁹ PHMSA estimates the salary cost for recordkeeping will increase by \$225,437.51. PHMSA does not estimate that this will increase in any out-of-pocket expenses.

Annual Increase in Number of Respondents: 5,717.

¹⁹ Occupation labor rates based on 2017 Occupational and Employment Statistics Survey (OES) for “Electrical Engineers (17-2070)” in the Other Electrical Equipment and Component Manufacturing industry. The hourly mean wage for this occupation (\$45.78) is adjusted to reflect the total costs of employee compensation (i.e., benefits) based on the BLS Employer Costs for Employee Compensation Summary, which indicates that wages for civilian workers are 68.3 percent of total compensation (total wage = wage rate/wage % of total compensation).

Annual Increase in Number of Responses: 40,360.

Annual Increase in Burden Hours: 3,363.33.

Annual Increase in Salary Costs: \$225,437.51.

Annual Increase in Burden Costs: \$0.

PHMSA is also proposing additional requirements that would affect the burden for OMB Control No. 2137-0034, but PHMSA believes that the overall effect on the number of respondents and burden hours are negligible in relationship to the number of respondents and burden hours currently associated with this information collection. The requirements include proposing: to require “TEMPERATURE CONTROLLED” on a shipping paper if not already indicated in the proper shipping, when appropriate; to remove 1-dodecene to the list of marine pollutants in Appendix B to § 172.101; to reduce the information required on a Dangerous Cargo Manifest for excepted packages containing Class 7 materials transported by vessel.

OMB Control Number 2137-0557, “Approvals for Hazardous Materials”

We anticipate this NPRM will increase the overall burden for this information collection request. PHMSA is proposing to add special provision 347 to four entries on the HMT, which would require the articles to pass the 6(d) test from Part I of the UN Manual of Tests and Criteria to maintain Compatibility Group “S” classification. It is estimated that this will increase the number of annual respondents by 54. PHMSA estimates that each respondent will submit 10 applications each year, for a

total increase of 540 annual responses (54 respondents x 10 responses). PHMSA estimates that each application will take 4.75 hours to complete, for a total increase of 2,565 annual burden hours (2,500 response x 4.75 hours). At a mean hourly wage of \$79.06²⁰, PHMSA estimates an increase of \$202,797 in salary costs. PHMSA does not estimate any additional out-of-pocket expenses.

Annual Increase in Number of Respondents: 54.

Annual Increase in Number of Responses: 540.

Annual Increase in Burden Hours: 2,565.

Annual Increase in Salary Costs: \$202,797.

Annual Increase in Burden Costs: \$0.

PHMSA is also proposing additional requirements that would affect the burden for OMB Control No. 2137-0557, but PHMSA believes that the overall effect on the number of respondents and burden hours are negligible in relationship to the number of respondents and burden hours associated with this OMB Control Number. PHMSA expects a minimal increase due to the proposed revision of special provision A105, which would allow a person to obtain approval from the Associate Administrator for Hazardous Materials Safety if the quantity of hazardous materials exceeds the quantity limits and applicability provisions of § 173.222(c). PHMSA also expects a minimal

²⁰ Occupation labor rates based on 2017 Occupational and Employment Statistics Survey (OES) for “Chemical Engineers (17-2041)” in the Chemical Manufacturing industry. The hourly mean wage for this occupation (\$54) is adjusted to reflect the total costs of employee compensation based on the BLS Employer Costs for Employee Compensation Summary, which indicates that wages for civilian workers are 68.3 percent of total compensation (total wage = wage rate/wage % of total compensation).

decrease in the number of approval applicants based on the adoption of a new entry in the § 173.224 Self-Reactive Materials Table and the adoption of three new entries in the § 173.225 Organic Peroxide Table. Respondents wishing to offer these materials in transportation, are no longer required to obtain approval by the Associate Administrator for Hazardous Materials Safety.

OMB Control No. 2137-0572, "Testing Requirements for Non-Bulk Packaging (Formerly: Testing Requirements for Packaging)"

PHMSA estimates this rulemaking will result in an increase in burden due to the proposed requirement to include the water temperature during the hydraulic pressure test for plastic non-bulk packagings. PHMSA does not estimate an increase in the number of respondents or responses, because the proposed amendment only adds burden to persons currently pressure testing plastic non-bulk packagings.

PHMSA currently estimates that 5,000 respondents create 3 test reports per year, and that each test report takes 2 hours to complete. Based on the estimated percentage of respondents who currently requalify plastic non-bulk packagings, PHMSA estimates that it will take an average of 1 minute to add the water temperature on the requalification report, for an estimated increase of 250 burden hours. At a mean hourly wage of \$68.58²¹, it is estimated to increase annual salary costs of \$17,145.

²¹ Occupation labor rates based on 2017 Occupational and Employment Statistics Survey (OES) for "Transportation, Storage, and Distribution Managers (11-3071)" in the Transportation and Warehousing industry. The hourly mean wage for this occupation (\$48.43) is adjusted to reflect the total costs of employee compensation based on the BLS Employer Costs for Employee Compensation Summary, which indicates that wages for civilian workers are 68.3 percent of total compensation (total wage =

PHMSA does not anticipate this requirement to affect out-of-pocket expenses.

Annual Increase in Number of Respondents: 0.

Annual Increase in Number of Responses: 0.

Annual Increase in Burden Hours: 250.

Annual Increase in Salary Costs: \$17,145.

Annual Increase in Burden Costs: \$0.

OMB Control No. 2137-0559 "Rail Carrier and Tank Car Tank Requirements, Rail Tank Car Tanks – Transportation of Hazardous Materials by Rail"

PHMSA anticipates this NPRM will result in a decrease in burden because of the proposed requirement to recognize Transport Canada issued Temporary Certificates for one time movements of non-compliant tank cars, in lieu of a DOT-issued OTMA when the tank car shipment's origin or destination is in Canada. Data from the FRA indicates that in calendar year 2017 there were 214 one time movement requests for tank car shipments with an origin or destination in Canada. PHMSA estimates that half of these movements will operate under a Temporary Certificate issued by Transport Canada, and thus not require PHMSA approval. Therefore, PHMSA estimates there will be a decrease in 54 annual respondents. Each of these respondents is estimated to annually request two OTMAs, for a decrease of 108 responses. PHMSA estimates that each application requires 4.75 hours to complete, resulting in a reduction of 513 burden hours. At an estimated mean hourly wage of

wage rate/wage % of total compensation).

\$68.58²², this reduction is expected to save \$35,181.54 in salary cost. PHMSA estimates there is no reduction in out-of-pocket expenses.

Annual Decrease in Number of Respondents: 54.

Annual Decrease in Number of Responses: 108.

Annual Decrease in Burden Hours: 513.

Annual Decrease in Salary Costs: \$38,181.54.

Annual Decrease in Burden Costs: \$0.

Under the Paperwork Reduction Act of 1995, no person is required to respond to an information collection unless it has been approved by OMB and displays a valid OMB control number. Section 1320.8(d) of title 5 of the CFR requires that PHMSA provide interested members of the public and affected agencies and opportunity to comment on information and recordkeeping requests. PHMSA specifically requests comments on the information collection and recordkeeping burdens associated with developing, implementing, and maintaining these proposed requirements. Address written comments to the Dockets Unit as identified in the **ADDRESSES** section of this rulemaking. We must receive comments regarding information collection burdens prior to the close of the comment period identified in the **DATES** section of this rulemaking. In addition, you may submit comments specifically related to the

²² Occupation labor rates based on 2017 Occupational and Employment Statistics Survey (OES) for “Transportation, Storage, and Distribution Managers (11-3071)” in the Transportation and Warehousing industry. The hourly mean wage for this occupation (\$46.84) is adjusted to reflect the total costs of employee compensation based on the BLS Employer Costs for Employee Compensation Summary, which indicates that wages for civilian workers are 68.3 percent of total compensation (total wage = wage rate/wage % of total compensation).

information collection burden to the PHMSA Desk Officer, Office of Management and Budget, at fax number 202-395-674. Requests for a copy of this information collection should be directed to Steven Andrews or Shelby Geller, Standards and Rulemaking Division (PHH-10), Pipeline and Hazardous Materials Safety Administration, 1200 New Jersey Avenue S.E., Washington, DC 20590-0001. If these proposed requirements are adopted in a final rule, PHMSA will submit the revised information collection and recordkeeping requirements to OMB for approval.

H. Regulation Identifier Number (RIN)

A regulation identifier number (RIN) is assigned to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. The RIN contained in the heading of this document can be used to cross-reference this action with the Unified Agenda.

I. Unfunded Mandates Reform Act of 1995

This proposed rule does not impose unfunded mandates under the Unfunded Mandates Reform Act of 1995. It does not result in costs of \$160.8 million or more, adjusted for inflation, to either State, local, or tribal governments, in the aggregate, or to the private sector in any one year, and is the least burdensome alternative that achieves the objective of the rule.

J. Environmental Assessment

The National Environmental Policy Act of 1969, 42 U.S.C. 4321–4375, requires that Federal agencies analyze proposed actions to determine whether the action will have a significant impact on the human environment. The Council on Environmental Quality (CEQ) regulations that implement NEPA (40 CFR parts 1500–1508) require Federal agencies to conduct an environmental review considering (1) the need for the proposed action, (2) alternatives to the proposed action, (3) probable environmental impacts of the proposed action and alternatives, and (4) the agencies and persons consulted during the consideration process.

1. Purpose and Need

This NPRM would amend the HMR (49 CFR parts 171-180) to maintain alignment with international standards by incorporating the 20th Revised Edition of the UN Model Regulations, Amendment 39-18 to the IMDG Code, the 2019–2020 ICAO Technical Instructions, and Transport Canada’s newest amendments to TDG Regulations.

This action is necessary to incorporate changes adopted in the IMDG Code, the ICAO Technical Instructions, and the UN Model Regulations, effective January 1, 2019. If the changes in this proposed rule are not adopted in the HMR by this effective date, U.S. companies—including numerous small entities competing in foreign markets—would be at an economic disadvantage because of their need to comply with a dual system of regulations. The changes in this proposed rulemaking

are intended to avoid this result.

The intended effect of this action is to align the HMR with international transport standards and requirements to the extent practicable in accordance with Federal hazmat law (see 49 U.S.C. 5120). When considering the adoption of international standards under the HMR, PHMSA reviews and evaluates each amendment on its own merit, on its overall impact on transportation safety, and on the economic implications associated with its adoption. Our goal is to harmonize internationally without diminishing the level of safety currently provided by the HMR or imposing undue burdens on the regulated public. PHMSA has provided a brief summary of each revision and the justification for the revision.

2. Alternatives

In proposing this rulemaking, PHMSA is considering the following alternatives:

No Action Alternative

If PHMSA were to select the No Action Alternative, current regulations would remain in place and no new provisions would be added.

Preferred Alternative

This alternative is the current proposal as it appears in this NPRM, applying to transport of hazardous materials by various transport modes (highway, rail, vessel, and aircraft). The proposed amendments included in this alternative are more fully

addressed in the preamble and regulatory text sections of this NPRM. However, they generally include:

1) Updated references to various international hazardous materials transport standards;

2) Amendments to the Hazardous Materials Table to include twelve new N.O.S. entries for articles containing dangerous goods, as well as additional defining criteria, authorized packagings, and safety requirements for transportation of these articles;

3) Amendments to add, revise, or remove certain proper shipping names, packing groups, special provisions, packaging authorizations, bulk packaging requirements, and vessel stowage requirements. Additionally, changes throughout the packaging requirements in part 173 to authorize more flexibility when choosing packages for hazardous materials;

4) Changes to the corrosivity classification procedures to include methods that do not involve testing for making a corrosivity classification determination for mixtures;

5) The creation of a lithium cell or battery test summary; and

6) Amendments to the HMR regarding the segregation of lithium cells and batteries offered for transport or transported on aircraft in relation to other hazardous materials.

3. Probable Environmental Impact of the Alternatives

No Action Alternative

If PHMSA were to select the No Action Alternative, current regulations would remain in place and no new provisions would be added. However, efficiencies gained through harmonization with updates to international transport standards—including regulated substances, definitions, packagings, stowage requirements/codes, flexibilities allowed, enhanced markings, segregation requirements, etc.—would not be realized.

Additionally, the No Action Alternative would not adopt enhanced and clarified regulatory requirements, which are intended to decrease the risk of environmental and safety incidents. For example, updates to corrosivity classification requirements are intended to better ensure that hazardous materials in this hazard class are properly identified. The lithium battery test summary and the lithium battery segregation requirements are intended to provide added protections against the risks that lithium batteries pose to air transportation. Also, the vessel stowage requirements seek to better separate materials that may be reactive to reduce the risks of serious incidents. While these are only a few examples, the provisions proposed in this Notice have been developed and vetted by the U.S. and international experts responsible for the following hazardous materials standards: UN Model Regulations, ICAO Technical Instructions, IMDG Code, and the Transport Canada TDG Regulations. Not adopting the proposed environmental and safety requirements in the NPRM under the No Action Alternative would result in a lost opportunity for reducing environmental and safety-related incidents.

Greenhouse gas emissions would remain relatively the same under the No Action Alternative. However, it is expected that fewer incidents result in fewer emissions of greenhouse gases and other pollutants.

Preferred Alternative

If PHMSA selects the provisions as proposed in this NPRM, we believe that safety and environmental risks would be reduced and that protections to human health and environmental resources would be increased. Potential environmental impacts of each proposed amendment in the preferred alternative are discussed as follows:

1. *Incorporation by Reference*: PHMSA proposes to update references to various international hazardous materials transport standards including the 2019–2020 ICAO Technical Instructions; Amendment 39-18 to the IMDG Code; the 20th Revised Edition of the UN Model Regulations; amendment 1 to the 6th Revised Edition of the UN Manual of Tests and Criteria; and the latest amendments to the Transport Canada TDG Regulations. Additionally, we propose to add three new references to standards and update six other references to standards applicable to the manufacture use and requalification of pressure vessels published by the International Organization for Standardization.

PHMSA believes that this proposed amendment, which will increase standardization and consistency of regulations, will result in greater protection of human health and the environment. Consistency between U.S. and international regulations enhances the safety and environmental protection of international

hazardous materials transportation through better understanding of the regulations, an increased level of industry compliance, the smooth flow of hazardous materials from their points of origin to their points of destination, and consistent emergency response procedures in the event of a hazardous materials incident. The HMR authorize shipments prepared in accordance with the ICAO Technical Instructions from transport by aircraft and for transport by motor vehicle either before or after being transported by aircraft. Similarly, the HMR authorize shipments prepared in accordance with the IMDG Code if all or part of the transportation is by vessel. The authorizations to use the ICAO Technical Instructions and the IMDG Code are subject to certain conditions and limitations outlined in part 171 subpart C.

Harmonization will result in more targeted and effective training, thereby facilitating enhanced environmental protection. This proposed amendment will eliminate inconsistent hazardous materials regulations, which hamper compliance training efforts. For ease of compliance with appropriate regulations, air and vessel carriers engaged in the transportation of hazardous materials generally elect to comply with the ICAO Technical Instructions and IMDG Code, as appropriate.

Greenhouse gas emissions would remain the same under this proposed amendment.

2. Consistent with amendments adopted into the UN Model Regulations, PHMSA proposes to revise the Hazardous Materials Table in § 172.101 to include 12 new N.O.S. entries for articles containing dangerous goods and to add into the HMR defining criteria, authorized packagings, and safety requirements for transportation of

these articles. Inclusion of entries in the HMT reflects a degree of danger associated with a particular material and identifies appropriate packaging intended to reduce the likelihood of release of hazardous materials that threaten human health and safety and the environment. This proposed change provides a level of protection and consistency for all articles specifically listed in the HMT, without diminishing environmental protection and safety.

Greenhouse gas emissions would remain the same under this proposed amendment.

3. *PHMSA proposes amendments to the HMT to add, revise, or remove certain proper shipping names, packing groups, special provisions, packaging authorizations, bulk packaging requirements, and vessel stowage requirements. Amendments to HMT proper shipping names include: requiring additional 6(d) testing for certain explosive articles; adding an entry for “Lithium batteries installed in cargo transport unit”; and adding two new entries for “Toxic solid, flammable, inorganic, n.o.s.” Additionally, we also propose to add and revise special provisions, large packaging authorizations, and intermediate bulk container (IBC) authorizations consistent with the UN Model Regulations to provide a wider range of packaging options to shippers of hazardous materials.*

Inclusion of entries in the HMT reflects a degree of danger associated with a particular material and identifies appropriate packaging. These proposed inclusions in the HMT provide a greater level of protection against release and consistency across borders.

4. *Changes to the corrosivity classification procedures to include methods that do not involve testing for making a corrosivity classification determination for mixtures.*

PHMSA believes that this proposed amendment permits additional flexibility for classifying corrosive mixtures and allows offerors the ability to make a classification and packing group assignment without having to conduct physical tests. This allowance does not compromise environmental protection or safety. Increased use of not-test methods for classification of mixtures results in less product being utilized to conduct physical testing, less clean-up and disposal that occurs after testing, which provide environmental benefits along with expanded alternatives to traditional testing methods.

5. *Consistent with amendments adopted into the UN Model Regulations, PHMSA proposes to require the creation of a lithium cell or battery test summary.*

PHMSA believes that these proposed amendments provide important additional information to downstream shippers and consumers of lithium batteries, including a standardized set of elements that provide traceability and accountability that lithium cells and batteries offered for transport meet the appropriate UN design tests. Testing standards for lithium batteries help ensure design types are subject to as many as eight separate tests designed to assess their ability to withstand the anticipated rigors incurred during transport. Increased availability of documentation indicating that cells and batteries are of a tested type could lead to a decrease in the number of illegitimate lithium batteries that can present a hazard to users and the environment.

6. Amendments to the HMR regarding the segregation of lithium cells and batteries offered for transport or transported on aircraft in relation to other hazardous materials.

PHMSA believes that the proposed amendments requiring lithium batteries to be segregated from other listed dangerous goods would enhance safety and environmental protection by decreasing the risk posed by a fire involving lithium batteries or another dangerous good. The segregation requirements are intended to avoid the cumulative effects of a fire involving both goods simultaneously. PHMSA believes that this proposed amendment would provide for a net increase in environmental protection and safety by potentially lessening the severity of a fire aboard an aircraft, thus preventing release and damage to human health and the natural environment.

Summary

In summary, consistency between these international regulations and the HMR allows shippers and carriers to train their hazmat employees in a single set of requirements for classification, packaging, hazard communication, handling, stowage, etc., thereby minimizing the possibility of improperly preparing and transporting a shipment of hazardous materials because of differences between domestic and international regulations. These proposed changes mirror changes in the Dangerous Goods List of the 20th Revised Edition of the UN Model Regulations, the 2019–2020 ICAO Technical Instructions, and Amendment 39-18 to the IMDG Code. It is extremely important for the domestic HMR to mirror these international standards

regarding the entries in the HMT to ensure consistent naming conventions across modes and international borders.

In some instances, the proposed changes in this Notice may result in a streamlining or reduction in burden to industry. However, in each case, PHMSA believes that those changes are consistent with safety and will not significantly increase the risk of release. Most of the proposed regulations in this Notice increase protections aimed at avoiding safety and environmental risks.

Greenhouse gas emissions would not significantly increase under this proposed amendment, but fewer incidents are expected to result in fewer emissions of greenhouse gases and other pollutants.

4. Agencies Consulted

This NPRM represents PHMSA's first action in the U.S. for this program area. PHMSA has coordinated with the U.S. Federal Aviation Administration, the Federal Motor Carrier Safety Administration, the Federal Railroad Administration, and the U.S. Coast Guard, in the development of this proposed rule. PHMSA will consider the views expressed in comments to the NPRM submitted by members of the public, state and local governments, and industry.

5. Conclusion

The provisions of this proposed rule build on current regulatory requirements in order to enhance the transportation safety and security of shipments of hazardous

materials transported by highway, rail, aircraft, and vessel, thereby reducing the risks of an accidental or intentional release of hazardous materials and consequent environmental damage. PHMSA proposes to find that the net environmental impact of this proposal will be positive and that there are no significant environmental impacts associated with this proposed rule. PHMSA welcomes any views, data, or information related to environmental impacts that may result if the proposed requirements are adopted, as well as the “no action alternative” and other viable alternatives and their environmental impacts.

K. Privacy Act

Anyone is able to search the electronic form of any written communications and comments received into any of our dockets by the name of the individual submitting the document (or signing the document, if submitted on behalf of an association, business, labor union, etc.). You may review DOT’s complete Privacy Act Statement in the Federal Register published on April 11, 2000 (65 FR 19477), or you may visit <http://www.dot.gov/privacy.html>.

L. Executive Order 13609 and International Trade Analysis

Under Executive Order 13609 (“Promoting International Regulatory Cooperation”), agencies must consider whether the impacts associated with significant variations between domestic and international regulatory approaches are unnecessary or may impair the ability of American business to export and compete internationally.

In meeting shared challenges involving health, safety, labor, security, environmental, and other issues, international regulatory cooperation can identify approaches that are at least as protective as those that are or would be adopted in the absence of such cooperation. International regulatory cooperation can also reduce, eliminate, or prevent unnecessary differences in regulatory requirements.

Similarly, the Trade Agreements Act of 1979 (Public Law 96-39), as amended by the Uruguay Round Agreements Act (Public Law 103-465), prohibits Federal agencies from establishing any standards or engaging in related activities that create unnecessary obstacles to the foreign commerce of the United States. For purposes of these requirements, Federal agencies may participate in the establishment of international standards, so long as the standards have a legitimate domestic objective, such as providing for safety, and do not operate to exclude imports that meet this objective. The statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards.

PHMSA participates in the establishment of international standards to protect the safety of the American public, and it has assessed the effects of the proposed rule to ensure that it does not cause unnecessary obstacles to foreign trade. In fact, the rule is designed to facilitate international trade. Accordingly, this rulemaking is consistent with Executive Order 13609 and PHMSA's obligations under the Trade Agreement Act, as amended.

M. National Technology Transfer and Advancement Act

The National Technology Transfer and Advancement Act of 1995 (15 U.S.C. 272 note) directs Federal agencies to use voluntary consensus standards in their regulatory activities unless doing so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., specification of materials, test methods, or performance requirements) that are developed or adopted by voluntary consensus standard bodies. This NPRM involves multiple voluntary consensus standards which are discussed at length in the discussion on § 171.7.

List of Subjects

49 CFR Part 171

Exports, Hazardous materials transportation, Hazardous waste, Imports, Incorporation by reference, Reporting and recordkeeping requirements.

49 CFR Part 172

Education, Hazardous materials transportation, Hazardous waste, Incorporation by reference, Labeling, Markings, Packaging and containers, Reporting and recordkeeping requirements.

49 CFR Part 173

Hazardous materials transportation, Incorporation by reference, Packaging and containers, Radioactive materials, Reporting and recordkeeping requirements,

Uranium.

49 CFR Part 174

Hazardous materials transportation, Rail carriers, Reporting and recordkeeping requirements, Security measures.

49 CFR Part 175

Air carriers, Hazardous materials transportation, Radioactive materials, Reporting and recordkeeping requirements.

49 CFR Part 176

Maritime carriers, Hazardous materials transportation, Incorporation by reference, Radioactive materials, Reporting and recordkeeping requirements.

49 CFR Part 178

Hazardous materials transportation, Incorporation by reference, Motor vehicle safety, Packaging and containers, Reporting and recordkeeping requirements.

49 CFR Part 180

Hazardous materials transportation, Motor carriers, Motor vehicle safety, Packaging and containers, Railroad safety, Reporting and recordkeeping requirements.

In consideration of the foregoing, PHMSA proposes to amend 49 CFR chapter I as follows:

PART 171—GENERAL INFORMATION, REGULATIONS, AND DEFINITIONS

1. The authority citation for part 171 continues to read as follows:

Authority: 49 U.S.C. 5101–5128, 44701; Pub. L. 101-410 section 4 (28 U.S.C. 2461 note); Pub. L. 104-134, section 31001; 49 CFR 1.81 and 1.97.

2. In § 171.7:

- a. Paragraph (s)(2) is added;
- b. Paragraphs (t)(1), (v)(2), (w)(1) through (68) are revised;
- c. Paragraphs (w)(69) through (77) are added;
- d. Paragraphs (aa)(1) through (4) are revised;
- e. Paragraphs (bb)(1) (xx), (xxi), and (xxii) and (bb)(2) are added; and
- d. Paragraphs (dd)(1) through (3) are revised.

The revisions and additions to read as follows:

§ 171.7 Reference material.

* * * * *

(s) * * *

(2) Code of Conduct on the Safety and Security of Radioactive Sources (International Atomic Energy Agency Code of Conduct), 2004, into § 172.800.

(t) * * *

(1) Technical Instructions for the Safe Transport of Dangerous Goods by Air (ICAO Technical Instructions), 2019-2020 Edition, copyright 2018, into §§171.8; 171.22; 171.23; 171.24; 172.101; 172.202; 172.401; 172.512; 172.519; 172.602;

173.56; 173.320; 175.10, 175.33; 178.3.

* * * * *

(v) * * *

(2) International Maritime Dangerous Goods Code (IMDG Code),
Incorporating Amendment 39-18 (English Edition), 2018 Edition, into §§171.22;
171.23; 171.25; 172.101; 172.202; 172.203 172.401; 172.502; 172.519; 172.602;
173.21; 173.56; 176.2; 176.5; 176.11; 176.27; 176.30; 176.83; 176.84; 176.140;
176.720; 176.906; 178.3; 178.274.

(w) * * *

(1) ISO 535-1991(E) Paper and board—Determination of water
absorptiveness—Cobb method, 1991, into §§178.707; 178.708; 178.516.

(2) ISO 1496-1: 1990 (E)—Series 1 freight containers—Specification and
testing, Part 1: General cargo containers. Fifth Edition, (August 15, 1990), into
§173.411.

(3) ISO 1496-3(E)—Series 1 freight containers—Specification and testing—
Part 3: Tank containers for liquids, gases and pressurized dry bulk, Fourth edition,
March 1995, into §§178.74; 178.75; 178.274.

(4) ISO 1516:2002(E), Determination of flash/no flash—Closed cup
equilibrium method, Third Edition, 2002-03-01, into §173.120.

(5) ISO 1523:2002(E), Determination of flash point—Closed cup equilibrium
method, Third Edition, 2002-03-01, into §173.120.

- (6) ISO 2431-1984(E) Standard Cup Method, 1984, into §173.121.
- (7) ISO 2592:2000(E), Determination of flash and fire points—Cleveland open cup method, Second Edition, 2000-09-15, into §173.120.
- (8) ISO 2719:2002(E), Determination of flash point—Pensky-Martens closed cup method, Third Edition, 2002-11-15, into §173.120.
- (9) ISO 2919:1999(E), Radiation Protection—Sealed radioactive sources—General requirements and classification, (ISO 2919), second edition, February 15, 1999, into §173.469.
- (10) ISO 3036-1975(E) Board—Determination of puncture resistance, 1975, into §178.708.
- (11) ISO 3405:2000(E), Petroleum products—Determination of distillation characteristics at atmospheric pressure, Third Edition, 2000-03-01, into §173.121.
- (12) ISO 3574-1986(E) Cold-reduced carbon steel sheet of commercial and drawing qualities, into §178.503; part 178, appendix C.
- (13) ISO 3679:2004(E), Determination of flash point—Rapid equilibrium closed cup method, Third Edition, 2004-04-01, into §173.120.
- (14) ISO 3680:2004(E), Determination of flash/no flash—Rapid equilibrium closed cup method, Fourth Edition, 2004-04-01, into §173.120.

(15) ISO 3807-2(E), Cylinders for acetylene—Basic requirements—Part 2: Cylinders with fusible plugs, First edition, March 2000, into §§173.303; 178.71.

(16) ISO 3807:2013(E), Gas cylinders—Acetylene cylinders—Basic requirements and type testing, Second edition, 2013-09-01, into §§173.303; 178.71.

(17) ISO 3924:1999(E), Petroleum products—Determination of boiling range distribution—Gas chromatography method, Second Edition, 1999-08-01, into §173.121.

(18) ISO 4126-1:2004(E): Safety devices for protection against excessive pressure—Part 1: Safety valves, Second edition 2004-02-15, into §178.274.

(19) ISO 4126-7:2004(E): Safety devices for protection against excessive pressure—Part 7: Common data, First Edition 2004-02-15 into §178.274.

(20) ISO 4126-7:2004/Cor.1:2006(E): Safety devices for protection against excessive pressure—Part 7: Common data, Technical Corrigendum 1, 2006-11-01, into §178.274.

(21) ISO 4626:1980(E), Volatile organic liquids—Determination of boiling range of organic solvents used as raw materials, First Edition, 1980-03-01, into §173.121.

(22) ISO 4706:2008(E), Gas cylinders—Refillable welded steel cylinders—Test pressure 60 bar and below, First Edition, 2008-07-014, Corrected Version, 2008-07-01, into §178.71.

(23) ISO 6406(E), Gas cylinders—Seamless steel gas cylinders—Periodic inspection and testing, Second edition, February 2005, into §180.207.

(24) ISO 6892 Metallic materials—Tensile testing, July 15, 1984, First Edition, into §178.274.

(25) ISO 7225(E), Gas cylinders—Precautionary labels, Second Edition, July 2005, into §178.71.

(26) ISO 7866(E), Gas cylinders—Refillable seamless aluminum alloy gas cylinders—Design, construction and testing, First edition, June 1999, into §178.71.

(27) ISO 7866:2012(E), Gas cylinders—Refillable seamless aluminium alloy gas cylinders—Design, construction and testing, Second edition, 2012-09-01, into §178.71.

(28) ISO 7866:2012/Cor.1:2014(E), Gas cylinders — Refillable seamless aluminium alloy gas cylinders — Design, construction and testing, Technical Corrigendum 1, 2014-04-15, into §178.71.

(29) ISO 8115 Cotton bales—Dimensions and density, 1986 Edition, into §172.102.

(30) ISO 9809-1:1999(E): Gas cylinders—Refillable seamless steel gas cylinders—Design, construction and testing—Part 1: Quenched and tempered steel cylinders with tensile strength less than 1100 MPa., First edition, June 1999, into §§178.37; 178.71; 178.75.

(31) ISO 9809-1:2010(E): Gas cylinders—Refillable seamless steel gas cylinders—Design, construction and testing—Part 1: Quenched and tempered steel cylinders with tensile strength less than 1 100 MPa., Second edition, 2010-04-15, into §§178.37; 178.71; 178.75.

(32) ISO 9809-2:2000(E): Gas cylinders—Refillable seamless steel gas cylinders—Design, construction and testing—Part 2: Quenched and tempered steel cylinders with tensile strength greater than or equal to 1 100 MPa., First edition, June 2000, into §§178.71; 178.75.

(33) ISO 9809-2:2010(E): Gas cylinders—Refillable seamless steel gas cylinders—Design, construction and testing—Part 2: Quenched and tempered steel cylinders with tensile strength greater than or equal to 1100 MPa., Second edition, 2010-04-15, into §§178.71; 178.75.

(34) ISO 9809-3:2000(E): Gas cylinders—Refillable seamless steel gas cylinders—Design, construction and testing—Part 3: Normalized steel cylinders, First edition, December 2000, into §§178.71; 178.75.

(35) ISO 9809-3:2010(E): Gas cylinders—Refillable seamless steel gas cylinders—Design, construction and testing—Part 3: Normalized steel cylinders, Second edition, 2010-04-15, into §§178.71; 178.75.

(36) ISO 9809-4:2014(E), Gas cylinders—Refillable seamless steel gas cylinders—Design, construction and testing—Part 4: Stainless steel cylinders with an Rm value of less than 1 100 MPa, First edition, 2014-07-15, into §§178.71; 178.75.

(37) ISO 9978:1992(E)—Radiation protection—Sealed radioactive sources—Leakage test methods. First Edition, (February 15, 1992), into §173.469.

(38) ISO 10156:2010(E): Gases and gas mixtures—Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets, Third edition, 2010-04-01, into §173.115.

(39) ISO 10156:2010/Cor.1:2010(E): Gases and gas mixtures—Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets, Technical Corrigendum 1, 2010-09-01, into §173.115.

(40) ISO 10297:1999(E), Gas cylinders—Refillable gas cylinder valves—Specification and type testing, First Edition, 1995-05-01, into §§173.301b; 178.71.

(41) ISO 10297:2006(E), Transportable gas cylinders—Cylinder valves—Specification and type testing, Second Edition, 2006-01-15, into §§173.301b; 178.71.

(42) ISO 10297:2014(E), Gas cylinders—Cylinder valves—Specification and type testing, Third Edition, 2014-07-15, into §§173.301b; 178.71.

(43) ISO 10461:2005(E), Gas cylinders—Seamless aluminum-alloy gas cylinders—Periodic inspection and testing, Second Edition, 2005-02-15 and Amendment 1, 2006-07-15, into §180.207.

(44) ISO 10462 (E), Gas cylinders—Transportable cylinders for dissolved acetylene—Periodic inspection and maintenance, Second edition, February 2005, into §180.207.

(45) ISO 10462:2013(E), Gas cylinders—Acetylene cylinders—Periodic inspection and maintenance, Third edition, 2013-12-15, into §180.207.

(46) ISO 10692-2:2001(E), Gas cylinders—Gas cylinder valve connections for use in the micro-electronics industry—Part 2: Specification and type testing for valve to cylinder connections, First Edition, 2001-08-01, into §§173.40; 173.302c.

(47) ISO 11114-1:2012(E), Gas cylinders—Compatibility of cylinder and valve materials with gas contents—Part 1: Metallic materials, Second edition, 2012-03-15, into §§172.102; 173.301b; 178.71.

(48) ISO 11114-2:2013(E), Gas cylinders—Compatibility of cylinder and valve materials with gas contents—Part 2: Non-metallic materials, Second edition, 2013-04-01, into §§173.301b; 178.71.

(49) ISO 11117:1998(E): Gas cylinders—Valve protection caps and valve guards for industrial and medical gas cylinders.—Design, construction and tests, First edition, 1998-08-01, into §173.301b.

(50) ISO 11117:2008(E): Gas cylinders—Valve protection caps and valve guards—Design, construction and tests, Second edition, 2008-09-01, into §173.301b.

(51) ISO 11117:2008/Cor.1:2009(E): Gas cylinders—Valve protection caps and valve guards—Design, construction and tests, Technical Corrigendum 1, 2009-05-01, into §173.301b.

(52) ISO 11118(E), Gas cylinders—Non-refillable metallic gas cylinders—Specification and test methods, First edition, October 1999, into §178.71.

(53) ISO 11118(E), Gas cylinders—Non-refillable metallic gas cylinders—Specification and test methods, Second edition, 2015-09-15, into §178.71.

(54) ISO 11119-1(E), Gas cylinders—Gas cylinders of composite construction—Specification and test methods—Part 1: Hoop-wrapped composite gas cylinders, First edition, May 2002, into §178.71.

(55) ISO 11119-1:2012(E), Gas cylinders—Refillable composite gas cylinders and tubes—Design, construction and testing— Part 1: Hoop wrapped fibre reinforced composite gas cylinders and tubes up to 450 l, Second edition, 2012-08-01, into §178.71.

(56) ISO 11119-2(E), Gas cylinders—Gas cylinders of composite construction—Specification and test methods—Part 2: Fully wrapped fibre reinforced composite gas cylinders with load-sharing metal liners, First edition, May 2002, into §178.71.

(57) ISO 11119-2:2012(E), Gas cylinders—Refillable composite gas cylinders and tubes—Design, construction and testing—Part 2: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 l with load-sharing metal liners, Second edition, 2012-07-15, into §178.71.

(58) ISO 11119-2:2012/Amd.1:2014(E), Gas cylinders—Refillable composite gas cylinders and tubes—Design, construction and testing—Part 2: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 l with load-sharing metal liners, Amendment 1, 2014-08-15, into §178.71.

(59) ISO 11119-3(E), Gas cylinders of composite construction—Specification and test methods—Part 3: Fully wrapped fibre reinforced composite gas cylinders with non-load-sharing metallic or non-metallic liners, First edition, September 2002, into §178.71.

(60) ISO 11119-3:2013(E), Gas cylinders— Refillable composite gas cylinders and tubes—Design, construction and testing—Part 3: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 l with non-load-sharing metallic or non-metallic liners, Second edition, 2013-04-15, into §178.71.

(61) ISO 11120(E), Gas cylinders—Refillable seamless steel tubes of water capacity between 150 L and 3000 L—Design, construction and testing, First edition, March 1999, into §§178.71; 178.75.

(62) ISO 11120(E), Gas cylinders — Refillable seamless steel tubes of water capacity between 150 l and 3000 l — Design, construction and testing, Second Edition, 2015-02-01, into §§178.71; 178.75.

(63) ISO 11513:2011(E), Gas cylinders—Refillable welded steel cylinders containing materials for sub-atmospheric gas packaging (excluding acetylene)—

Design, construction, testing, use and periodic inspection, First edition, 2011-09-12, into §§173.302c; 178.71; 180.207.

(64) ISO 11621(E), Gas cylinders—Procedures for change of gas service, First edition, April 1997, into §§173.302, 173.336, 173.337.

(65) ISO 11623(E), Transportable gas cylinders—Periodic inspection and testing of composite gas cylinders, First edition, March 2002, into §180.207.

(66) ISO 11623(E), Transportable gas cylinders—Periodic inspection and testing of composite gas cylinders, Second edition, 2015-12-01, into §180.207.

(67) ISO 13340:2001(E) Transportable gas cylinders—Cylinder valves for non-refillable cylinders—Specification and prototype testing, First edition, 2004-04-01, into §§173.301b; 178.71.

(68) ISO 13736:2008(E), Determination of flash point—Abel closed-cup method, Second Edition, 2008-09-15, into §173.120.

(69) ISO 14246:2014(E), Gas cylinders—Cylinder valves—Manufacturing tests and examination, Second Edition, 2014-06-15, into § 178.71.

(70) ISO 16111:2008(E), Transportable gas storage devices—Hydrogen absorbed in reversible metal hydride, First Edition, 2008-11-15, into §§173.301b; 173.311; 178.71.

(71) ISO 16148:2016(E), Gas cylinders—Refillable seamless steel gas cylinders and tubes—Acoustic emission examination (AT) and follow-up ultrasonic

examination (UT) for periodic inspection and testing, Second Edition, 2016-04-15, into § 180.207.

(72) ISO 17871:2015(E), Gas cylinders — Quick-release cylinder valves — Specification and type testing, First Edition, 2015-08-15, into 173.301.

(73) ISO 18172-1:2007(E), Gas cylinders—Refillable welded stainless steel cylinders—Part 1: Test pressure 6 MPa and below, First Edition, 2007-03-01, into §178.71.

(74) ISO 20703:2006(E), Gas cylinders—Refillable welded aluminum-alloy cylinders—Design, construction and testing, First Edition, 2006-05-01, into §178.71.

(75) ISO 21172-1:2015(E), Gas cylinders — Welded steel pressure drums up to 3 000 litres capacity for the transport of gases — Design and construction —Part 1: Capacities up to 1 000 litres, First edition, 2015-04-01, into §178.71

(76) ISO 22434:2006(E), Transportable gas cylinders—Inspection and maintenance of cylinder valves, First Edition, 2006-09-01, into §180.207.

(77) ISO/TR 11364:2012(E), Gas cylinders—Compilation of national and international valve system/gas cylinder neck threads and their identification and marking system, First Edition, 2012-12-01, into § 178.71.

* * * * *

(aa) * * *

(1) Test No. 404: Acute Dermal Irritation/Corrosion, OECD Guidelines for the Testing of Chemicals, Section 4: Health Effects, adopted 28 July 2015, into §173.137.

(2) Test No. 430: In Vitro Skin Corrosion: Transcutaneous Electrical Resistance Test (TER), OECD Guidelines for the Testing of Chemicals, Section 4: Health Effects, adopted 28 July 2015, into §173.137.

(3) Test No. 431: In Vitro Skin Corrosion: Reconstructed Human Epidermis (RHE) Test Method, OECD Guidelines for the Testing of Chemicals, Section 4: Health Effects, adopted 28 July 2015, into §173.137.

(4) Test No. 435: In Vitro Membrane Barrier Test Method for Skin Corrosion, OECD Guidelines for the Testing of Chemicals, Section 4: Health Effects, adopted 28 July 2015, into §173.137.

(bb) * * *

(1) * * *

(xx) SOR/2016-95 June 1, 2016; and SOR/2017-253 published December 13, 2017.

(xxi) SOR/2017-137 July 12, 2017.

(xxii) SOR/2017-253 December 13, 2017.

(2) Containers for Transport of Dangerous Goods by Rail, TP 14877E, 12/2013, into §171.12.

* * * * *

(dd) * * *

(1) UN Recommendations on the Transport of Dangerous Goods, Model Regulations (UN Recommendations), 20th revised edition, Volumes I and II (2017), into §§171.8; 171.12; 172.202; 172.401; 172.407; 172.502; 173.22; 173.24; 173.24b; 173.40; 173.56; 173.192; 173.302b; 173.304b; 178.75; 178.274.

(2) UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria, (Manual of Tests and Criteria), into §§171.24, 172.102; 173.21; 173.56; 173.57; 173.58; 173.60; 173.115; 173.124; 173.125; 173.127; 173.128; 173.137; 173.185; 173.220; 173.221; 173.225, part 173, appendix H; 176.905; 178.274:

(i) Sixth Revised Edition (2015)

(ii) Sixth Revised Edition, Amendment 1 (2017)

(3) UN Recommendations on the Transport of Dangerous Goods, Globally Harmonized System of Classification and Labelling of Chemicals (GHS), Seventh Revised Edition (2017), into §172.401.

* * * * *

3. In § 171.8, a definition for “UN Pressure drum” is added in alphabetical order, and the definition of “UN pressure receptacle” is revised to read as follows:

§ 171.8 Definitions and abbreviations.

* * * * *

UN pressure drum means a welded transportable pressure receptacle of a water capacity exceeding 150 l (39.6 gallons) and not more than 1,000 l (264.2 gallons) (e.g. cylindrical receptacles equipped with rolling hoops, spheres on skids).

UN pressure receptacle means a UN cylinder, drum, or tube.

* * * * *

4. In § 171.12, paragraphs (a)(1) and (a)(3)(v) are revised to read as follows:

§ 171.12 North American Shipments.

(a) * * *

(1) A hazardous material transported from Canada to the United States, from the United States to Canada, or transiting the United States to Canada or a foreign destination may be offered for transportation or transported by motor carrier and rail in accordance with the Transport Canada TDG Regulations (IBR, see § 171.7) or an equivalency certificate (permit for equivalent level of safety) issued by Transport Canada as an alternative to the TDG Regulations, as authorized in § 171.22, provided the requirements in §§ 171.22 and 171.23, as applicable, and this section are met. In addition, a cylinder, MEGC, cargo tank motor vehicle, portable tank or rail tank car authorized by the Transport Canada TDG Regulations may be used for transportation to, from, or within the United States provided the cylinder, MEGC, cargo tank motor vehicle, portable tank or rail tank car conforms to the applicable requirements of this section. Except as otherwise provided in this subpart and subpart C of this part, the

requirements in parts 172, 173, and 178 of this subchapter do not apply for a material transported in accordance with the Transport Canada TDG Regulations.

* * * * *

(3) * * *

(v) Rail tank cars must conform to the requirements of Containers for Transport of Dangerous Goods by Rail (IBR, see §171.7).

* * * * *

PART 172—HAZARDOUS MATERIALS TABLE, SPECIAL PROVISIONS, HAZARDOUS MATERIALS COMMUNICATIONS, EMERGENCY RESPONSE INFORMATION, AND TRAINING REQUIREMENTS

5. The authority citation for part 172 continues to read as follows:

Authority: 49 U.S.C. 5101–5128, 44701; 49 CFR 1.81, 1.96 and 1.97.

6. In § 172.101:

a. Paragraph (e) is revised;

b. The Hazardous Materials Table is amended by removing the entries under “[REMOVE]”, by adding the entries under “[ADD]” and revising entries under “[REVISE]” in the appropriate alphabetical sequence; and

c. In appendix B to § 172.101, the List of Marine Pollutants is amended by revising the entry for Dodecene.

The revisions and additions read as follows:

§ 172.101 Purpose and use of the hazardous materials table.

* * * * *

(e) *Column 4: Identification number.* Column 4 lists the identification number assigned to each proper shipping name. Those preceded by the letters “UN” are associated with proper shipping names considered appropriate for international transportation as well as domestic transportation. Those preceded by the letters “NA” are associated with proper shipping names not recognized for transportation outside of the United States. Identification numbers in the “NA9000” series are associated with proper shipping names not appropriately covered by international hazardous materials (dangerous goods) transportation standards, or not appropriately addressed by international transportation standards for emergency response information purposes, except for transportation in the United States. Those preceded by the letters “ID” are associated with proper shipping names recognized by the ICAO Technical Instructions (IBR, see § 171.7 of this subchapter).

* * * * *

Sym-bols	Hazardous materials descriptions and proper shipping names	Hazard class or division	Identification Numbers	PG	Label Codes	Special Provisions (§ 172.102)	(8)			(9)		(10)	
							Packaging (§ 173.***)			Quantity limitations (see §§ 173.27 and 175.75)		Vessel stowage	
							Excep-tions	Non-bulk	Bulk	Passenger aircraft/rail	Cargo aircraft only	Location	Other
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8A)	(8B)	(8C)	(9A)	(9B)	(10A)	(10B)
	[REMOVE]												
	*		*		*		*		*		*		*
	Chemical kits	9	UN3316	II	9	15	161	161	None	10 kg	10 kg	A	
				III	9	15	161	161	None	10 kg	10 kg	A	
	*		*		*		*		*		*		*
	First aid kits	9	UN3316	II	9	15	161	161	None	10 kg	10 kg	A	
	First aid kits	9	UN3316	III	9	15	161	161	None	10 kg	10 kg	A	
	*		*		*		*		*		*		*
	2-Dimethylaminoethyl acrylate	6.1	UN3302	II	6.1	IB2, T7, TP2	153	202	243	5 L	60 L	D	25
	*		*		*		*		*		*		*
	[ADD]												
	*		*		*		*		*		*		*
G	Articles containing a substance liable to spontaneous combustion, n.o.s.	4.2	UN3542			131, 391	None	214	214	Forbidden	Forbidden		
G	Articles containing a substance which emits flammable gas in contact with water, n.o.s.	4.3	UN3543			131, 391	None	214	214	Forbidden	Forbidden		
G	Articles containing corrosive substance, n.o.s.	8	UN3547			391	None	232	232	Forbidden	Forbidden	B	
G	Articles containing flammable gas, n.o.s.	2.1	UN3537			391	None	232	232	Forbidden	Forbidden	D	
G	Articles containing flammable liquid, n.o.s.	3	UN3540			391	None	232	232	Forbidden	Forbidden	B	
G	Articles containing flammable solid, n.o.s.	4.1	UN3541			391	None	232	232	Forbidden	Forbidden	B	

G	Articles containing miscellaneous dangerous goods, n.o.s.	9	UN3548			391	None	232	232	Forbidden	Forbidden	A	
G	Articles containing non-flammable, non-toxic gas, n.o.s.	2.2	UN3538			391	None	232	232	Forbidden	Forbidden	A	
G	Articles containing organic peroxide, n.o.s.	5.2	UN3545			131, 391	None	214	214	Forbidden	Forbidden		
G	Articles containing oxidizing substance, n.o.s.	5.1	UN3544			131, 391	None	214	214	Forbidden	Forbidden		
G	Articles containing toxic gas, n.o.s.	2.3	UN3539			131, 391	None	214	214	Forbidden	Forbidden		
G	Articles containing toxic substance, n.o.s.	6.1	UN3546			391	None	232	232	Forbidden	Forbidden	B	
	*		*		*		*		*		*		*
	Chemical kit	9	UN3316		9	15	161	161	None	10 kg	10 kg	A	
	*		*		*		*		*		*		*
	2-Dimethylaminoethyl acrylate, stabilized	6.1	UN3302	II	6.1	387, IB2, T7, TP2	153	202	243	5 L	60 L	D	25
	*		*		*		*		*		*		*
	First aid kit	9	UN3316		9	15	161	161	None	10 kg	10 kg	A	
	*		*		*		*		*		*		*
	Lithium batteries installed in cargo transport unit <i>lithium ion batteries or lithium metal batteries</i>	9	UN3536			389				Forbidden	Forbidden	A	
	*		*		*		*		*		*		*
G	Toxic solid, flammable, inorganic, n.o.s.	6.1	UN3535	I	6.1, 4.1	IB6, T6, TP33	None	211	242	1 kg	15 kg	B	
				II	6.1, 4.1	IB8, IP2, IP4, T3, TP33	153	212	242	15 kg	50 kg	B	
	*		*		*		*		*		*		*
	[REVISE]												

	*		*		*		*		*		*		*
Acetic acid, glacial or Acetic acid solution, with more than 80 percent acid, by mass	8	UN2789	II	8, 3	A3, A6, A7, A10, B2, IB2, T7, TP2	154	202	243	1 L	30 L	A	53, 58	
Acetic acid solution, not less than 50 percent but not more than 80 percent acid, by mass	8	UN2790	II	8	148, A3, A6, A7, A10, B2, IB2, T7, TP2	154	202	242	1 L	30 L	A	53, 58	
Acetic acid solution, with more than 10 percent and less than 50 percent acid, by mass	8	UN2790	III	8	148, IB3, T4, TP1	154	203	242	5 L	60 L	A	53, 58	
Acetic anhydride	8	UN1715	II	8, 3	A3, A6, A7, A10, B2, IB2, T7, TP2	154	202	243	1 L	30 L	A	40, 53, 58	
	*		*		*		*		*		*		*
Acetyl bromide	8	UN1716	II	8	B2, IB2, T8, TP2	154	202	242	1 L	30 L	C	40, 53, 58	
Acetyl chloride	3	UN1717	II	3, 8	A3, A6, A7, IB1, N34, T8, TP2	150	202	243	1 L	5 L	B	40, 53, 58	
	*		*		*		*		*		*		*
Acetyl iodide	8	UN1898	II	8	B2, IB2, T7, TP2, TP13	154	202	242	1 L	30 L	C	40, 53, 58	
	*		*		*		*		*		*		*
Acrylic acid, stabilized	8	UN2218	II	8, 3	387, B2, IB2, T7, TP2	154	202	243	1 L	30 L	C	25, 40, 53, 58	
	*		*		*		*		*		*		*
Adhesives, containing a flammable liquid	3	UN1133	I	3	T11, TP1, TP8, TP27	150	201	243	1 L	30 L	B		
			II	3	149, B52, IB2, T4, TP1, TP8	150	173	242	5 L	60 L	B		
			III	3	B1, B52, IB3, T2, TP1	150	173	242	60 L	220 L	A		
	*		*		*		*		*		*		*
Alkali metal amalgam, solid	4.3	UN3401	I	4.3	IB4, IP1, N40, T9, TP7, TP33, W31	None	211	242	Forbidden	15 kg	D	13, 52, 148	
	*		*		*		*		*		*		*
Alkaline earth metal amalgams, solid	4.3	UN3402	I	4.3	A19, N34, N40, T9, TP7, TP33, W31	None	211	242	Forbidden	15 kg	D	13, 52, 14	

	*		*		*		*		*		*		*
	Alkyl sulfonic acids, liquid <i>or</i> Aryl sulfonic acids, liquid <i>with more than 5 percent free sulfuric acid</i>	8	UN2584	II	8	B2, IB2, T8, TP2, TP13	154	202	242	1 L	30 L	B	53, 58
	Alkyl sulfonic acids, liquid <i>or</i> Aryl sulfonic acids, liquid <i>with not more than 5 percent free sulfuric acid</i>	8	UN2586	III	8	IB3, T4, TP1	154	203	241	5 L	60 L	B	53, 58
	Alkyl sulfonic acids, solid <i>or</i> Aryl sulfonic acids, solid, <i>with more than 5 percent free sulfuric acid</i>	8	UN2583	II	8	IB8, IP2, IP4, T3, TP33	154	212	240	15 kg	50 kg	A	53, 58
	Alkyl sulfonic acids, solid <i>or</i> Aryl sulfonic acids, solid <i>with not more than 5 percent free sulfuric acid</i>	8	UN2585	III	8	IB8, IP3, T1, TP33	154	213	240	25 kg	100 kg	A	53, 58
	*		*		*		*		*		*		*
	Alkylsulfuric acids	8	UN2571	II	8	B2, IB2, T8, TP2, TP13, TP28	154	202	242	1 L	30 L	C	14, 53, 58
	*		*		*		*		*		*		*
	Allyl chloroformate	6.1	UN1722	I	6.1, 3, 8	2, B9, B14, B32, N41, T20, TP2, TP13, TP38, TP45	None	227	244	Forbidden	Forbidden	D	21, 40, 53, 58, 100
	*		*		*		*		*		*		*
	Allyl iodide	3	UN1723	II	3, 8	A3, A6, IB1, N34, T7, TP2, TP13	150	202	243	1 L	5 L	B	40, 53, 58
	*		*		*		*		*		*		*
	Allylamine	6.1	UN2334	I	6.1, 3	2, B9, B14, B32, T20, TP2, TP13, TP38, TP45	None	227	244	Forbidden	Forbidden	D	40, 52
	Allyltrichlorosilane, stabilized	8	UN1724	II	8, 3	387, A7, B2, B6, N34, T10, TP2, TP7, TP13	None	206	243	Forbidden	30 L	C	25, 40, 53, 58
	*		*		*		*		*		*		*
	Aluminum bromide, anhydrous	8	UN1725	II	8	IB8, IP2, IP4, T3, TP33	154	212	240	15 kg	50 kg	A	40, 53, 58

	Aluminum bromide, solution	8	UN2580	III	8	IB3, T4, TP1	154	203	241	5 L	60 L	A	53, 58
	*		*		*		*		*		*		*
	Aluminum chloride, anhydrous	8	UN1726	II	8	IB8, IP2, IP4, T3, TP33	154	212	240	15 kg	50 kg	A	40, 53, 58
	Aluminum chloride, solution	8	UN2581	III	8	IB3, T4, TP1	154	203	241	5 L	60 L	A	53, 58
	*		*		*		*		*		*		*
	Aluminum hydride	4.3	UN2463	I	4.3	A19, N40, W31	None	211	242	Forbidden	15 kg	E	13, 148
	*		*		*		*		*		*		*
	Aluminum phosphide	4.3	UN1397	I	4.3, 6.1	A8, A19, N40, W31	None	211	242	Forbidden	15 kg	E	13, 40, 52, 85, 148
	*		*		*		*		*		*		*
	Aluminum powder, uncoated	4.3	UN1396	II	4.3	A19, A20, IB7, IP2, IP21, T3, TP33, W31, W40	151	212	242	15 kg	50 kg	A	13, 39, 52, 53, 148
				III	4.3	A19, A20, IB8, IP21, T1, TP33, W31	151	213	241	25 kg	100 kg	A	13, 39, 52, 53, 148
	*		*		*		*		*		*		*
	Aluminum silicon powder, uncoated	4.3	UN1398	III	4.3	A1, A19, B136, IB8, IP4, T1, TP33, W31	151	213	241	25 kg	100 kg	A	13, 39, 40, 52, 53, 85, 103, 148
	*		*		*		*		*		*		*
	2-(2-Aminoethoxy) ethanol	8	UN3055	III	8	IB3, T4, TP1	154	203	241	5 L	60 L	A	52
	N-Aminoethylpiperazine	8	UN2815	III	8, 6.1	IB3, T4, TP1	154	203	241	5 L	60 L	B	12, 25, 40, 52
	*		*		*		*		*		*		*
	Ammonium hydrogen sulfate	8	UN2506	II	8	IB8, IP2, IP4, T3, TP33	154	212	240	15 kg	50 kg	A	40, 53, 58
	Ammonium hydrogendifluoride, solid	8	UN1727	II	8	IB8, IP2, IP4, N34, T3, TP33	154	212	240	15 kg	50 kg	A	25, 40, 52, 53, 58
	Ammonium hydrogendifluoride, solution	8	UN2817	II	8, 6.1	IB2, N34, T8, TP2, TP13	154	202	243	1 L	30 L	B	40, 53, 58

				III	8, 6.1	IB3, N3, T4, TP1, TP13	154	203	241	5 L	60 L	B	40, 53, 58, 95
	*		*		*		*		*		*		*
A W	Ammonium nitrate based fertilizer	9	UN2071	III	9	132, B136, IB8, IP3	155	213	240	200 kg	200 kg	A	
	*		*		*		*		*		*		*
	Amyl acid phosphate	8	UN2819	III	8	IB3, T4, TP1	154	203	241	5 L	60 L	A	53, 58
	*		*		*		*		*		*		*
	Amylamines	3	UN1106	II	3, 8	IB2, T7, TP1	150	202	243	1 L	5 L	B	52
				III	3, 8	B1, IB3, T4, TP1	150	203	242	5 L	60 L	A	52
	Amyltrichlorosilane	8	UN1728	II	8	A7, B2, B6, N34, T10, TP2, TP7, TP13	None	206	242	Forbidden	30 L	C	40, 53, 58
	*		*		*		*		*		*		*
	Anisoyl chloride	8	UN1729	II	8	B2, B4, IB8, IP2, IP4, T3, TP33	154	212	240	15 kg	50 kg	A	40, 53, 58
	*		*		*		*		*		*		*
	Antimony pentachloride, liquid	8	UN1730	II	8	B2, IB2, T7, TP2	None	202	242	1 L	30 L	C	40, 53, 58
	Antimony pentachloride, solutions	8	UN1731	II	8	B2, IB2, T7, TP2	154	202	242	1 L	30 L	C	40, 53, 58
				III	8	IB3, T4, TP1	154	203	241	5 L	60 L	C	40, 53, 58
	Antimony pentafluoride	8	UN1732	II	8, 6.1	A3, A6, A7, A10, IB2, N3, N36, T7, TP2	None	202	243	Forbidden	30 L	D	40, 44, 53, 58, 89, 100, 141
	*		*		*		*		*		*		*
	Antimony trichloride, liquid	8	UN1733	II	8	B2, IB2	154	202	242	1 L	30 L	C	40, 53, 58
	Antimony trichloride, solid	8	UN1733	II	8	IB8, IP2, IP4, T3, TP33	154	212	240	15 kg	50 kg	A	40, 53, 58
	*		*		*		*		*		*		*

G	Articles, explosive, n.o.s.	1.4S	UN0349		1.4S	101, 148, 347, 382	None	62	None	25 kg	100 kg	01	25
	*		*		*		*		*		*		*
G	Articles, explosive, n.o.s.	1.1C	UN0462		1.1C	101	None	62	None	Forbidden	Forbidden	03	25
G	Articles, explosive, n.o.s.	1.1D	UN0463		1.1D	101	None	62	None	Forbidden	Forbidden	03	25
G	Articles, explosive, n.o.s.	1.1E	UN0464		1.1E	101	None	62	None	Forbidden	Forbidden	03	25
G	Articles, explosive, n.o.s.	1.1F	UN0465		1.1F	101	None	62	None	Forbidden	Forbidden	03	25
G	Articles, explosive, n.o.s.	1.2C	UN0466		1.2C	101	None	62	None	Forbidden	Forbidden	03	25
G	Articles, explosive, n.o.s.	1.2D	UN0467		1.2D	101	None	62	None	Forbidden	Forbidden	03	25
G	Articles, explosive, n.o.s.	1.2E	UN0468		1.2E	101	None	62	None	Forbidden	Forbidden	03	25
G	Articles, explosive, n.o.s.	1.2F	UN0469		1.2F	101	None	62	None	Forbidden	Forbidden	03	25
G	Articles, explosive, n.o.s.	1.3C	UN0470		1.3C	101	None	62	None	Forbidden	Forbidden	03	25
G	Articles, explosive, n.o.s.	1.4F	UN0472		1.4F	101	None	62	None	Forbidden	Forbidden	03	25
	*		*		*		*		*		*		*
	Batteries, wet, filled with acid, <i>electric storage</i>	8	UN2794		8	A51	159	159	159	30 kg	No limit	A	53, 58, 146
	*		*		*		*		*		*		*
	Benzotrichloride	8	UN2226	II	8	B2, IB2, T7, TP2	154	202	242	1 L	30 L	A	40, 53, 58
	*		*		*		*		*		*		*
	Benzoyl chloride	8	UN1736	II	8	B2, IB2, T8, TP2, TP13	154	202	242	1 L	30 L	C	40, 53, 58
	Benzyl bromide	6.1	UN1737	II	6.1, 8	A3, A7, IB2, N33, N34, T8, TP2, TP13	None	202	243	1 L	30 L	D	13, 40, 53, 58
	Benzyl chloride	6.1	UN1738	II	6.1, 8	A3, A7, B70, IB2, N33, N42, T8, TP2, TP13	None	202	243	1 L	30 L	D	13, 40, 53, 58

	Benzyl chloride <i>unstabilized</i>	6.1	UN1738	II	6.1, 8	A3, A7, B8, B11, IB2, N33, N34, N43, T8, TP2, TP13	153	202	243	1 L	30 L	D	13, 40, 53, 58
	Benzyl chloroformate	8	UN1739	I	8	A3, A6, B4, N41, T10, TP2, TP13	None	201	243	Forbidden	2.5 L	D	40, 53, 58
	*		*		*		*		*		*		*
	Benzyl dimethylamine	8	UN2619	II	8, 3	B2, IB2, T7, TP2	154	202	243	1 L	30 L	A	25, 40, 52
	*		*		*		*		*		*		*
	Bombs, photo-flash	1.1F	UN0037		1.1F		None	62	None	Forbidden	Forbidden	03	25
	Bombs, photo-flash	1.1D	UN0038		1.1D		None	62	62	Forbidden	Forbidden	03	25
	*		*		*		*		*		*		*
	Bombs, <i>with bursting charge</i>	1.1F	UN0033		1.1F		None	62	None	Forbidden	Forbidden	03	25
	Bombs, <i>with bursting charge</i>	1.1D	UN0034		1.1D		None	62	62	Forbidden	Forbidden	03	25
	Bombs, <i>with bursting charge</i>	1.2D	UN0035		1.2D		None	62	62	Forbidden	Forbidden	03	25
	Bombs, <i>with bursting charge</i>	1.2F	UN0291		1.2F		None	62	None	Forbidden	Forbidden	03	25
	*		*		*		*		*		*		*
	Boosters, <i>without detonator</i>	1.1D	UN0042		1.1D	148	None	62	None	Forbidden	Forbidden	03	25
	Boosters, <i>without detonator</i>	1.2D	UN0283		1.2D		None	62	None	Forbidden	Forbidden	03	25
	*		*		*		*		*		*		*
+	Boron tribromide	8	UN2692	I	8, 6.1	2, B9, B14, B32, N34, T20, TP2, TP13, TP38, TP45	None	227	244	Forbidden	Forbidden	C	12, 25, 53, 58
	*		*		*		*		*		*		*
	Boron trifluoride acetic acid complex, liquid	8	UN1742	II	8	B2, B6, IB2, T8, TP2	154	202	242	1 L	30 L	A	53, 58
	Boron trifluoride acetic acid complex, solid	8	UN3419	II	8	B2, B6, IB8, IP2, IP4, T3, TP33	154	212	240	15 kg	50 kg	A	53, 58

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	Boron trifluoride diethyl etherate	8	UN2604	I	8, 3	A3, A19, T10, TP2, W31	None	201	243	0.5 L	2.5 L	D	40, 53, 58
	Boron trifluoride dihydrate	8	UN2851	II	8	IB2, T7, TP2	154	212	240	15 kg	50 kg	B	12, 25, 40, 53, 58
	*		*		*		*		*		*		*
	Boron trifluoride propionic acid complex, liquid	8	UN1743	II	8	B2, IB2, T8, TP2	154	202	242	1 L	30 L	A	53, 58
	Boron trifluoride propionic acid complex, solid	8	UN3420	II	8	B2, IB8, IP2, IP4, T3, TP33	154	212	240	15 kg	50 kg	A	53, 58
	*		*		*		*		*		*		*
+	Bromine pentafluoride	5.1	UN1745	I	5.1, 6.1, 8	1, B9, B14, B30, T22, TP2, TP13, TP38, TP44	None	228	244	Forbidden	Forbidden	D	25, 40, 53, 58, 66, 90
+	Bromine solutions	8	UN1744	I	8, 6.1	1, B9, B85, N34, N43, T22, TP2, TP10, TP13	None	226	249	Forbidden	Forbidden	D	12, 25, 40, 53, 58, 66, 74, 89, 90
+	Bromine solutions	8	UN1744	I	8, 6.1	2, B9, B85, N34, N43, T22, TP2, TP10, TP13	None	227	249	Forbidden	Forbidden	D	12, 25, 40, 53, 58, 66, 74, 89, 90
+	Bromine trifluoride	5.1	UN1746	I	5.1, 6.1, 8	2, B9, B14, B32, T22, TP2, TP13, TP38, TP45	None	228	244	Forbidden	Forbidden	D	25, 40, 53, 58, 66, 90
	*		*		*		*		*		*		*
	Bromoacetic acid, solid	8	UN3425	II	8	A7, IB8, IP2, IP4, N34, T3, TP33	154	212	240	15 kg	50 kg	A	53, 58
	Bromoacetic acid solution	8	UN1938	II	8	A7, B2, IB2, T7, TP2	154	202	242	1 L	30 L	A	40, 53, 58
				III	8	B2, IB3, T7, TP2	154	203	241	5 L	60 L	A	40, 53, 58
	*		*		*		*		*		*		*
	Bromoacetyl bromide	8	UN2513	II	8	B2, IB2, T8, TP2	154	202	242	1 L	30 L	C	40, 53, 58
	*		*		*		*		*		*		*
	Bursters, <i>explosive</i>	1.1D	UN0043		1.1D		None	62	None	Forbidden	Forbidden	03	25

	*		*		*		*		*		*		*
	Butyl acid phosphate	8	UN1718	III	8	IB3, T4, TP1	154	203	241	5 L	60 L	A	53, 58
	*		*		*		*		*		*		*
	n-Butyl chloroformate	6.1	UN2743	I	6.1, 8, 3	2, B9, B14, B32, T20, TP2, TP13, TP38, TP45	None	227	244	Forbidden	Forbidden	A	12, 13, 21, 25, 40, 53, 58, 100
	*		*		*		*		*		*		*
	n-Butylamine	3	UN1125	II	3, 8	IB2, T7, TP1	150	202	242	1 L	5 L	B	40, 52
	*		*		*		*		*		*		*
	Butyltrichlorosilane	8	UN1747	II	8, 3	A7, B2, B6, N34, T10, TP2, TP7, TP13	None	206	243	Forbidden	30 L	C	40, 53, 58
	*		*		*		*		*		*		*
	Butyric acid	8	UN2820	III	8	IB3, T4, TP1	154	203	241	5 L	60 L	A	12, 25, 53, 58
	Butyric anhydride	8	UN2739	III	8	IB3, T4, TP1	154	203	241	5 L	60 L	A	53, 58
	*		*		*		*		*		*		*
	Butyryl chloride	3	UN2353	II	3, 8	IB2, T8, TP2, TP13	150	202	243	1 L	5 L	C	40, 53, 58
	Cacodylic acid	6.1	UN1572	II	6.1	IB8, IP2, IP4, T3, TP33	153	212	242	25 kg	100 kg	E	52, 53, 58
	*		*		*		*		*		*		*
	Calcium carbide	4.3	UN1402	I	4.3	A1, A8, B55, B59, IB4, IP1, N34, T9, TP7, TP33, W31	None	211	242	Forbidden	15 kg	B	13, 52, 148
				II	4.3	A1, A8, B55, B59, IB7, IP2, IP21, N34, T3, TP33, W31, W40	151	212	241	15 kg	50 kg	B	13, 52, 148
	*		*		*		*		*		*		*
	Calcium cyanamide <i>with more than 0.1 percent of calcium carbide</i>	4.3	UN1403	III	4.3	A1, A19, IB8, IP4, T1, TP33, W31	151	213	241	25 kg	100 kg	A	13, 52, 148

	*		*		*		*		*		*		*
Calcium hydride	4.3	UN1404	I	4.3	A19, N40, W31	None	211	242	Forbidden	15 kg	E	13, 52, 148	
	*	*		*		*		*		*		*	
Calcium phosphide	4.3	UN1360	I	4.3, 6.1	A8, A19, N40, W31	None	211	242	Forbidden	15 kg	E	13, 40, 52, 85, 148	
	*	*		*		*		*		*		*	
Calcium silicide	4.3	UN1405	II	4.3	A19, IB7, IP2, IP21, T3, TP33, W31, W40	151	212	241	15 kg	50 kg	B	13, 52, 85, 103, 148	
			III	4.3	A1, A19, IB8, IP21, T1, TP33, W31	151	213	241	25 kg	100 kg	B	13, 52, 85, 103, 148	
	*	*		*		*		*		*		*	
Caproic acid	8	UN2829	III	8	IB3, T4, TP1	154	203	241	5 L	60 L	A	53, 58	
	*	*		*		*		*		*		*	
Cartridges for weapons, blank	1.1C	UN0326		1.1C		None	62	None	Forbidden	Forbidden	03	25	
Cartridges for weapons, blank	1.2C	UN0413		1.2C		None	62	None	Forbidden	Forbidden	03	25	
Cartridges for weapons, blank or Cartridges, small arms, blank	1.3C	UN0327		1.3C		None	62	None	Forbidden	Forbidden	03	25	
	*	*		*		*		*		*		*	
Cartridges for weapons, inert projectile	1.2C	UN0328		1.2C		None	62	62	Forbidden	Forbidden	03	25	
	*	*		*		*		*		*		*	
Cartridges for weapons, inert projectile <i>or</i> Cartridges, small arms	1.3C	UN0417		1.3C		None	62	None	Forbidden	Forbidden	03	25	
Cartridges for weapons, <i>with bursting charge</i>	1.1F	UN0005		1.1F		None	62	None	Forbidden	Forbidden	03	25	
Cartridges for weapons, <i>with bursting charge</i>	1.1E	UN0006		1.1E		None	62	62	Forbidden	Forbidden	03	25	
Cartridges for weapons, <i>with bursting charge</i>	1.2F	UN0007		1.2F		None	62	None	Forbidden	Forbidden	03	25	

Cartridges for weapons, <i>with bursting charge</i>	1.2E	UN0321		1.2E		None	62	62	Forbidden	Forbidden	03	25
Cartridges for weapons, <i>with bursting charge</i>	1.4F	UN0348		1.4F		None	62	62	Forbidden	Forbidden	03	25
*		*		*		*		*		*		*
Cartridges, oil well	1.3C	UN0277		1.3C		None	62	62	Forbidden	Forbidden	03	25
*		*		*		*		*		*		*
Cartridges, power device	1.3C	UN0275		1.3C		None	62	62	Forbidden	75 kg	03	25
*		*		*		*		*		*		*
Cartridges, power device	1.2C	UN0381		1.2C		None	62	62	Forbidden	Forbidden	03	25
*		*		*		*		*		*		*
Cases, combustible, empty, without primer	1.3C	UN0447		1.3C		None	62	None	Forbidden	Forbidden	03	25
*		*		*		*		*		*		*
Cesium <i>or</i> Caesium	4.3	UN1407	I	4.3	A7, A19, IB4, IP1, N34, N40, W31	None	211	242	Forbidden	15 kg	D	13, 52, 148
*		*		*		*		*		*		*
Charges, bursting, plastics bonded	1.1D	UN0457		1.1D		None	62	None	Forbidden	Forbidden	03	25
Charges, bursting, plastics bonded	1.2D	UN0458		1.2D		None	62	None	Forbidden	Forbidden	03	25
*		*		*		*		*		*		*
Charges, demolition	1.1D	UN0048		1.1D		None	62	62	Forbidden	Forbidden	03	25
Charges, depth	1.1D	UN0056		1.1D		None	62	62	Forbidden	Forbidden	03	25
*		*		*		*		*		*		*
Charges, explosive, commercial <i>without detonator</i>	1.1D	UN0442		1.1D		None	62	None	Forbidden	Forbidden	03	25
Charges, explosive, commercial <i>without detonator</i>	1.2D	UN0443		1.2D		None	62	None	Forbidden	Forbidden	03	25

	*		*		*		*		*		*		*
	Charges, propelling	1.1C	UN0271		1.1C		None	62	None	Forbidden	Forbidden	03	25
	Charges, propelling	1.3C	UN0272		1.3C		None	62	None	Forbidden	Forbidden	03	25
	Charges, propelling	1.2C	UN0415		1.2C		None	62	None	Forbidden	Forbidden	03	25
	*		*		*		*		*		*		*
	Charges, propelling, for cannon	1.3C	UN0242		1.3C		None	62	None	Forbidden	Forbidden	03	25
	Charges, propelling, for cannon	1.1C	UN0279		1.1C		None	62	None	Forbidden	Forbidden	03	25
	Charges, propelling, for cannon	1.2C	UN0414		1.2C		None	62	None	Forbidden	Forbidden	03	25
	*		*		*		*		*		*		*
	Charges, shaped, <i>without detonator</i>	1.1D	UN0059		1.1D		None	62	None	Forbidden	Forbidden	03	25
	Charges, shaped, <i>without detonator</i>	1.2D	UN0439		1.2D		None	62	None	Forbidden	Forbidden	03	25
	*		*		*		*		*		*		*
	Charges, supplementary explosive	1.1D	UN0060		1.1D		None	62	None	Forbidden	Forbidden	03	25
	*		*		*		*		*		*		*
	Chloric acid aqueous solution, <i>with not more than 10 percent chloric acid</i>	5.1	UN2626	II	5.1	IB2, T4, TP1, W31	None	229	None	Forbidden	Forbidden	D	53, 56, 58
	*		*		*		*		*		*		*
	Chloroacetic acid, molten	6.1	UN3250	II	6.1, 8	IB1, T7, TP3, TP28	None	202	243	Forbidden	Forbidden	C	40, 53, 58
	Chloroacetic acid, solid	6.1	UN1751	II	6.1, 8	A3, A7, IB8, IP2, IP4, N34, T3, TP33	153	212	242	15 kg	50 kg	C	40, 53, 58
	Chloroacetic acid, solution	6.1	UN1750	II	6.1, 8	A7, IB2, N34, T7, TP2	153	202	243	1 L	30 L	C	40, 53, 58
	*		*		*		*		*		*		*

	Chloroacetyl chloride	6.1	UN1752	I	6.1, 8	2, B3, B8, B9, B14, B32, B77, N34, N43, T20, TP2, TP13, TP38, TP45	None	227	244	Forbidden	Forbidden	D	40, 53, 58
	*		*		*		*		*		*		*
G	Chloroformates, toxic, corrosive, flammable, n.o.s.	6.1	UN2742	II	6.1, 8, 3	5, IB1, T7, TP2	153	202	243	1 L	30 L	A	12, 13, 21, 25, 40, 53, 58, 100
G	Chloroformates, toxic, corrosive, n.o.s.	6.1	UN3277	II	6.1, 8	IB2, T8, TP2, TP13, TP28	153	202	243	1 L	30 L	A	12, 13, 25, 40, 53, 58
	Chloromethyl chloroformate	6.1	UN2745	II	6.1, 8	IB2, T7, TP2, TP13	153	202	243	1 L	30 L	A	12, 13, 25, 40, 53, 58
	*		*		*		*		*		*		*
	Chlorophenyltrichlorosilane	8	UN1753	II	8	A7, B2, B6, N34, T10, TP2, TP7	None	206	242	Forbidden	30 L	C	40, 53, 58
	*		*		*		*		*		*		*
	Chloroplatinic acid, solid	8	UN2507	III	8	IB8, IP3, T1, TP33	154	213	240	25 kg	100 kg	A	53, 58
	*		*		*		*		*		*		*
	2-Chloropropionic acid	8	UN2511	III	8	IB3, T4, TP2	154	203	241	5 L	60 L	A	8, 53, 58
	*		*		*		*		*		*		*
	Chlorosilanes, corrosive, flammable, n.o.s	8	UN2986	II	8, 3	T14, TP2, TP7, TP13, TP27	None	206	243	Forbidden	30 L	C	40, 53, 58
	Chlorosilanes, corrosive, n.o.s	8	UN2987	II	8	B2, T14, TP2, TP7, TP13, TP27	None	206	242	Forbidden	30 L	C	40, 53, 58
	Chlorosilanes, flammable, corrosive, n.o.s	3	UN2985	II	3, 8	T14, TP2, TP7, TP13, TP27	None	206	243	Forbidden	5 L	B	40, 53, 58
G	Chlorosilanes, toxic, corrosive, flammable, n.o.s	6.1	UN3362	II	6.1, 8, 3	T14, TP2, TP7, TP13, TP27	None	206	243	Forbidden	30 L	C	40, 53, 58, 125
G	Chlorosilanes, toxic, corrosive, n.o.s	6.1	UN3361	II	6.1, 8	T14, TP2, TP7, TP13, TP27	None	206	243	Forbidden	30 L	C	40, 53, 58
	Chlorosilanes, water-reactive, flammable, corrosive, n.o.s	4.3	UN2988	I	4.3, 3, 8	A2, T14, TP2, TP7, TP13, W31	None	201	244	Forbidden	1 L	D	13, 21, 40, 49, 53, 58, 100, 147, 148
+	Chlorosulfonic acid (<i>with or without sulfur trioxide</i>)	8	UN1754	I	8, 6.1	2, B9, B10, B14, B32, T20, TP2, TP38, TP45	None	227	244	Forbidden	Forbidden	C	40, 53, 58

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	Chromic acid solution	8	UN1755	II	8	B2, IB2, T8, TP2	154	202	242	1 L	30 L	C	40, 44, 53, 58, 89, 100, 141
				III	8	IB3, T4, TP1	154	203	241	5 L	60 L	C	40, 44, 53, 58, 89, 100, 141
	*		*		*		*		*		*		*
	Chromic fluoride, solid	8	UN1756	II	8	IB8, IP2, IP4, T3, TP33	154	212	240	15 kg	50 kg	A	52, 53, 58
	Chromic fluoride, solution	8	UN1757	II	8	B2, IB2, T7, TP2	154	202	242	1 L	30 L	A	53, 58
				III	8	IB3, T4, TP1	154	203	241	5 L	60 L	A	53, 58
	*		*		*		*		*		*		*
	Chromium oxychloride	8	UN1758	I	8	A3, A6, A7, B10, N34, T10, TP2	None	201	243	0.5 L	2.5 L	C	40, 53, 58, 66, 74, 89, 90
	*		*		*		*		*		*		*
	Chromosulfuric acid	8	UN2240	I	8	A3, A6, A7, B4, B6, N34, T10, TP2, TP13	None	201	243	0.5L	2.5L	B	40, 53, 58, 66, 74, 89, 90
	*		*		*		*		*		*		*
G	Components, explosive train, n.o.s.	1.4S	UN0384		1.4S	101, 347	None	62	None	25 kg	100 kg	01	25
	*		*		*		*		*		*		*
	Copper chloride	8	UN2802	III	8	IB8, IP3, T1, TP33	154	213	240	25 kg	100 kg	A	53, 58
	*		*		*		*		*		*		*
A,W	Copra	4.2	UN1363	III	4.2	B136, IB8, IP3, IP7	None	213	241	Forbidden	Forbidden	A	13, 25, 119
	Cord, detonating, <i>flexible</i>	1.1D	UN0065		1.1D	102, 148	63(a)	62	None	Forbidden	Forbidden	03	25
	*		*		*		*		*		*		*
	Cord, detonating <i>or</i> Fuze, detonating <i>metal clad</i>	1.2D	UN0102		1.2D		None	62	None	Forbidden	Forbidden	03	25

	Cord, detonating or Fuze, detonating <i>metal clad</i>	1.1D	UN0290		1.1D		None	62	None	Forbidden	Forbidden	03	25
	*		*		*		*		*		*		*
G	Corrosive liquid, acidic, inorganic, n.o.s	8	UN3264	I	8	A6, B10, T14, TP2, TP27	None	201	243	0.5 L	2.5 L	B	40, 53, 58
				II	8	386, B2, IB2, T11, TP2, TP27	154	202	242	1 L	30 L	B	40, 53, 58
				III	8	IB3, T7, TP1, TP28	154	203	241	5 L	60 L	A	40, 53, 58
G	Corrosive liquid, acidic, organic, n.o.s	8	UN3265	I	8	A6, B10, T14, TP2, TP27	None	201	243	0.5 L	2.5 L	B	40, 53, 58
				II	8	148, B2, IB2, T11, TP2, TP27	154	202	242	1 L	30 L	B	40, 53, 58
				III	8	386, IB3, T7, TP1, TP28	154	203	241	5 L	60 L	A	40, 53, 58
	*		*		*		*		*		*		*
G	Corrosive solid, acidic, inorganic, n.o.s.	8	UN3260	I	8	IB7, IP1, T6, TP33	None	211	242	1 kg	25 kg	B	53, 58
				II	8	IB8, IP2, IP4, T3, TP33	154	212	240	15 kg	50 kg	B	53, 58
				III	8	IB8, IP3, T1, TP33	154	213	240	25 kg	100 kg	A	53, 58
G	Corrosive solid, acidic, organic, n.o.s.	8	UN3261	I	8	IB7, IP1, T6, TP33	None	211	242	1 kg	25 kg	B	53, 58
				II	8	IB8, IP2, IP4, T3, TP33	154	212	240	15 kg	50 kg	B	53, 58
				III	8	IB8, IP3, T1, TP33	154	213	240	25 kg	100 kg	A	53, 58
	*		*		*		*		*		*		*
	Crotonic acid, liquid	8	UN3472	III	8	IB8, T1	154	203	241	5 L	60 L	A	12, 25, 53, 58
	Crotonic acid, solid	8	UN2823	III	8	IB8, IP3, T1, TP33	154	213	240	25 kg	100 kg	A	12, 25, 53, 58
	*		*		*		*		*		*		*
	Cupriethylenediamine solution	8	UN1761	II	8, 6.1	IB2, T7, TP2	154	202	243	1 L	30 L	A	52
				III	8, 6.1	IB3, T7, TP1, TP28	154	203	242	5 L	60 L	A	52, 95

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	Cyanuric chloride	8	UN2670	II	8	IB8, IP2, IP4, T3, TP33	None	212	240	15 kg	50 kg	A	12, 25, 40, 53, 58
	*		*		*		*		*		*		*
	Cyclobutyl chloroformate	6.1	UN2744	II	6.1, 8, 3	IB1, T7, TP2, TP13	153	202	243	1 L	30 L	A	12, 13, 21, 25, 40, 53, 58, 100
	*		*		*		*		*		*		*
	Cyclohexenyltrichlorosilane	8	UN1762	II	8	A7, B2, N34, T10, TP2, TP7, TP13	None	206	242	Forbidden	30 L	C	40, 53, 58
	*		*		*		*		*		*		*
	Cyclohexylamine	8	UN2357	II	8, 3	IB2, T7, TP2	None	202	243	1 L	30 L	A	40, 52
	Cyclohexyltrichlorosilane	8	UN1763	II	8	A7, B2, N34, T10, TP2, TP7, TP13	None	206	242	Forbidden	30 L	C	40, 53, 58
	*		*		*		*		*		*		*
	Di-n-amylamine	3	UN2841	III	3, 6.1	B1, IB3, T4, TP1	150	203	242	60 L	220 L	A	52
	*		*		*		*		*		*		*
	Di-n-butylamine	8	UN2248	II	8, 3	IB2, T7, TP2	None	202	243	1 L	30 L	A	52
	*		*		*		*		*		*		*
	Diallylamine	3	UN2359	II	3, 6.1, 8	IB2, T7, TP1	150	202	243	1 L	5 L	B	21, 40, 52, 100
	*		*		*		*		*		*		*
	Dibenzylchlorosilane	8	UN2434	II	8	B2, T10, TP2, TP7, TP13	154	206	242	Forbidden	30 L	C	40, 53, 58
	*		*		*		*		*		*		*
	Dichloroacetic acid	8	UN1764	II	8	A3, A6, A7, B2, IB2, N34, T8, TP2	154	202	242	1 L	30 L	A	53, 58
	*		*		*		*		*		*		*
	Dichloroacetyl chloride	8	UN1765	II	8	A3, A6, A7, B2, B6, IB2, N34, T7,	154	202	242	1 L	30 L	D	40, 53, 58

						TP2							
	*		*		*		*		*		*		*
	Dichlorophenyltrichlorosilane	8	UN1766	II	8	A7, B2, B6, N34, T10, TP2, TP7, TP13	None	206	242	Forbidden	30 L	C	40, 53, 58
	*		*		*		*		*		*		*
	Dicyclohexylamine	8	UN2565	III	8	IB3, T4, TP1	154	203	241	5 L	60 L	A	52
	*		*		*		*		*		*		*
	Diethylamine	3	UN1154	II	3, 8	A3, IB2, N34, T7, TP1	150	202	243	1 L	5 L	E	40, 52
	2-Diethylaminoethanol	8	UN2686	II	8, 3	B2, IB2, T7, TP2	None	202	243	1 L	30 L	A	52
	3-Diethylamino-propylamine.	3	UN2684	III	3, 8	B1, IB3, T4, TP1	150	203	242	5 L	60 L	A	52
	*		*		*		*		*		*		*
	Diethyldichlorosilane	8	UN1767	II	8, 3	A7, B6, N34, T10, TP2, TP7, TP13	None	206	243	Forbidden	30 L	C	40, 53, 58
	*		*		*		*		*		*		*
	N,N-Diethylethylenediamine	8	UN2685	II	8, 3	IB2, T7, TP2	None	202	243	1 L	30 L	A	52
	*		*		*		*		*		*		*
	Diethylthiophosphoryl chloride	8	UN2751	II	8	B2, IB2, T7, TP2	None	212	240	15 kg	50 kg	D	12, 25, 40, 53, 58
	*		*		*		*		*		*		*
	Difluorophosphoric acid, anhydrous	8	UN1768	II	8	A6, A7, B2, IB2, N5, N34, T8, TP2	None	202	242	1 L	30 L	A	40, 53, 58
	*		*		*		*		*		*		*
	Diisobutylamine	3	UN2361	III	3, 8	B1, IB3, T4, TP1	150	203	242	5 L	60 L	A	52
	*		*		*		*		*		*		*

	Diisooctyl acid phosphate	8	UN1902	III	8	IB3, T4, TP1	154	203	241	5 L	60 L	A	53, 58
	*		*		*		*		*		*		*
	Diisopropylamine	3	UN1158	II	3, 8	IB2, T7, TP1	150	202	243	1 L	5 L	B	52
	*		*		*		*		*		*		*
	Dimethyl sulfate	6.1	UN1595	I	6.1, 8	2, B9, B14, B32, B77, T20, TP2, TP13, TP38, TP45	None	227	244	Forbidden	Forbidden	D	40, 53, 58
	*		*		*		*		*		*		*
	N,N-Dimethylcyclohexylamine	8	UN2264	II	8, 3	B2, IB2, T7, TP2	154	202	243	1 L	30 L	A	40, 52
	*		*		*		*		*		*		*
	Dimethyl thiophosphoryl chloride	6.1	UN2267	II	6.1, 8	IB2, T7, TP2	153	202	243	1 L	30 L	B	25, 53, 58
	Dimethylamine, anhydrous	2.1	UN1032		2.1	N87, T50	None	304	314, 315	Forbidden	150 kg	D	40, 52
	*		*		*		*		*		*		*
	2-Dimethylaminoethanol	8	UN2051	II	8, 3	B2, IB2, T7, TP2	154	202	243	1 L	30 L	A	52
	*		*		*		*		*		*		*
	Dimethylcarbamoyl chloride	8	UN2262	II	8	B2, IB2, T7, TP2	154	202	242	1 L	30 L	A	40, 53, 58
	*		*		*		*		*		*		*
	Dimethyl-N-propylamine	3	UN2266	II	3, 8	IB2, T7, TP2, TP13	150	202	243	1 L	5 L	B	40, 52
	*		*		*		*		*		*		*
	Diphenyldichlorosilane	8	UN1769	II	8	A7, B2, N34, T10, TP2, TP7, TP13	None	206	242	Forbidden	30 L	C	40, 53, 58
	Diphenylmethyl bromide	8	UN1770	II	8	IB8, IP2, IP4, T3, TP33	154	212	240	15 kg	50 kg	D	40, 53, 58
	*		*		*		*		*		*		*

	Dipropylamine	3	UN2383	II	3, 8	IB2, T7, TP1	150	202	243	1 L	5 L	B	25, 52
	*		*		*		*		*		*		*
	Dodecyltrichlorosilane	8	UN1771	II	8	A7, B2, B6, N34, T10, TP2, TP7, TP13	None	206	242	Forbidden	30 L	C	40, 53, 58
	*		*		*		*		*		*		*
	Ethyl chloroformate	6.1	UN1182	I	6.1, 3, 8	2, B9, B14, B32, N34, T20, TP2, TP13, TP38, TP45	None	227	244	Forbidden	Forbidden	D	21, 40, 53, 58, 100
	*		*		*		*		*		*		*
+	Ethyl chlorothioformate	8	UN2826	II	8, 6.1, 3	2, B9, B14, B32, T20, TP2, TP38, TP45	None	227	244	Forbidden	Forbidden	A	40, 53, 58
	*		*		*		*		*		*		*
	Ethylamine	2.1	UN1036		2.1	B77, N87, T50	None	321	314, 315	Forbidden	150 kg	D	40, 52
	*		*		*		*		*		*		*
	Ethyl dichlorosilane	4.3	UN1183	I	4.3, 8, 3	A2, A3, A7, N34, T14, TP2, TP7, TP13, W31	None	201	244	Forbidden	1 L	D	21, 40, 49, 53, 58, 100
	*		*		*		*		*		*		*
	2-Ethylhexyl chloroformate	6.1	UN2748	II	6.1, 8	IB2, T7, TP2, TP13	153	202	243	1 L	30 L	A	12, 13, 25, 40, 53, 58
	2-Ethylhexylamine	3	UN2276	III	3, 8	B1, IB3, T4, TP1	150	203	242	5 L	60 L	A	40, 52
	*		*		*		*		*		*		*
	Ethylphenyldichlorosilane	8	UN2435	II	8	A7, B2, N34, T10, TP2, TP7, TP13	None	206	242	Forbidden	30 L	C	53, 58
	*		*		*		*		*		*		*
	Ferric chloride, anhydrous	8	UN1773	III	8	IB8, IP3, T1, TP33	154	213	240	25 kg	100 kg	A	53, 58
	Ferric chloride, solution	8	UN2582	III	8	B15, IB3, T4, TP1	154	203	241	5 L	60 L	A	53, 58

	*		*		*		*		*		*		*
	Ferrous metal borings <i>or</i> Ferrous metal shavings <i>or</i> Ferrous metal turnings <i>or</i> Ferrous metal cuttings <i>in a form liable to self-heating</i>	4.2	UN2793	III	4.2	A1, A19, B134, B136, IB8, IP3, IP7, IP21, W100	None	213	241	25 kg	100 kg	A	13, 148
	*		*		*		*		*		*		*
A,W	Fish meal, stabilized <u>or</u> Fish scrap, stabilized	9	UN2216	III	None	155, B136, IB8, IP3, T1, TP33	155	218	218	Forbidden	Forbidden	B	25, 88, 122
	*		*		*		*		*		*		*
	Fluoroacetic acid	6.1	UN2642	I	6.1	IB7, IP1, T6, TP33	None	211	242	1 kg	15 kg	E	53, 58
	*		*		*		*		*		*		*
	Fluoroboric acid	8	UN1775	II	8	A6, A7, B2, B15, IB2, N3, N34, T7, TP2	154	202	242	1 L	30 L	A	53, 58
	Fluorophosphoric acid anhydrous	8	UN1776	II	8	A6, A7, B2, IB2, N3, N34, T8, TP2	None	202	242	1 L	30 L	A	53, 58
	*		*		*		*		*		*		*
	Fluorosilicic acid	8	UN1778	II	8	A6, A7, B2, B15, IB2, N3, N34, T8, TP2	None	202	242	1 L	30 L	A	53, 58
	Fluorosulfonic acid	8	UN1777	I	8	A3, A6, A7, A10, B6, B10, N3, N36, T10, TP2	None	201	243	0.5 L	2.5 L	D	40, 53, 58
	*		*		*		*		*		*		*
	Formic acid <i>with not less than 10% but not more than 85% acid by mass</i>	8	UN3412	II	8	IB2, T7, TP2	154	202	242	1 L	30 L	A	40, 53, 58
	Formic acid <i>with not less than 5% but less than 10% acid by mass</i>	8	UN3412	III	8	IB3, T4, TP1	154	203	241	5 L	60 L	A	40, 53, 58
	Formic acid <i>with more than 85% acid by mass</i>	8	UN1779	II	8, 3	B2, B28, IB2, T7, TP2	154	202	242	1 L	30 L	A	40, 53, 58
	*		*		*		*		*		*		*
	Fracturing devices, explosive, <i>without detonators for oil</i>	1.1D	UN0099		1.1D		None	62	62	Forbidden	Forbidden	03	25

	<i>wells</i>												
	*		*		*		*		*		*		*
	Fumaryl chloride	8	UN1780	II	8	B2, IB2, T7, TP2	154	202	242	1 L	30 L	C	8, 40, 53, 58
	*		*		*		*		*		*		*
	Furfurylamine	3	UN2526	III	3, 8	B1, IB3, T4, TP1	150	203	242	5 L	60 L	A	40, 52
	*		*		*		*		*		*		*
	Fuzes, detonating	1.4S	UN0367		1.4S	116, 347	None	62	None	25 kg	100 kg	01	25
	Fuzes, detonating, with protective features	1.1D	UN0408		1.1D		None	62	None	Forbidden	Forbidden	03	25
	Fuzes, detonating, with protective features	1.2D	UN0409		1.2D		None	62	None	Forbidden	Forbidden	03	25
	*		*		*		*		*		*		*
	Grenades, hand or rifle, with bursting charge	1.1D	UN0284		1.1D		None	62	None	Forbidden	Forbidden	03	25
	Grenades, hand or rifle, with bursting charge	1.2D	UN0285		1.2D		None	62	None	Forbidden	Forbidden	03	25
	Grenades, hand or rifle, with bursting charge	1.1F	UN0292		1.1F		None	62	None	Forbidden	Forbidden	03	25
	Grenades, hand or rifle, with bursting charge	1.2F	UN0293		1.2F		None	62	None	Forbidden	Forbidden	03	25
	*		*		*		*		*		*		*
	Hexadecyltrichlorosilane	8	UN1781	II	8	A7, B2, B6, N34, T10, TP2, TP7, TP13	None	206	242	Forbidden	30 L	C	40, 53, 58
	*		*		*		*		*		*		*
	Hexafluorophosphoric acid	8	UN1782	II	8	A6, A7, B2, IB2, N3, N34, T8, TP2	None	202	242	1 L	30 L	A	53, 58
	*		*		*		*		*		*		*
	Hexamethylenediamine, solid	8	UN2280	III	8	IB8, IP3, T1, TP33	154	213	240	25 kg	100 kg	A	12, 25, 52

	Hexamethylenediamine solution	8	UN1783	II	8	IB2, T7, TP2	None	202	242	1 L	30 L	A	52
				III	8	IB3, T4, TP1	154	203	241	5 L	60 L	A	52
	*		*		*		*		*		*		*
	Hexyltrichlorosilane	8	UN1784	II	8	A7, B2, B6, N34, T10, TP2, TP7, TP13	None	206	242	Forbidden	30 L	C	40, 53, 58
	*		*		*		*		*		*		*
	Hydrobromic acid, with more than 49 percent hydrobromic acid	8	UN1788	II	8	B2, B15, IB2, N41, T7, TP2	154	202	242	Forbidden	Forbidden	C	53, 58
				III	8	IB3, T4, TP1	154	203	241	Forbidden	Forbidden	C	8, 53, 58
	*		*		*		*		*		*		*
	Hydrochloric acid	8	UN1789	II	8	386, A3, A6, B3, B15, B133, IB2, N41, T8, TP2	154	202	242	1 L	30 L	C	53, 58
				III	8	A3, IB3, T4, TP1	154	203	241	5 L	60 L	C	8, 53, 58
	*		*		*		*		*		*		*
	Hydrofluoric acid and Sulfuric acid mixtures	8	UN1786	I	8, 6.1	A6, A7, B15, B23, N5, N34, T10, TP2, TP13	None	201	243	Forbidden	2.5 L	D	40, 53, 58
	*		*		*		*		*		*		*
	Hydrofluoric acid, with more than 60 percent strength	8	UN1790	I	8, 6.1	A6, A7, B4, B15, B23, N5, N34, T10, TP2, TP13	None	201	243	0.5 L	2.5 L	D	12, 25, 40, 53, 58
	Hydrofluoric acid, with not more than 60 percent strength	8	UN1790	II	8, 6.1	A6, A7, B15, IB2, N5, N34, T8, TP2	154	202	243	1 L	30 L	D	12, 25, 40, 53, 58
	*		*		*		*		*		*		*
	Hydrogen fluoride, anhydrous	8	UN1052	I	8.6.1	3, B7, B46, B77, N86, T10, TP2	None	163	244	Forbidden	Forbidden	D	40, 53, 58
	*		*		*		*		*		*		*
	Hydrogendifluoride, solid, n.o.s	8	UN1740	II	8	IB8, IP2, IP4, N3, N34, T3, TP33	None	212	240	15 kg	50 kg	A	25, 40, 52, 53, 58

				III	8	IB8, IP3, N3, N34, T1, TP33	154	213	240	25 kg	100 kg	A	25, 40, 52, 53, 58
	*		*		*		*		*		*		*
	Hydroxylamine sulfate	8	UN2865	III	8	IB8, IP3, T1, TP33	154	213	240	25 kg	100 kg	A	52, 53, 58
	Hypochlorite solutions	8	UN1791	II	8	148, A7, B2, B15, IB2, IP5, N34, T7, TP2, TP24	154	202	242	1 L	30 L	B	26, 53, 58
				III	8	386, IB3, N34, T4, TP2, TP24	154	203	241	5 L	60 L	B	26, 53, 58
	*		*		*		*		*		*		*
	Iodine monochloride, liquid	8	UN3498	II	8	IB2, T7, TP2	154	202	242	1 L	30 L	D	40, 53, 58, 66, 74, 89, 90
	Iodine monochloride, solid	8	UN1792	II	8	B6, IB8, IP2, IP4, N41, T7, TP2	None	212	240	Forbidden	50 kg	D	40, 53, 58, 66, 74
	Iodine pentafluoride	5.1	UN2495	I	5.1, 6.1, 8		None	205	243	Forbidden	Forbidden	D	25, 40, 52, 53, 58, 66, 90
	*		*		*		*		*		*		*
	3,3'-Iminodipropylamine	8	UN2269	III	8	IB3, T4, TP2	154	203	241	5 L	60 L	A	52
	*		*		*		*		*		*		*
	Isobutylamine	3	UN1214	II	3, 8	IB2, T7, TP1	150	202	243	1 L	5 L	B	40, 52
	*		*		*		*		*		*		*
	Isobutyryl chloride	3	UN2395	II	3, 8	IB1, T7, TP2	150	202	243	1 L	5 L	C	40, 53, 58
	*		*		*		*		*		*		*
	Isophoronediamine	8	UN2289	III	8	IB3, T4, TP1	154	203	241	5 L	60 L	A	52
	*		*		*		*		*		*		*
	Isopropyl acid phosphate	8	UN1793	III	8	IB2, T4, TP1	154	213	240	25 kg	100 kg	A	53, 58
	*		*		*		*		*		*		*

	Isopropyl chloroformate	6.1	UN2407	I	6.1, 3, 8	2, B9, B14, B32, B77, T20, TP2, TP13, TP38, TP44	None	227	244	Forbidden	Forbidden	B	21, 40, 53, 58, 100
	*		*		*		*		*		*		*
	Isopropylamine	3	UN1221	I	3, 8	T11, TP2	None	201	243	0.5 L	2.5 L	E	52
	*		*		*		*		*		*		*
D	Jet perforating guns, charged oil well with detonator	1.1D	NA0124		1.1D	55, 56	None	62	None	Forbidden	Forbidden	03	25, 154
D	Jet perforating guns, charged oil well, with detonator	1.4D	NA0494		1.4D	55, 56	None	62	None	Forbidden	Forbidden	02	25, 154
	Jet perforating guns, charged, oil well, without detonator	1.4D	UN0494		1.4D	55, 114	None	62	None	Forbidden	300 kg	02	25, 154
	Jet perforating guns, charged oil well without detonator	1.1D	UN0124		1.1D	55	None	62	None	Forbidden	Forbidden	03	25, 154
	*		*		*		*		*		*		*
	Lead sulfate with more than 3 percent free acid	8	UN1794	II	8	IB8, IP2, IP4, T3, TP33	154	212	240	15 kg	50 kg	A	53, 58
	*		*		*		*		*		*		*
	Lithium	4.3	UN1415	I	4.3	A7, A19, IB4, IP1, N45, T9, TP7, TP33, W31	151	211	244	Forbidden	15 kg	D	13, 52, 148
	*		*		*		*		*		*		*
	Lithium aluminum hydride	4.3	UN1410	I	4.3	A19, W31	None	211	242	Forbidden	15 kg	E	13, 52, 148
	*		*		*		*		*		*		*
	Lithium borohydride	4.3	UN1413	I	4.3	A19, N40, W31	None	211	242	Forbidden	15 kg	E	13, 52, 148
	*		*		*		*		*		*		*
	Lithium hydride	4.3	UN1414	I	4.3	A19, N40, W31	None	211	242	Forbidden	15 kg	E	13, 52, 148
	*		*		*		*		*		*		*

	Lithium ion batteries including lithium ion polymer batteries	9	UN3480		9	388, 422, A51, A54	185	185	185	5 kg	35 kg	A	
	Lithium ion batteries contained in equipment including lithium ion polymer batteries	9	UN3481		9	181, 388, 422, A54	185	185	185	5 kg	35 kg	A	
	Lithium ion batteries packed with equipment including lithium ion polymer batteries	9	UN3481		9	181, 388, 422, A54	185	185	185	5 kg	35 kg	A	
	Lithium metal batteries including lithium alloy batteries	9	UN3090		9	388, 422, A54	185	185	185	Forbidden	35 kg	A	
	Lithium metal batteries contained in equipment including lithium alloy batteries	9	UN3091		9	181, 388, 422, A54, A101	185	185	185	5 kg	35 kg	A	
	Lithium metal batteries packed with equipment including lithium alloy batteries	9	UN3091		9	181, 388, 422, A54	185	185	185	5 kg	35 kg	A	
	*		*		*		*		*		*		*
	Lithium nitride	4.3	UN2806	I	4.3	A19, IB4, IP1, N40, W31	None	211	242	Forbidden	15 kg	E	
	*		*		*		*		*		*		*
	Magnesium aluminum phosphide	4.3	UN1419	I	4.3, 6.1	A19, N34, N40, W31	None	211	242	Forbidden	15 kg	E	13, 40, 52, 85, 148
	*		*		*		*		*		*		*
	Magnesium hydride	4.3	UN2010	I	4.3	A19, N40, W31	None	211	242	Forbidden	15 kg	E	13, 52, 148
	*		*		*		*		*		*		*
	Magnesium phosphide	4.3	UN2011	I	4.3, 6.1	A19, N40, W31	None	211	None	Forbidden	15 kg	E	13, 40, 52, 85, 148
	Magnesium, powder or Magnesium alloys, powder	4.3	UN1418	I	4.3, 4.2	A19, B56, W31	None	211	244	Forbidden	15 kg	A	13, 39, 52, 148
				II	4.3, 4.2	A19, B56, IB5, IP2, T3, TP33, W31, W40	None	212	241	15 kg	50 kg	A	13, 39, 52, 148
				III	4.3, 4.2	A19, B56, IB8, IP4, T1, TP33, W31	None	213	241	25 kg	100 kg	A	13, 39, 52, 148

	*		*		*		*		*		*		*
	Maleic anhydride	8	UN2215	III	8	IB8, IP3, T1, TP33	154	213	240	25 kg	100 kg	A	53, 58, 95, 102
	Maleic anhydride, molten	8	UN2215	III	8	T4, TP3	None	213	240	Forbidden	Forbidden	A	53, 58, 95, 102
	*		*		*		*		*		*		*
G	Metal hydrides, water reactive, n.o.s	4.3	UN1409	I	4.3	A19, N34, N40, W31	None	211	242	Forbidden	15 kg	D	13, 52, 148
				II	4.3	A19, IB4, N34, N40, T3, TP33, W31, W40	151	212	242	15 kg	50 kg	D	13, 52, 148
	*		*		*		*		*		*		*
G	Metallic substance, water-reactive, n.o.s	4.3	UN3208	I	4.3	A7, IB4, W31	None	211	242	Forbidden	15 kg	E	13, 40, 148
				II	4.3	A7, IB7, IP2, IP21, T3, TP33, W31, W40	151	212	242	15 kg	50 kg	E	13, 40, 148
				III	4.3	A7, IB8, IP21, T1, TP33, W31	151	213	241	25 kg	100 kg	E	13, 40, 148
G	Metallic substance, water-reactive, self-heating, n.o.s	4.3	UN3209	I	4.3, 4.2	A7, W31	None	211	242	Forbidden	15 kg	E	13, 40, 148
				II	4.3, 4.2	A7, IB5, IP2, T3, TP33, W31, W40	None	212	242	15 kg	50 kg	E	13, 40, 148
				III	4.3, 4.2	A7, IB8, IP4, T1, TP33, W31	None	213	242	25 kg	100 kg	E	13, 40, 148
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	Methacrylic acid, stabilized	8	UN2531	II	8	41, 387, IB2, T7, TP1, TP18, TP30	154	202	242	1 L	30 L	C	25, 40, 53, 58
	*		*		*		*		*		*		*
	Methanesulfonyl chloride	6.1	UN3246	I	6.1, 8	2, B9, B14, B32, T20, TP2, TP13, TP38, TP45	None	227	244	Forbidden	Forbidden	D	40, 53, 58
	*		*		*		*		*		*		*
	Methyl chloroformate	6.1	UN1238	I	6.1, 3, 8	1, B9, B14, B30, N34, T22, TP2, TP13, TP38, TP44	None	226	244	Forbidden	Forbidden	D	21, 53, 58, 40, 100

	*		*		*		*		*		*		*
	Methylamine, anhydrous	2.1	UN1061		2.1	N87, T50	306	304	314, 315	Forbidden	150 kg	B	40, 52
	*		*		*		*		*		*		*
	N-Methylbutylamine	3	UN2945	II	3, 8	IB2, T7, TP1	150	202	243	1 L	5 L	B	40, 52
	*		*		*		*		*		*		*
	Methyldichlorosilane	4.3	UN1242	I	4.3, 8, 3	A2, A3, A7, B6, B77, N34, T14, TP2, TP7, TP13, W31	None	201	243	Forbidden	1 L	D	21, 40, 49, 53, 58, 100
	*		*		*		*		*		*		*
	Methylphenyldichlorosilane	8	UN2437	II	8	T10, TP2, TP7, TP13	None	206	242	Forbidden	30 L	C	40, 53, 58
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	Methyltrichlorosilane	3	UN1250	II	3, 8	A7, B6, B77, N34, T10, TP2, TP7, TP13	None	206	243	Forbidden	5 L	B	40, 53, 58
	*		*		*		*		*		*		*
	Mines with bursting charge	1.1F	UN0136		1.1F		None	62	None	Forbidden	Forbidden	03	25
	Mines with bursting charge	1.1D	UN0137		1.1D		None	62	None	Forbidden	Forbidden	03	25
	Mines with bursting charge	1.2D	UN0138		1.2D		None	62	None	Forbidden	Forbidden	03	25
	Mines with bursting charge	1.2F	UN0294		1.2F		None	62	None	Forbidden	Forbidden	03	25
	*		*		*		*		*		*		*
	Molybdenum pentachloride	8	UN2508	III	8	IB8, IP3, T1, TP33	154	213	240	25 kg	100 kg	C	40, 53, 58
	*		*		*		*		*		*		*
	Nitrating acid mixtures, spent with more than 50 percent nitric acid	8	UN1826	I	8, 5.1	A7, T10, TP2, TP13	None	158	243	Forbidden	2.5 L	D	40, 53, 58, 66

	Nitrating acid mixtures spent <i>with not more than 50 percent nitric acid</i>	8	UN1826	II	8	A7, B2, IB2, T8, TP2	None	158	242	Forbidden	30 L	D	40, 53, 58
	Nitrating acid mixtures with <i>more than 50 percent nitric acid</i>	8	UN1796	I	8, 5.1	A7, T10, TP2, TP13	None	158	243	Forbidden	2.5 L	D	40, 53, 58, 66
	Nitrating acid mixtures with <i>not more than 50 percent nitric acid</i>	8	UN1796	II	8	A7, B2, IB2, T8, TP2, TP13	None	158	242	Forbidden	30 L	D	40, 53, 58
	Nitric acid <i>other than red fuming, with at least 65 percent, but not more than 70 percent nitric acid</i>	8	UN2031	II	8, 5.1	A6, B2, B47, B53, IB2, IP15, T8, TP2	None	158	242	Forbidden	30 L	D	53, 58, 66, 74, 89, 90
	Nitric acid <i>other than red fuming, with more than 20 percent and less than 65 percent nitric acid</i>	8	UN2031	II	8	A6, A212, B2, B47, B53, IB2, IP15, T8, TP2	None	158	242	Forbidden	30 L	D	44, 53, 58, 66, 74, 89, 90
	Nitric acid <i>other than red fuming with not more than 20 percent nitric acid</i>	8	UN2031	II	8	A6, B2, B47, B53, IB2, T8, TP2	None	158	242	1 L	30 L	D	53, 58
+	Nitric acid, red fuming	8	UN2032	I	8, 5.1, 6.1	2, B9, B32, T20, TP2, TP13, TP38, TP45	None	227	244	Forbidden	Forbidden	D	40, 53, 58, 66, 74, 89, 90
	*		*		*		*		*		*		*
	Nitrobenzenesulfonic acid	8	UN2305	II	8	B2, B4, IB8, IP2, IP4, T3, TP33	154	202	242	1 L	30 L	A	53, 58
	*		*		*		*		*		*		*
	Nitrocellulose with alcohol <i>with not less than 25 percent alcohol by mass, and with not more than 12.6 percent nitrogen, by dry mass</i>	4.1	UN2556	II	4.1	W31	151	212	None	1 kg	15 kg	D	12, 25, 28, 36
	*		*		*		*		*		*		*
	Nitrohydrochloric acid	8	UN1798	I	8	A3, B10, N41, T10, TP2, TP13	None	201	243	Forbidden	2.5 L	D	40, 53, 58, 66, 74, 89, 90
	*		*		*		*		*		*		*
	Nitrosylsulfuric acid, liquid	8	UN2308	II	8	A3, A6, A7, B2, IB2, N34, T8, TP2	154	202	242	1 L	30 L	D	40, 53, 58, 66, 74, 89, 90
	Nitrosylsulphuric acid, solid	8	UN3456	II	8	IB8, IP2, IP4, T3, TP33	154	212	240	15 kg	50 kg	D	40, 53, 58, 66, 74, 89, 90

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	Nonyltrichlorosilane	8	UN1799	II	8	A7, B2, B6, N34, T10, TP2, TP7, TP13	None	206	242	Forbidden	30 L	C	40, 53, 58
	*		*		*		*		*		*		*
	Octadecyltrichlorosilane	8	UN1800	II	8	A7, B2, B6, N34, T10, TP2, TP7, TP13	None	206	242	Forbidden	30 L	C	40, 53, 58
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	Octyltrichlorosilane	8	UN1801	II	8	A7, B2, B6, N34, T10, TP2, TP7, TP13	None	206	242	Forbidden	30 L	C	40, 53, 58
	*		*		*		*		*		*		*
	Paint including paint, lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler and liquid lacquer base	3	UN1263	I	3	367, T11, TP1, TP8, TP27	150	201	243	1 L	30 L	E	
				II	3	149, 367, B52, B131, IB2, T4, TP1, TP8, TP28	150	173	242	5 L	60 L	B	
				III	3	367, B1, B52, B131, IB3, T2, TP1, TP29	150	173	242	60 L	220 L	A	
	*		*		*		*		*		*		*
	Paint related material including paint thinning, drying, removing, or reducing compound	3	UN1263	I	3	367, T11, TP1, TP8, TP27	150	201	243	1 L	30 L	E	
				II	3	149, 367, B52, B131, IB2, T4, TP1, TP8, TP28	150	173	242	5 L	60 L	B	
				III	3	367, B1, B52, B131, IB3, T2, TP1, TP29	150	173	242	60 L	220 L	A	
	*		*		*		*		*		*		*
	Perchloric acid with more than 50 percent but not more than 72 percent acid, by mass	5.1	UN1873	I	5.1, 8	A2, A3, N41, T10, TP1	None	201	243	Forbidden	2.5 L	D	53, 58, 66

	Perchloric acid <i>with not more than 50 percent acid by mass</i>	8	UN1802	II	8, 5.1	IB2, N41, T7, TP2	None	202	243	Forbidden	30 L	C	53, 58, 66
	*		*		*		*		*		*		*
	Phenolsulfonic acid, liquid	8	UN1803	II	8	B2, IB2, N41, T7, TP2	154	202	242	1 L	30 L	C	14, 53, 58
	*		*		*		*		*		*		*
	Phenyl chloroformate	6.1	UN2746	II	6.1, 8	IB2, T7, TP2, TP13	153	202	243	1 L	30 L	A	12, 13, 25, 40, 53, 58
	*		*		*		*		*		*		*
	Phenyl phosphorus dichloride	8	UN2798	II	8	B2, B15, IB2, T7, TP2	154	202	242	Forbidden	30 L	B	40, 53, 58
	Phenyl phosphorus thiodichloride	8	UN2799	II	8	B2, B15, IB2, T7, TP2	154	202	242	Forbidden	30 L	B	40, 53, 58
	*		*		*		*		*		*		*
	Phenylacetyl chloride	8	UN2577	II	8	B2, IB2, T7, TP2	154	202	242	1 L	30 L	C	40, 53, 58
	*		*		*		*		*		*		*
	Phenyltrichlorosilane	8	UN1804	II	8	A7, B6, N34, T10, TP2, TP7, TP13	None	206	242	Forbidden	30 L	C	40, 53, 58
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	Phosphoric acid solution	8	UN1805	III	8	A7, IB3, N34, T4, TP1	154	203	241	5 L	60 L	A	53, 58
	Phosphoric acid, solid	8	UN3453	III	8	IB8, IP3, T1, TP33	154	213	240	25 kg	100 kg	A	53, 58
	*		*		*		*		*		*		*
	Phosphorous acid	8	UN2834	III	8	IB8, IP3, T1, TP33	154	213	240	25 kg	100 kg	A	25, 53, 58
	*		*		*		*		*		*		*
	Phosphorus oxybromide	8	UN1939	II	8	B8, IB8, IP2, IP4, N41, N43, T3, TP33	None	212	240	Forbidden	50 kg	C	12, 25, 40, 53, 58
	Phosphorus oxybromide, molten	8	UN2576	II	8	B2, B8, IB1, N41, N43, T7, TP3, TP13	None	202	242	Forbidden	Forbidden	C	40, 53, 58
	*		*		*		*		*		*		*

+	Phosphorous oxychloride	6.1	UN1810	I	6.1, 8	2, B9, B14, B32, B77, N34, T20, TP2, TP13, TP38, TP45	None	227	244	Forbidden	Forbidden	D	40, 53, 58
	Phosphorus pentabromide	8	UN2691	II	8	A7, IB8, IP2, IP4, N34, T3, TP33	154	212	240	Forbidden	50 kg	B	12, 25, 40, 53, 55, 58
	Phosphorus pentachloride	8	UN1806	II	8	A7, IB8, IP2, IP4, N34, T3, TP33	None	212	240	Forbidden	50 kg	C	40, 44, 53, 58, 89, 100, 141
	*		*		*		*		*		*		*
	Phosphorus pentoxide	8	UN1807	II	8	A7, IB8, IP2, IP4, N34, T3, TP33	154	212	240	15 kg	50 kg	A	53, 58
	*		*		*		*		*		*		*
	Phosphorus tribromide	8	UN1808	II	8	A3, A6, A7, B2, B25, IB2, N34, N43, T7, TP2	None	202	242	Forbidden	30 L	C	40, 53, 58
	Phosphorus trichloride	6.1	UN1809	I	6.1, 8	2, B9, B14, B15, B32, B77, N34, T20, TP2, TP13, TP38, TP45	None	227	244	Forbidden	Forbidden	C	40, 53, 58
	Phosphorus trioxide	8	UN2578	III	8	IB8, IP3, T1, TP33	154	213	240	25 kg	100 kg	A	12, 25, 53, 58
	*		*		*		*		*		*		*
	Phthalic anhydride with more than .05 percent maleic anhydride	8	UN2214	III	8	IB8, IP3, T1, TP33	154	213	240	25 kg	100 kg	A	53, 58
	*		*		*		*		*		*		*
	Potassium	4.3	UN2257	I	4.3	A7, A19, A20, B27, IB4, IP1, N6, N34, T9, TP7, TP33, W31	151	211	244	Forbidden	15 kg	D	13, 52, 148
	*		*		*		*		*		*		*
	Potassium borohydride	4.3	UN1870	I	4.3	A19, N40, W31	None	211	242	Forbidden	15 kg	E	13, 52, 148
	*		*		*		*		*		*		*
	Potassium hydrogen sulfate	8	UN2509	II	8	A7, IB8, IP2, IP4, N34, T3, TP33	154	212	240	15 kg	50 kg	A	53, 58
	Potassium hydrogendifluoride solid	8	UN1811	II	8, 6.1	IB8, IP2, IP4, N3, N34, T3, TP33	154	212	240	15 kg	50 kg	A	25, 40, 52, 53, 58

	Potassium hydrogendifluoride solution	8	UN3421	II	8, 6.1	IB2, N3, N34, T7, TP2	154	202	243	1 L	30 L	A	25, 40, 52, 53, 58
				III	8, 6.1	IB3, N3, N34, T4, TP1	154	203	241	5 L	60 L	A	40, 52, 53, 58
	*		*		*		*		*		*		*
	Potassium, metal alloys, solid	4.3	UN3403	I	4.3	A19, A20, B27, IB4, IP1, T9, TP7, TP33, W31	None	211	244	Forbidden	15 kg	D	13, 52, 148
	*		*		*		*		*		*		*
	Potassium phosphide	4.3	UN2012	I	4.3, 6.1	A19, N40, W31	None	211	None	Forbidden	15 kg	E	13, 40, 52, 85, 148
	*		*		*		*		*		*		*
	Potassium sodium alloys, solid	4.3	UN3404	I	4.3	A19, B27, N34, N40, T9, TP7, TP33, W31	None	211	244	Forbidden	15 kg	D	13, 52, 148
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	Printing ink, <i>flammable or Printing ink related material (including printing ink thinning or reducing compound), flammable</i>	3	UN1210	I	3	367, T11, TP1, TP8	150	173	243	1 L	30 L	E	
				II	3	149, 367, IB2, T4, TP1, TP8	150	173	242	5 L	60 L	B	
				III	3	367, B1, IB3, T2, TP1	150	173	242	60 L	220 L	A	
	*		*		*		*		*		*		*
	Projectiles, <i>with burster or expelling charge</i>	1.2D	UN0346		1.2D		None	62	None	Forbidden	Forbidden	03	25
	*		*		*		*		*		*		*
	Projectiles, <i>with burster or expelling charge</i>	1.2F	UN0426		1.2F		None	62	None	Forbidden	Forbidden	03	25
	Projectiles, <i>with burster or expelling charge</i>	1.4F	UN0427		1.4F		None	62	None	Forbidden	Forbidden	03	25
	*		*		*		*		*		*		*
	Projectiles, <i>with bursting charge</i>	1.1F	UN0167		1.1F		None	62	None	Forbidden	Forbidden	03	25

	Projectiles, with bursting charge	1.1D	UN0168		1.1D		None	62	None	Forbidden	Forbidden	03	25
	Projectiles, with bursting charge	1.2D	UN0169		1.2D		None	62	None	Forbidden	Forbidden	03	25
	Projectiles, with bursting charge	1.2F	UN0324		1.2F		None	62	None	Forbidden	Forbidden	03	25
	*		*		*		*		*		*		*
	Propionic acid with not less than 90% acid by mass	8	UN3463	II	8, 3	IB2, T7, TP2	154	202	243	1 L	30 L	A	53, 58
	Propionic acid with not less than 10% and less than 90% acid by mass	8	UN1848	III	8	IB3, T4, TP1	154	203	241	5 L	60 L	A	53, 58
	Propionic anhydride	8	UN2496	III	8	IB3, T4, TP1	154	203	241	5 L	60 L	A	53, 58
	*		*		*		*		*		*		*
	Propionyl chloride	3	UN1815	II	3, 8	IB1, T7, TP1	150	202	243	1 L	5 L	B	40, 53, 58
	*		*		*		*		*		*		*
	n-Propyl chloroformate	6.1	UN2740	I	6.1, 3, 8	2, B9, B14, B32, B77, N34, T20, TP2, TP13, TP38, TP44	None	227	244	Forbidden	Forbidden	B	21, 40, 53, 58, 100
	*		*		*		*		*		*		*
	Propylamine	3	UN1277	II	3, 8	A7, IB2, N34, T7, TP1	150	202	243	1 L	5 L	E	40, 52
	*		*		*		*		*		*		*
	1,2-Propylenediamine	8	UN2258	II	8, 3	A3, A6, IB2, N34, T7, TP2	None	202	243	1 L	30 L	A	40, 52
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	Propyltrichlorosilane	8	UN1816	II	8, 3	A7, B2, B6, N34, T10, TP2, TP7, TP13	None	206	243	Forbidden	30 L	C	40, 53, 58
	*		*		*		*		*		*		*
	Pyrosulfuryl chloride	8	UN1817	II	8	B2, IB2, T8, TP2	154	202	242	1 L	30 L	C	40, 53, 58

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	Radioactive material, excepted package-empty packaging	7	UN2908		Empty	368	422, 428	422, 428	422, 428			A	
	*		*		*		*		*		*		*
	Radioactive material, surface contaminated objects (SCO-I or SCO-II) non fissile or fissile-excepted	7	UN2913		7	392, A56	421, 422, 428	427	427			A	95
	*		*		*		*		*		*		*
	Radioactive material, uranium hexafluoride non fissile or fissile-excepted	7	UN2978		7, 6.1, 8		423	420, 427	420, 427			B	40, 74, 95, 132, 151
	Radioactive material, uranium hexafluoride, fissile	7	UN2977		7, 6.1, 8		453	417, 420	417, 420			B	40, 74, 95, 132, 151
	*		*		*		*		*		*		*
	Resin Solution, flammable	3	UN1866	I	3	B52, T11, TP1, TP8, TP28	150	201	243	1 L	30 L	E	
				II	3	149, B52, IB2, T4, TP1, TP8	150	173	242	5 L	60 L	II	
				III	3	B1, B52, IB3, T2, TP1	150	173	242	60 L	220 L	A	
	*		*		*		*		*		*		*
	Rocket motors	1.3C	UN0186		1.3C	109	None	62	None	Forbidden	220 kg	03	25
	Rocket motors	1.1C	UN0280		1.1C	109	None	62	None	Forbidden	Forbidden	03	25
	*		*		*		*		*		*		*
	Rockets, with bursting charge	1.1F	UN0180		1.1F		None	62	None	Forbidden	Forbidden	03	25
	Rockets, with bursting charge	1.1E	UN0181		1.1E		None	62	None	Forbidden	Forbidden	03	25
	Rockets, with bursting charge	1.2E	UN0182		1.2E		None	62	None	Forbidden	Forbidden	03	25
	Rockets, with bursting charge	1.2F	UN0295		1.2F		None	62	None	Forbidden	Forbidden	03	25

	Rockets, with expelling charge	1.2C	UN0436		1.2C		None	62	None	Forbidden	Forbidden	03	25
	Rockets, with expelling charge	1.3C	UN0437		1.3C		None	62	None	Forbidden	Forbidden	03	25
	*		*		*		*		*		*		*
	Rockets, with inert head	1.3C	UN0183		1.3C		None	62	None	Forbidden	Forbidden	03	25
	Rockets, with inert head	1.2C	UN0502		1.2C		None	62	None	Forbidden	Forbidden	03	25, 5E
	*		*		*		*		*		*		*
	Rubidium	4.3	UN1423	I	4.3	22, A7, A19, IB4, IP1, N34, N40, N45, W31	None	211	242	Forbidden	15 kg	D	13, 52, 148
	*		*		*		*		*		*		*
	Seed cake, containing vegetable oil solvent extractions and expelled seeds, with not more than 10 percent of oil and when the amount of moisture is higher than 11 percent, with not more than 20 percent of oil and moisture combined	4.2	UN1386	III	None	B136, IB8, IP3, 1P7, N7	None	213	241	Forbidden	Forbidden	A	13, 25
I	Seed cake with more than 1.5 percent oil and not more than 11 percent moisture	4.2	UN1386	III	None	B136, IB8, IP3, IP7, N7	None	213	241	Forbidden	Forbidden	E	13, 25
I	Seed cake with not more than 1.5 percent oil and not more than 11 percent moisture	4.2	UN2217	III	None	B136, IB8, IP3, 1P7, N7	None	213	241	Forbidden	Forbidden	A	13, 25, 120
	*		*		*		*		*		*		*
	Selenic acid	8	UN1905	I	8	IB7, IP1, N34, T6, TP33	None	211	242	Forbidden	25 kg	A	53, 58
	*		*		*		*		*		*		*
	Selenium oxychloride	8	UN2879	I	8, 6.1	A3, A6, A7, N34, T10, TP2, TP13	None	201	243	0.5 L	2.5 L	E	40, 53, 58
	*		*		*		*		*		*		*
	Silicon tetrachloride	8	UN1818	II	8	A3, A6, B2, B6, T10, TP2, TP7,	None	202	242	Forbidden	30 L	C	40, 53, 58

						TP13							
	*		*		*		*		*		*		*
	Sludge, acid	8	UN1906	II	8	A3, A7, B2, IB2, N34, T8, TP2, TP28	None	202	242	Forbidden	30 L	C	14, 53, 58
	*		*		*		*		*		*		*
	Sodium	4.3	UN1428	I	4.3	A7, A8, A19, A20, B9, B48, B68, IB4, IP1, N34, T9, TP7, TP33, TP46, W31	151	211	244	Forbidden	15 kg	D	13, 52, 148
	*		*		*		*		*		*		*
	Sodium borohydride	4.3	UN1426	I	4.3	N40, W31	None	211	242	Forbidden	15 kg	E	13, 52, 148
	*		*		*		*		*		*		*
	Sodium hydride	4.3	UN1427	I	4.3	A19, N40, W31	None	211	242	Forbidden	15 kg	E	13, 52, 148
	Sodium hydrogendifluoride	8	UN2439	II	8	IB8, IP2, IP4, N3, N34, T3, TP33	154	212	240	15 kg	50 kg	A	12, 25, 40, 52, 53, 58
	*		*		*		*		*		*		*
	Sodium phosphide	4.3	UN1432	I	4.3, 6.1	A19, N40, W31	None	211	None	Forbidden	15 kg	E	13, 40, 52, 85, 148
	*		*		*		*		*		*		*
	Sounding devices, explosive	1.2F	UN0204		1.2F		None	62	None	Forbidden	Forbidden	03	25
	Sounding devices, explosive	1.1F	UN0296		1.1F		None	62	None	Forbidden	Forbidden	03	25
	Sounding devices, explosive	1.1D	UN0374		1.1D		None	62	None	Forbidden	Forbidden	03	25
	Sounding devices, explosive	1.2D	UN0375		1.2D		None	62	None	Forbidden	Forbidden	03	25
	*		*		*		*		*		*		*
	Stannic chloride, anhydrous	8	UN1827	II	8	B2, IB2, T7, TP2	154	202	242	1 L	30 L	C	53, 58
	Stannic chloride pentahydrate	8	UN2440	III	8	IB8, IP3, T1, TP33	154	213	240	25 kg	100 kg	A	53, 58

	Stannic phosphide	4.3	UN1433	I	4.3, 6.1	A19, N40, W31	None	211	242	Forbidden	15 kg	E	13, 40, 52, 85, 148
	*		*		*		*		*		*		*
	Strontium phosphide	4.3	UN2013	I	4.3, 6.1	A19, N40, W31	None	211	None	Forbidden	15 kg	E	13, 40, 52, 85, 148
	*		*		*		*		*		*		*
G	Substances, explosive, n.o.s.	1.4S	UN0481		1.4S	101, 347	None	62	None	25 kg	75 kg	01	25
	*		*		*		*		*		*		*
	Sulfamic acid	8	UN2967	III	8	1B8, IP3, T1, TP33	154	213	240	25 kg	100 kg	A	53, 58
	*		*		*		*		*		*		*
	Sulfur chlorides	8	UN1828	I	8	5, A3, A7, A10, B10, B77, N34, T20, TP2	None	201	243	Forbidden	2.5 L	C	40, 53, 58
	*		*		*		*		*		*		*
+	Sulfur trioxide, stabilized	8	UN1829	I	8, 6.1	2, 387, B9, B14, B32, B49, B77, N34, T20, TP4, TP13, TP25, TP26, TP38, TP45	None	227	244	Forbidden	Forbidden	A	25, 40, 53, 58
	*		*		*		*		*		*		*
	Sulfuric acid, fuming with less than 30 percent free sulfur trioxide	8	UN1831	I	8	A3, A7, N34, T20, TP2, TP13	None	201	243	Forbidden	2.5 L	C	14, 40, 53, 58
	Sulfuric acid, fuming with 30 percent or more free sulfur trioxide	8	UN1831	I	8, 6.1	2, B9, B14, B32, B77, B84, N34, T20, TP2, TP12, TP13	None	227	244	Forbidden	Forbidden	C	53, 58
	Sulfuric acid, spent	8	UN1832	II	8	A3, A7, B2, B83, B84, IB2, N34, T8, TP2	None	202	242	Forbidden	30 L	C	14, 53, 58
	*		*		*		*		*		*		*
	Sulfuric acid with more than 51 percent acid	8	UN1830	II	8	A3, A7, B3, B83, B84, IB2, N34, T8, TP2	154	202	242	1 L	30 L	C	14, 53, 58

	Sulfuric acid <i>with not more than 51% acid</i>	8	UN2796	II	8	386, A3, A7, B2, B15, IB2, N6, N34, T8, TP2	154	202	242	1 L	30 L	B	53, 58
	*		*		*		*		*		*		*
	Sulfurous acid	8	UN1833	II	8	B3, IB2, T7, TP2	154	202	242	1 L	30 L	B	40, 53, 58
+	Sulfuryl chloride	6.1	UN1834	I	6.1, 8	1, B6, B9, B10, B14, B30, B77, N34, T22, TP2, TP13, TP38, TP44	None	226	244	Forbidden	Forbidden	D	40, 53, 58
	*		*		*		*		*		*		*
	Tetrahydrophthalic anhydrides <i>with more than 0.05 percent of maleic anhydride</i>	8	UN2698	III	8	IB8, IP3, T1, TP33	154	213	240	25 kg	100 kg	A	53, 58
	*		*		*		*		*		*		*
	Thioglycolic acid	8	UN1940	II	8	A7, B2, IB2, N34, T7, TP2	154	202	242	1 L	30 L	A	53, 58
	*		*		*		*		*		*		*
	Thionyl chloride	8	UN1836	I	8	B6, B10, N34, T10, TP2, TP13	None	201	243	Forbidden	Forbidden	C	40, 53, 58
	*		*		*		*		*		*		*
	Thiophosphoryl chloride	8	UN1837	II	8	A3, A7, B2, B8, B25, IB2, N34, T7, TP2	None	202	242	Forbidden	30 L	C	40, 53, 58
	*												
+	Titanium tetrachloride	6.1	UN1838	I	6.1, 8	2, B7, B9, B14, B32, B77, T20, TP2, TP13, TP38, TP45	None	227	244	Forbidden	Forbidden	D	40, 53, 58
	Titanium trichloride mixtures	8	UN2869	II	8	A7, IB8, IP2, IP4, N34, T3, TP33	154	212	240	15 kg	50 kg	A	40, 53, 58
				III	8	A7, IB8, IP3, N34, T1, TP33	154	213	240	25 kg	100 kg	A	40, 53, 58
	*		*		*		*		*		*		*
	Torpedoes <i>with bursting charge</i>	1.1F	UN0330		1.1F		None	62	None	Forbidden	Forbidden	03	25

	Torpedoes with bursting charge	1.1D	UN0451		1.1D		None	62	None	Forbidden	Forbidden	03	25
	*		*		*		*		*		*		*
	Triallylamine	3	UN2610	III	3, 8	B1, IB3, T4, TP1	None	203	242	5 L	60 L	A	40, 52
	*		*		*		*		*		*		*
	Trichloroacetic acid	8	UN1839	II	8	A7, IB8, IP2, IP4, N34, T3, TP33	154	212	240	15 kg	50 kg	A	53, 58
	Trichloroacetic acid, solution	8	UN2564	II	8	A3, A6, A7, B2, IB2, N34, T7, TP2	154	202	242	1 L	30 L	B	53, 58
				III	8	A3, A6, A7, IB3, N34, T4, TP1	154	203	241	5 L	60 L	B	8, 53, 58
+	Trichloroacetyl chloride	8	UN2442	II	8, 6.1	2, B9, B14, B32, N34, T20, TP2, TP38, TP45	None	227	244	Forbidden	Forbidden	D	40, 53, 58
	*		*		*		*		*		*		*
	Trichlorosilane	4.3	UN1295	I	4.3, 3, 8	N34, T14, TP2, TP7, TP13, W31	None	201	244	Forbidden	Forbidden	D	21, 40, 49, 53, 58, 100
	*		*		*		*		*		*		*
	Trifluoroacetic acid	8	UN2699	I	8	A3, A6, A7, B4, N3, N34, N36, T10, TP2	None	201	243	0.5 L	2.5 L	B	12, 25, 40, 53, 58
	*		*		*		*		*		*		*
	Trimethylacetyl chloride	6.1	UN2438	I	6.1, 8, 3	2, B3, B9, B14, B32, N34, T20, TP2, TP13, TP38, TP45	None	227	244	Forbidden	Forbidden	D	21, 25, 40, 53, 58, 100
	Trimethylamine, anhydrous	2.1	UN1083		2.1	N87, T50	306	304	314, 315	Forbidden	150 kg	B	40, 52
	Trimethylamine, aqueous solutions with not more than 50 percent trimethylamine by mass	3	UN1297	I	3, 8	T11, TP1	None	201	243	0.5 L	2.5 L	D	40, 52, 135
				II	3, 8	B1, IB2, T7, TP1	150	202	243	1 L	5 L	B	40, 41, 52
				III	3, 8	B1, IB3, T7, TP1	150	203	242	5 L	60 L	A	40, 41, 52

	*		*		*		*		*		*		*
	Trimethylchlorosilane	3	UN1298	II	3, 8	A3, A7, B77, N34, T10, TP2, TP7, TP13	None	206	243	Forbidden	5 L	E	40, 53, 58
	Trimethylcyclohexylamine	8	UN2326	III	8	IB3, T4, TP1	154	203	241	5 L	60 L	A	52
	*		*		*		*		*		*		*
	Trimethylhexamethylenediamines	8	UN2327	III	8	IB3, T4, TP1	154	203	241	5 L	60 L	A	52
	*		*		*		*		*		*		*
	Tripropylamine	3	UN2260	III	3, 8	B1, IB3, T4, TP1	150	203	242	5 L	60 L	A	40, 52
	*		*		*		*		*		*		*
	Uranium hexafluoride, radioactive material, excepted package, less than 0.1 kg per package, non-fissile or fissile-excepted	6.1	UN3507	I	6.1, 7, 8	369	420	None	None	Less than .1 kg	Less than .1 kg	A	132, 152
	*		*		*		*		*		*		*
	Valeryl chloride	8	UN2502	II	8, 3	A3, A6, A7, B2, IB2, N34, T7, TP2	154	202	243	1 L	30 L	C	40, 53, 58
	*		*		*		*		*		*		*
	Vanadium oxytrichloride	8	UN2443	II	8	A3, A6, A7, B2, B16, IB2, N34, T7, TP2	154	202	242	Forbidden	30 L	C	40, 53, 58
	*		*		*		*		*		*		*
	Vanadium tetrachloride	8	UN2444	I	8	A3, A6, A7, B4, N34, T10, TP2	None	201	243	Forbidden	2.5 L	C	40, 53, 58
	Vanadium trichloride	8	UN2475	III	8	IB8, IP3, T1, TP33	154	213	240	25 kg	100 kg	A	40, 53, 58
	*		*		*		*		*		*		*
	Vinyltrichlorosilane	3	UN1305	II	3, 8	A3, A7, B6, N34, T10, TP2, TP7, TP13	None	206	243	Forbidden	5 L	B	40, 53, 58

	*		*		*		*		*		*		*
	Warheads, rocket with burster or expelling charge	1.4F	UN0371		1.4F		None	62	None	Forbidden	Forbidden	03	25
	Warheads, rocket with bursting charge	1.1D	UN0286		1.1D		None	62	None	Forbidden	Forbidden	03	25
	Warheads, rocket with bursting charge	1.2D	UN0287		1.2D		None	62	None	Forbidden	Forbidden	03	25
	Warheads, rocket with bursting charge	1.1F	UN0369		1.1F		None	62	None	Forbidden	Forbidden	03	25
	Warheads, torpedo with bursting charge	1.1D	UN0221		1.1D		None	62	None	Forbidden	Forbidden	03	25
	*		*		*		*		*		*		*
G	Water-reactive solid, n.o.s	4.3	UN2813	I	4.3	IB4, N40, T9, TP7, TP33, W31	None	211	242	Forbidden	15 kg	E	13, 40, 148
				II	4.3	B132, IB7, IP2, IP21, T3, TP33, W31, W40	151	212	242	15 kg	50 kg	E	13, 40, 148
				III	4.3	B132, IB8, IP21, T1, TP33, W31	151	213	241	25 kg	100 kg	E	13, 40, 148
	*		*		*		*		*		*		*
	Zinc ashes	4.3	UN1435	III	4.3	A1, A19, B136, IB8, IP4, T1, TP33	151	213	241	25 kg	100 kg	A	13, 148
	*		*		*		*		*		*		*
	Zinc chloride, anhydrous	8	UN2331	III	8	IB8, IP3, T1, TP33	None	213	240	25 kg	100 kg	A	53, 58
	Zinc chloride, solution	8	UN1840	III	8	IB3, T4, TP2	154	203	241	5 L	60 L	A	53, 58
	*		*		*		*		*		*		*
	Zinc phosphide	4.3	UN1714	I	4.3, 6.1	A19, N40, W31	None	211	None	Forbidden	15 kg	E	13, 40, 52, 85, 148
	*		*		*		*		*		*		*
	Zirconium tetrachloride	8	UN2503	III	8	IB8, IP3, T1, TP33	154	213	240	25 kg	100 kg	A	53, 58

* * * * *

Appendix B to § 172.101--List of Marine Pollutants.

* * * * *

LIST OF MARINE POLLUTANTS

S. M. P. (1)	Marine Pollutant (2)
* *	* * * * *
	Dodecene (except 1-dodecene)
* *	* * * * *

* * * * *

7. In § 172.102:

a. In paragraph (c)(1):

i. Special provisions 132, 150, 238, the first sentence of special provision 369, and special provision 387 are revised;

ii. Special provisions 388, 389, 391, and 392 are added; and

iii. Special provisions 421 and 422 are revised;

b. In paragraph (c)(2), special provisions A56 and A105 are revised;

c. In paragraph (c)(3), special provision B136 is added;

d. In paragraph (c)(8)(ii), special provision TP10 is revised; and

e. In paragraph (c)(9), special provision W32 is removed.

The additions and revisions read as follows:

§ 172.102 Special Provisions.

* * * * *

(c) * * *

(1) * * *

132 This description may only be used for ammonium nitrate-based compound fertilizers. They must be classified in accordance with the procedure as set out in the Manual of Tests and Criteria, part III, section 39 (IBR, *see* § 171.7 of this subchapter). Fertilizers meeting the criteria for this identification number are only subject to the requirements of this subchapter when offered for transportation and transported by air or vessel.

* * * * *

150 This description may only be used for ammonium nitrate-based fertilizers.

They must be classified in accordance with the procedure as set out in the Manual of Tests and Criteria, part III, section 39 (IBR, *see* §171.7 of this subchapter).

* * * *

238 Neutron radiation detectors: Neutron radiation detectors containing non-pressurized boron trifluoride gas in excess of 1 gram (0.035 ounces) and radiation detection systems containing such neutron radiation detectors as components may be transported by highway, rail, vessel, or cargo aircraft in accordance with the following:

a. Each radiation detector must meet the following conditions:

(1) The pressure in each neutron radiation detector must not exceed 105 kPa absolute at 20 °C (68 °F);

(2) The amount of gas must not exceed 13 grams (0.45 ounces) per detector; and

(3) Each neutron radiation detector must be of welded metal construction with brazed metal to ceramic feed through assemblies. These detectors must have a minimum burst pressure of 1800 kPa as demonstrated by design type qualification testing; and

(4) Each detector must be tested to a 1×10^{-10} cm³/s leaktightness standard before filling.

b. Radiation detectors transported as individual components must be transported as follows:

(1) They must be packed in a sealed intermediate plastic liner with sufficient absorbent or adsorbent material to absorb or adsorb the entire gas contents.

(2) They must be packed in strong outer packagings and the completed package must be capable of withstanding a 1.8 meter (5.9 feet) drop without leakage of gas contents from detectors.

(3) The total amount of gas from all detectors per outer packaging must not exceed 52 grams (1.83 ounces).

c. Completed neutron radiation detection systems containing detectors meeting the conditions of paragraph a of this special provision must be transported as follows:

(1) The detectors must be contained in a strong sealed outer casing;

(2) The casing must contain include sufficient absorbent or adsorbent material to absorb or adsorb the entire gas contents;

(3) The completed system must be packed in strong outer packagings capable of withstanding a 1.8 meter (5.9 feet) drop test without leakage unless a system's outer casing affords equivalent protection.

d. Except for transportation by aircraft, neutron radiation detectors and radiation detection systems containing such detectors transported in accordance with paragraph a of this special provision are not subject to the labeling and placarding requirements of part 172 of this subchapter.

e. When transported by highway, rail, vessel, or as cargo on an aircraft, neutron radiation detectors containing not more than 1 gram of boron trifluoride, including those with solder glass joints are not subject to any other requirements of this subchapter provided they meet the requirements in paragraph a of this special provision and are packed in accordance with paragraph b of this special provision. Radiation detection systems containing such detectors are not subject to any other requirements of this subchapter provided they are packed in accordance with paragraph c of this special provision.

* * * *

369 In accordance with §173.2a of this subchapter, this radioactive material in an excepted package possessing toxic and corrosive properties is classified in Division 6.1 with radioactivity and corrosive subsidiary risks. * * *

* * * *

387 When materials are stabilized by temperature control, the provisions of § 173.21(f) of this subchapter apply. When chemical stabilization is employed, the person offering the material for transport shall ensure that the level of stabilization is sufficient to prevent the material as packaged from dangerous polymerization at 50 °C (122 °F). If chemical stabilization becomes ineffective at lower temperatures within the anticipated duration of transport, temperature control is required and is forbidden by aircraft. In making this determination factors to be taken into consideration include, but are not limited to, the capacity and geometry of the packaging and the effect of any insulation present, the temperature of the material when offered for transport, the duration of the

journey, and the ambient temperature conditions typically encountered in the journey (considering also the season of year), the effectiveness and other properties of the stabilizer employed, applicable operational controls imposed by regulation (e.g. requirements to protect from sources of heat, including other cargo carried at a temperature above ambient) and any other relevant factors. The provisions of this special provision will be effective until January 2, 2021, unless we terminate them earlier or extend them beyond that date by notice of a final rule in the Federal Register.

388 a. Lithium batteries containing both primary lithium metal cells and rechargeable lithium ion cells that are not designed to be externally charged, must meet the following conditions:

- i. The rechargeable lithium ion cells can only be charged from the primary lithium metal cells;
- ii. Overcharge of the rechargeable lithium ion cells is precluded by design;
- iii. The battery has been tested as a primary lithium battery; and
- iv. Component cells of the battery must be of a type proved to meet the respective testing requirements of the Manual of Tests and Criteria, part III, subsection 38.3 (IBR, see § 171.7 of this subchapter).

b. Lithium batteries conforming to paragraph a. of this special provision must be assigned to UN Nos. 3090 or 3091, as appropriate. When such

batteries are transported in accordance with § 173.185(c), the total lithium content of all lithium metal cells contained in the battery must not exceed 1.5 g and the total capacity of all lithium ion cells contained in the battery must not exceed 10 Wh.

389 This entry only applies to lithium ion batteries or lithium metal batteries installed in a cargo transport unit and designed only to provide power external to the cargo transport unit. The lithium batteries must meet the requirements of § 173.185(a) and contain the necessary systems to prevent overcharge and over discharge between the batteries. The batteries must be securely attached to the interior structure of the cargo transport unit (e.g., by means of placement in racks, cabinets, etc.) in such a manner as to prevent short circuits, accidental operation, and significant movement relative to the cargo transport unit under the shocks, loadings, and vibrations normally incident to transport. Hazardous materials necessary for the safe and proper operation of the cargo transport unit (e.g., fire extinguishing systems and air conditioning systems), must be properly secured to or installed in the cargo transport unit and are not otherwise subject to this subchapter. Hazardous materials not necessary for the safe and proper operation of the cargo transport unit must not be transported within the cargo transport unit. The batteries inside the cargo transport unit are not subject to marking or labelling requirements of part 172 subparts D and E of this subchapter. The cargo transport unit shall display the UN number in a manner in accordance with § 172.332 of this subchapter and be placarded on two opposing sides. For transportation by

aircraft, cargo transport units may only be offered for transportation and transported under conditions approved by the Associate Administrator.

391 Except for articles being transported by motor vehicle as a material of trade in accordance with § 173.6 of this subchapter, articles containing hazardous materials of Division 2.3, or Division 4.2, or Division 4.3, or Division 5.1, or Division 5.2, or Division 6.1 (substances with a inhalation toxicity of Packing Group I) and articles containing more than one of the following hazards: (1) Gases of Class 2; (2) Liquid desensitized explosives of Class 3; or (3) Self-reactive substances and solid desensitized explosives of Division 4.1, may only be offered for transportation and transported under conditions approved by the Associate Administrator.

392 In the case of non-fissile or fissile-excepted uranium hexafluoride, the material must be classified under UN2978.

* * * * *

421 This entry will no longer be effective on January 2, 2021, unless we terminate it earlier or extend it beyond that date by notice of a final rule in the Federal Register.

422 When labelling is required, the label to be used must be the label shown in §172.447. When a placard is displayed, the placard must be the placard shown in §172.560.

(2) * * *

A56 Radioactive material with a subsidiary hazard of Division 4.2, Packing Group I, must be transported in Type B packages when offered for transportation by aircraft. Where the subsidiary hazard material is "Forbidden" in column (9A) or (9B) of the § 172.101 Table, the radioactive material may only be offered for transportation and transported by aircraft under conditions approved by the Associate Administrator.

* * * *

A105 a. This entry applies to machinery or apparatus containing hazardous materials as a residue or as an integral element of the machinery or apparatus. It must not be used for machinery or apparatus for which a proper shipping name already exists in the § 172.101 Table.

b. Where the quantity of hazardous materials contained as an integral element in machinery or apparatus exceeds the limits permitted by § 173.222(c)(2), and the hazardous materials meet the provisions of § 173.222(c), the machinery or apparatus may be transported by aircraft only with the prior approval of the Associate Administrator.

* * * *

(3) * * *

B136 Non-specification closed bulk bins are authorized.

* * * *

(8) * * *

(ii) * * *

TP10 A lead lining, not less than 5 mm thick, which shall be tested annually, or

another suitable lining material approved by the competent authority, is required.

A portable tank may be offered for transport after the date of expiry of the last lining inspection for a period not to exceed three months for purposes of performing the next required test or inspection, after emptying but before cleaning.

* * * * *

8. In § 172.203 paragraph (o) is revised to read as follows:

§ 172.203 Additional description requirements.

* * * * *

(o) *Organic peroxides, polymerizing substances, and self-reactive materials.*

The description on a shipping paper for a Division 4.1 (polymerizing substance and self-reactive) material or a Division 5.2 (organic peroxide) material must include the following additional information, as appropriate:

(1) If notification or competent authority approval is required, the shipping paper must contain a statement of approval of the classification and conditions of transport.

(2) For Division 4.1 (polymerizing substance and self-reactive) and Division 5.2 (organic peroxide) materials that require temperature control during transport, the words “TEMPERATURE CONTROLLED” must be added as part of the proper shipping name, unless already part of the proper shipping name. The control and emergency temperature must be included on the shipping paper.

(3) The word “SAMPLE” must be included in association with the basic description when a sample of a Division 4.1 (polymerizing substance and self-reactive) material (see § 173.224(c)(3) of this subchapter) or Division 5.2 (organic peroxide)

material (see § 173.225(b)(2) of this subchapter) is offered for transportation.

* * * * *

9. In § 172.407, paragraph (c)(1) is revised to read as follows:

§ 172.407 Label specifications.

* * * * *

(c) * * *

(1) Each diamond (square-on-point) label prescribed in this subpart must be at least 100 mm (3.9 inches) on each side with each side having a solid line inner border approximately 5 mm (.2 inches) inside and parallel to the edge. The 5 mm (.2 inches) measurement is from the outside edge of the label to the outside of the solid line forming the inner border.

(i) If the size of the package so requires, the dimensions of the label and its features may be reduced proportionally provided the symbol and other elements of the label remain clearly visible.

(ii) Where dimensions are not specified, all features shall be in approximate proportion to those shown in §§ 172.411 through 172.448 of this subpart, as appropriate.

(iii) [Reserved]

(iv) For domestic transportation, a packaging labeled prior to January 1, 2017, and in conformance with the requirements of this paragraph in effect on December 31, 2014, may continue in service until the end of its useful life.

* * * * *

10. In, § 172.514 paragraphs (a) and (c)(3) are revised and paragraph (d) is added to read as follows:

§ 172.514 Bulk packagings.

(a) Except as provided in paragraphs (c) and (d) of this section, each person who offers for transportation a bulk packaging which contains a hazardous material, shall affix the placards specified for the material in §§172.504 and 172.505.

* * * * *

(c) * * *

(3) A bulk packaging other than a portable tank, cargo tank, flexible bulk container, or tank car (e.g., a bulk bag or box) with a volumetric capacity of less than 18 cubic meters (640 cubic feet);

* * * * *

(d) A flexible bulk container may be placarded in two opposing positions.

11. In § 172.604, paragraph (d)(2) is revised to read as follows:

§ 172.604 Emergency response telephone number.

* * * * *

(d) * * *

(2) Materials properly described under the following shipping names:

Battery powered equipment.

Battery powered vehicle.

Carbon dioxide, solid.

Castor bean.

Castor flake.

Castor meal.

Castor pomace.

Consumer commodity.

Dry ice.

Engine, fuel cell, flammable gas powered.

Engine, fuel cell, flammable liquid powered.

Engine, internal combustion.

Engine, internal combustion, flammable gas powered.

Engine, internal combustion, flammable liquid powered.

Fish meal, stabilized.

Fish scrap, stabilized.

Krill Meal, PG III.

Machinery, internal combustion.

Machinery, fuel cell, flammable gas powered.

Machinery, fuel cell, flammable liquid powered.

Machinery, internal combustion, flammable gas powered.

Machinery, internal combustion, flammable liquid powered.

Refrigerating machine.

Vehicle, flammable gas powered.

Vehicle, flammable liquid powered.

Wheelchair, electric.

* * * * *

12. In § 172.800, paragraph (b)(15) is revised to read as follows:

§ 172.800 Purpose and applicability.

* * * * *

(b) * * *

(15) International Atomic Energy Agency Code of Conduct (IBR, see § 171.7)

Category 1 and 2 materials, Nuclear Regulatory Commission, Category 1 and Category 2 radioactive materials as listed in Table 1, Appendix A to 10 CFR Part 37, and Highway Route Controlled quantities as defined in 49 CFR 173.403.

* * * * *

PART 173--SHIPPERS--GENERAL REQUIREMENTS FOR SHIPMENTS AND PACKAGINGS

13. The authority citation for part 173 continues to read as follows:

Authority: 49 U.S.C. 5101–5128, 44701; 49 CFR 1.81, 1.96 and 1.97.

14. In § 173.2a, revise paragraph (a) introductory text to read as follows:

§173.2a Classification of a material having more than one hazard.

(a) *Classification of a material having more than one hazard.* Except as provided in paragraph (c) of this section, a material not specifically listed in the §172.101 Table or assigned to an entry of articles containing hazardous materials (UN3537 to UN3548) that meets the definition of more than one hazard class or division as defined in this part, shall be classed according to the highest applicable hazard class of the following hazard classes, which are listed in descending order of hazard:

* * * * *

15. In § 173.6, paragraph (a)(7) is added and paragraph (b)(3) is revised to read as

follows:

§ 173.6 Materials of trade exceptions.

* * * * *

(a) * * *

(7) For a material or article for which Column (5) of the Hazardous Materials Table in §172.101 of this subchapter does not indicate a packing group. Authorized amounts are:

(i) For Classes or Divisions indicated in paragraph (a)(1) of this section, the amounts shown in paragraph (a)(1)(ii).

(ii) For Division 4.3, the amounts shown in paragraph (a)(3) of this section.

(b) * * *

(3) Outer packagings are not required for receptacles (e.g., cans and bottles) or articles that are secured against shifting in cages, carts, bins, boxes, or compartments or by other means.

* * * * *

16. In § 173.62:

a. In paragraph (b), the heading of the Explosives Table is revised; and

b. In paragraph (c), in the Table of Packing Methods, the table heading and Packing Instruction US 1 are revised to read as follows:

§ 173.62 Specific packaging requirements for explosives.

* * * * *

(b) * * *

Table to paragraph (b): Explosives Table

(c) * * *

Table to paragraph (c): Table of Packing Methods

Packing instruction	Inner packagings	Intermediate packagings	Outer packagings
---------------------	------------------	-------------------------	------------------

* * * * *

US 1			
1. A jet perforating gun, charged, oil well may be transported under the following conditions:			
a. Initiation devices carried on the same motor vehicle or offshore supply vessel must be segregated; each kind from every other kind, and from any gun, tool or other supplies, unless approved in accordance with §173.56. Segregated initiation devices must be carried in a container having individual pockets for each such device or in a fully enclosed steel container lined with a non-sparking material. No more than two segregated initiation devices per gun may be carried on the same motor vehicle.			
b. Each shaped charge affixed to the gun may not contain more than 112 g (4 ounces) of explosives.			
c. Each shaped charge if not completely enclosed in glass or metal, must be fully protected by a metal cover after installation in the gun.			
d. A jet perforating gun classed as 1.1D or 1.4D may be transported by highway by private or contract carriers engaged in oil well operations.			
(i) A motor vehicle transporting a gun must have specially built racks or carrying cases designed and constructed so that the gun is securely held in place during transportation and is not subject to damage by contact, one to the other or any other article or material carried in the vehicle; and			
(ii) The assembled gun packed on the vehicle may not extend beyond the body of the motor vehicle.			
e. A jet perforating gun classed as 1.4D may be transported by a private offshore supply vessel only when the gun is carried in a motor vehicle as specified in paragraph (d) of this packing method or on offshore well tool pallets provided that:			
(i) All the conditions specified in paragraphs (a), (b), and (c) of this packing method are met;			
(ii) The total explosive contents do not exceed 95 kg (209.43 pounds) per tool pallet;			
(iii) Each cargo vessel compartment may contain up to 95 kg (209.43 pounds) of			

explosive content if the segregation requirements in §176.83(b) of this subchapter are met; and

(iv) When more than one vehicle or tool pallet is stowed “on deck” a minimum horizontal separation of 3 m (9.8 feet) must be provided.

17. In §173.121, paragraph (b)(1)(iii) is revised to read as follows

§173.121 Class 3—Assignment of packing group.

* * * * *

(b) * * *

(1) * * *

(iii) The capacity of the packaging is not more than 450 L (119 gallons); except that for transportation by passenger aircraft, the capacity of the package is not more than 30 L (7.9 gallons) and for transportation by cargo aircraft, the capacity of the package is not more than 100 L (26.3 gallons); and

* * * * *

18. In § 173.124, paragraph (a)(4)(iv) is revised to read as follows:

§ 173.124 Class 4, Divisions 4.1, 4.2 and 4.3—Definitions.

* * * * *

(a) * * *

(4) * * *

(iv) The provisions concerning polymerizing substances in paragraph (a)(4) will be effective until January 2, 2021.

* * * * *

19. In § 173.127, paragraph (a)(1) is revised and (a)(3) is added to read as follows:

§173.127 Class 5, Division 5.1—Definition and assignment of packing groups.

(a) * * *

(1) A solid material, except for solid ammonium nitrate based fertilizer (see paragraph (3) of this paragraph), is classed as a Division 5.1 material if, when tested in accordance with the UN Manual of Tests and Criteria (IBR, see §171.7 of this subchapter):

(i) If test O.1 is used (UN Manual of Tests and Criteria, sub-section 34.4.1), the mean burning time is less than or equal to the burning time of a 3:7 potassium bromate/cellulose mixture; or

(ii) If test O.3 is used (UN Manual of Tests and Criteria, sub-section 34.4.3), the mean burning rate is greater than or equal to the burning rate of a 1:2 calcium peroxide/cellulose mixture.

* * * * *

(3) Solid ammonium nitrate-based fertilizers must be classified in accordance with the procedure as set out in the UN Manual of Tests and Criteria, Part III, Section 39.

* * * * *

20. In §173.134, paragraph (a)(4) is revised to read as follows:

§173.134 Class 6, Division 6.2—Definitions and exceptions.

(a) * * *

(4) *Patient specimens* means those collected directly from humans or animals and transported for research, diagnosis, investigational activities, or disease treatment or prevention. *Patient specimens* includes excreta, secreta, blood and its components, tissue and tissue swabs, body parts, and specimens in transport

media (e.g., transwabs, culture media, and blood culture bottles).

* * * * *

21. In §173.136, paragraph (a) is revised to read as follows:

§173.136 Class 8—Definitions.

(a) For the purpose of this subchapter, “corrosive material” (Class 8) means a liquid or solid that causes irreversible damage to human skin at the site of contact within a specified period of time. A liquid, or a solid which may become liquid during transportation, that has a severe corrosion rate on steel or aluminum based on the criteria in § 173.137(c)(2) is also a corrosive material. Whenever practical, *in vitro* test methods authorized in § 173.137 of this part or historical data authorized in paragraph (c) of this section should be used to determine whether a material is corrosive.

* * * * *

22. Section 173.137 is revised to read as follows:

§173.137 Class 8—Assignment of packing group.

The packing group of a Class 8 material is indicated in Column 5 of the § 172.101 Table. When the § 172.101 Table provides more than one packing group for a Class 8 material, the packing group must be determined using data obtained from tests conducted in accordance with the OECD Guidelines for the Testing of Chemicals, Number 435, “*In Vitro* Membrane Barrier Test Method for Skin Corrosion” (IBR, *see* § 171.7 of this subchapter) or Number 404, “Acute Dermal Irritation/Corrosion” (IBR, *see* § 171.7 of this subchapter). A material that is determined not to be corrosive in accordance with OECD Guideline for the Testing of Chemicals, Number 430, “*In Vitro* Skin Corrosion: Transcutaneous Electrical Resistance Test (TER)” (IBR, *see* § 171.7 of this subchapter)

or Number 431, “*In Vitro* Skin Corrosion: Reconstructed Human Epidermis (RHE) Test Method” (IBR, *see* § 171.7 of this subchapter) may be considered not to be corrosive to human skin for the purposes of this subchapter without further testing. However, a material determined to be corrosive in accordance with Number 430 or Number 431 must be further tested using Number 435 or Number 404. The packing group assignment using data obtained from tests conducted in accordance with OECD Guideline Number 404 or Number 435 must be as follows:

(a) *Packing Group I.* Materials that cause irreversible damage to intact skin tissue within an observation period of up to 60 minutes, starting after the exposure time of three minutes or less.

(b) *Packing Group II.* Materials, other than those meeting Packing Group I, criteria that cause irreversible damage to intact skin tissue within an observation period of up to 14 days, starting after the exposure time of more than three minutes but not more than 60 minutes.

(c) *Packing Group III.* Materials, other than those meeting Packing Group I or II criteria—

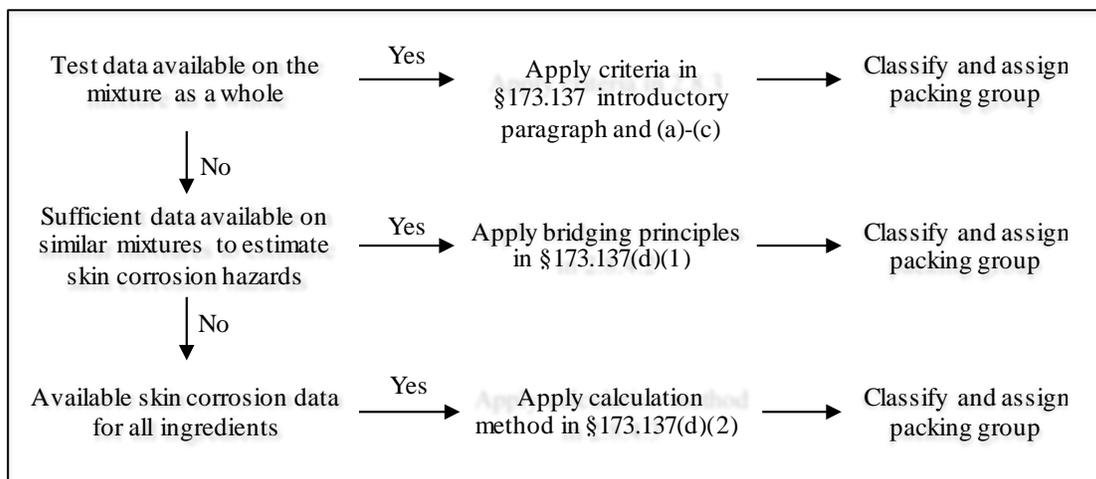
(1) That cause irreversible damage to intact skin tissue within an observation period of up to 14 days, starting after the exposure time of more than 60 minutes but not more than 4 hours; or

(2) That do not cause irreversible damage to intact skin tissue but exhibit a corrosion on either steel or aluminum surfaces exceeding 6.25 mm (0.25 inch) a year at a test temperature of 55 °C (130 °F) when tested on both materials. The corrosion may be determined in accordance with the UN Manual of Tests and Criteria (IBR, *see* §171.7 of

this subchapter) or other equivalent test methods.

(d) *Alternative packing group assignment methods for mixtures.* For mixtures it is necessary to obtain or derive information that allows the criteria to be applied to the mixture for the purpose of classification and assignment of packing groups. The approach to classification and assignment of packing groups is tiered, and is dependent upon the amount of information available for the mixture itself, for similar mixtures and/or for its ingredients. The flow chart in Figure 1 to paragraph (d) outlines the process to be followed:

Figure 1 to paragraph (d): Step-wise approach to classify and assign packing group of corrosive mixtures



(1) *Bridging principles.* Where a mixture has not been tested to determine its skin corrosion potential, but there is sufficient data on both the individual ingredients and similar tested mixtures to adequately classify and assign a packing group for the mixture, this data will be used in accordance with the following bridging principles. This ensures that the classification process uses the available data to the greatest extent possible in characterizing the hazards of the mixture.

(i) *Dilution.* If a tested mixture is diluted with a diluent which does not meet the

criteria for Class 8 and does not affect the packing group of other ingredients, then the new diluted mixture may be assigned to the same packing group as the original tested mixture. In certain cases, diluting a mixture or substance may lead to an increase in the corrosive properties. If this is the case, this bridging principle cannot be used.

(ii) *Batching*. The skin corrosion potential of a tested production batch of a mixture can be assumed to be substantially equivalent to that of another untested production batch of the same commercial product when produced by or under the control of the same manufacturer, unless there is reason to believe there is significant variation such that the skin corrosion potential of the untested batch has changed. If the latter occurs, a new classification is necessary.

(iii) *Concentration of mixtures of packing group I*. If a tested mixture meeting the criteria for inclusion in packing group I is concentrated, the more concentrated untested mixture may be assigned to packing group I without additional testing.

(iv) *Interpolation within one packing group*. For three mixtures (A, B and C) with identical ingredients, where mixtures A and B have been tested and are in the same skin corrosion packing group, and where untested mixture C has the same Class 8 ingredients as mixtures A and B but has concentrations of Class 8 ingredients intermediate to the concentrations in mixtures A and B, then mixture C is assumed to be in the same skin corrosion packing group as A and B.

(v) *Substantially similar mixtures*. Given the following:

(A) Two mixtures: (A+B) and (C+B);

(B) The concentration of ingredient B is the same in both mixtures;

(C) The concentration of ingredient A in mixture (A+B) equals the concentration of ingredient C in mixture (C+B);

(D) Data on skin corrosion for ingredients A and C are available and substantially equivalent, i.e. they are the same skin corrosion packing group and do not affect the skin corrosion potential of B.

(E) If the above mixture (A+B) or (C+B) is already classified based on test data, then the other mixture may be assigned to the same packing group.

(2) *Calculation method based on the classification of the substances.* (i) Where a mixture has not been tested to determine its skin corrosion potential, nor is sufficient data available on similar mixtures, the corrosive properties of the substances in the mixture shall be considered to classify and assign a packing group. Applying the calculation method is only allowed if there are no synergistic effects that make the mixture more corrosive than the sum of its substances. This restriction applies only if packing group II or III would be assigned to the mixture.

(A) All Class 8 ingredients present at a concentration of $\geq 1\%$ shall be taken into account, or $< 1\%$ if these ingredients are still relevant for classifying the mixture to be corrosive to skin.

(B) When a specific concentration limit (SCL) is assigned to a substance following its entry in the Hazardous Materials Table or in a special provision, this limit shall be used instead of the generic concentration limits (GCL). This applies where 1% is used in the first step for the assessment of the packing group I substances, and where 5% is used for the other steps respectively in Appendix I of this part.

(C) The following formula must be used for each step of the calculation process. The criterion for a packing group is fulfilled when the result of the calculation is ≥ 1 . The generic concentration limits to be used for the evaluation in each step of the calculation method are those found in Appendix I of this part. Where applicable, the generic concentration limit shall be substituted by the specific concentration limit assigned to the substance(s) (SCLi), and the adapted formula is a weighted average of the different concentration limits assigned to the different substances in the mixture:

$$\frac{PGx1}{GCL} + \frac{PGx2}{SCL2} + \dots + \frac{PGxi}{SCLi} > 1$$

PG xi = concentration of substance 1, 2 ...i in the mixture, assigned to packing group x (I, II or III)

GCL = generic concentration limit

SCLi = specific concentration limit assigned to substance i

Note to § 173.137: When an initial test on either a steel or aluminum surface indicates the material being tested is corrosive, the follow up test on the other surface is not required.

23. In § 173.159, paragraphs (a)(2)(i) through (iii) and (d)(1) are revised to read as follows:

§173.159 Batteries, wet.

(a) * * *

(2) * * *

(i) Packaging each battery or each battery-powered device when practicable, in fully enclosed inner packagings made of electrically non-conductive material;

(ii) Separating or packaging batteries and battery-powered devices in a manner to

prevent contact with other batteries, devices or electrically conductive materials (e.g., metal) in the packagings; or

(iii) Ensuring exposed terminals are protected with electrically non-conductive caps, electrically non-conductive tape, or by other appropriate means; and;

* * * * *

(d) * * *

(1) Electric storage batteries are firmly secured to skids or pallets capable of withstanding the shocks normally incident to transportation are authorized for transportation by rail, highway, or vessel. The height of the completed unit must not exceed 1½ times the width of the skid or pallet. The unit must be capable of withstanding, without damage, a superimposed weight equal to two times the weight of the unit or, if the weight of the unit exceeds 907 kg (2,000 pounds), a superimposed weight of 1,814 kg (4,000 pounds). Battery terminals must not be relied upon to support any part of the superimposed weight and must not short out if an electrically conductive material is placed in direct contact with them.

* * * * *

24. Revise § 173.185 to read as follows:

§173.185 Lithium cells and batteries.

As used in this section, *lithium cell(s)* or *battery(ies)* includes both lithium metal and lithium ion chemistries. *Equipment* means the device or apparatus for which the lithium cells or batteries will provide electrical power for its operation. *Consignment* means one or more packages of hazardous materials accepted by an operator from one shipper at one time and at one address, receipted for in one lot and moving to one

consignee at one destination address. A single cell battery as defined in part III, sub-section 38.3 of the UN Manual of Tests and Criteria (IBR; see §171.7 of this subchapter) is considered a “cell” and must be offered for transportation in accordance with the requirements for cells.

(a) *Classification.* (1) Each lithium cell or battery must be of the type proven to meet the criteria in part III, sub-section 38.3 of the UN Manual of Tests and Criteria. Lithium cells and batteries are subject to these tests regardless of whether the cells used to construct the battery are of a tested type.

(i) Cells and batteries manufactured according to a type meeting the requirements of sub-section 38.3 of the UN Manual of Tests and Criteria, Revision 3, Amendment 1 or any subsequent revision and amendment applicable at the date of the type testing may continue to be transported, unless otherwise provided in this subchapter.

(ii) Cell and battery types only meeting the requirements of the UN Manual of Tests and Criteria, Revision 3, are no longer valid. However, cells and batteries manufactured in conformity with such types before July 2003 may continue to be transported if all other applicable requirements are fulfilled.

(2) Each person who manufactures lithium cells or batteries must create a record of satisfactory completion of the testing (e.g. test report) required by this paragraph prior to offering the lithium cell or battery for transport and must:

(i) Maintain this record for as long as that design is offered for transportation and for one year thereafter; and

(ii) Make this record available to an authorized representative of the Federal, state or local government upon request.

(3) Each manufacturer and subsequent distributor of lithium cells or batteries manufactured after June 30, 2003, must make available upon request at reasonable times and locations, a test summary. The test summary must include the following elements:

- (i) Name of cell, battery, or product manufacturer, as applicable;
- (ii) Cell, battery, or product manufacturer's contact information to include address, telephone number, e-mail address, and website for more information;
- (iii) Name of the test laboratory, to include address, telephone number, e-mail address, and website for more information;
- (iv) A unique test report identification number;
- (v) Date of test report;
- (vi) Description of cell or battery to include at a minimum;
 - (A) Lithium ion or lithium metal cell or battery;
 - (B) Mass of cell or battery;
 - (C) Watt-hour rating, or lithium content;
 - (D) Physical description of the cell/battery; and
 - (E) Cell or battery model number or, alternatively, if the test summary is established for a product containing a cell or battery, the product model number
- (vii) List of tests conducted and results (i.e., pass/fail);
- (viii) Reference to assembled battery testing requirements (if applicable);
- (ix) Reference to the revised edition of the UN Manual of Tests and Criteria used and to amendments thereto, if any; and
- (x) Signature with name and title of signatory as an indication of the validity of information provided.

(4) Except for cells or batteries meeting the requirements of paragraph (c) of this section, each lithium cell or battery must:

(i) Incorporate a safety venting device or be designed to preclude a violent rupture under conditions normally incident to transport;

(ii) Be equipped with means of preventing external short circuits; and

(iii) Be equipped with a means of preventing dangerous reverse current flow (e.g., diodes or fuses) if a battery contains cells, or a series of cells that are connected in parallel.

(b) *Packaging.* (1) Each package offered for transportation containing lithium cells or batteries, including lithium cells or batteries packed with, or contained in, equipment, must meet all applicable requirements of subpart B of this part.

(2) Lithium cells or batteries, including lithium cells or batteries packed with, or contained in, equipment, must be packaged in a manner to prevent:

(i) Short circuits;

(ii) Damage caused by movement or placement within the package; and

(iii) Accidental activation of the equipment.

(3) For packages containing lithium cells or batteries offered for transportation:

(i) The lithium cells or batteries must be placed in non-metallic inner packagings that completely enclose the cells or batteries, and separate the cells or batteries from contact with equipment, other devices, or electrically conductive materials (e.g., metal) in the packaging.

(ii) The inner packagings containing lithium cells or batteries must be placed in one of the following packagings meeting the requirements of part 178, subparts L and M,

of this subchapter at the Packing Group II level:

(A) Metal (4A, 4B, 4N), wooden (4C1, 4C2, 4D, 4F), fiberboard (4G), or solid plastic (4H1, 4H2) box;

(B) Metal (1A2, 1B2, 1N2), plywood (1D), fiber (1G), or plastic (1H2) drum;

(C) Metal (3A2, 3B2) or plastic (3H2) jerrican.

(iii) When packed with equipment, lithium cells or batteries must:

(A) Be placed in inner packagings that completely enclose the cell or battery, then placed in an outer packaging. The completed package for the cells or batteries must meet the Packing Group II performance requirements as specified in paragraph (b)(3)(ii) of this section; or

(B) Be placed in inner packagings that completely enclose the cell or battery, then placed with equipment in a package that meets the Packing Group II performance requirements as specified in paragraph (b)(3)(ii) of this section.

(4) When lithium cells or batteries are contained in equipment:

(i) The outer packaging, when used, must be constructed of suitable material of adequate strength and design in relation to the capacity and intended use of the packaging, unless the lithium cells or batteries are afforded equivalent protection by the equipment in which they are contained;

(ii) Equipment must be secured against movement within the outer packaging and be packed so as to prevent accidental operation during transport; and

(iii) Any spare lithium cells or batteries packed with the equipment must be packaged in accordance with paragraph (b)(3) of this section.

(5) Except for transportation by passenger-carrying aircraft, lithium batteries that

weigh 12 kg (26.5 pounds) or more and have a strong, impact-resistant outer casing and assemblies of such batteries, may be packed in strong outer packagings; in protective enclosures (for example, in fully enclosed or wooden slatted crates); or on pallets or other handling devices, instead of packages meeting the UN performance packaging requirements in paragraphs (b)(3)(ii) and (b)(3)(iii) of this section. Batteries or battery assemblies must be secured to prevent inadvertent movement, and the terminals may not support the weight of other superimposed elements. Batteries or battery assemblies packaged in accordance with this paragraph may only be transported by cargo aircraft if approved by the Associate Administrator.

(6) Except for transportation by aircraft, the following rigid large packagings are authorized for a single battery, and for batteries contained in a single item of equipment, meeting provisions in paragraphs (b)(1) and (2) of this section and the requirements of part 178, subparts P and Q, of this subchapter at the Packing Group II level:

- (i) Metal (50A, 50B, 50N) metal packagings must be fitted with an electrically non-conductive lining material (e.g., plastics) of adequate strength for the intended use;
- (ii) Rigid plastic (50H);
- (iii) Wooden (50C, 50D, 50F);
- (iv) Rigid fiberboard (50G).

(7) For transportation by aircraft, lithium ion cells and batteries must not be packed in the same outer packaging with substances and articles of Class 1 (explosives) other than Division 1.4S, Division 2.1 (flammable gases), Class 3 (flammable liquids), Division 4.1 (flammable solids), or Division 5.1 (oxidizers).

(c) *Exceptions for smaller cells or batteries.* Other than as specifically stated

below, a package containing lithium cells or batteries, or lithium cells or batteries packed with, or contained in, equipment, that meets the conditions of this paragraph is excepted from the requirements in subparts C through H of part 172 of this subchapter and the UN performance packaging requirements in paragraphs (b)(3)(ii) and (iii) of this section under the following conditions and limitations.

(1) *Size limits.* (i) The Watt-hour (Wh) rating may not exceed 20 Wh for a lithium ion cell or 100 Wh for a lithium ion battery. After December 31, 2015, each lithium ion battery subject to this provision must be marked with the Watt-hour rating on the outside case.

(ii) The lithium content may not exceed 1 g for a lithium metal cell or 2 g for a lithium metal battery.

(iii) Except when lithium metal cells or batteries are packed with or contained in equipment in quantities not exceeding 5 kg net weight, the outer package that contains lithium metal cells or batteries must be marked: “PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT” or “LITHIUM METAL BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT” or labeled with a “CARGO AIRCRAFT ONLY” label specified in §172.448 of this subchapter.

(iv) For transportation by highway or rail only, the lithium content of the cell and battery may be increased to 5 g for a lithium metal cell or 25 g for a lithium metal battery and 60 Wh for a lithium ion cell or 300 Wh for a lithium ion battery, provided the outer package is marked: “LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD AIRCRAFT AND VESSEL.”

(v) The marking specified in paragraphs (c)(1)(iii) and (iv) of this section must have a background of contrasting color, and the letters in the marking must be:

(A) At least 6 mm (0.25 inch) in height on packages having a gross weight of 30 kg (66 pounds) or less, except that smaller font may be used as necessary when package dimensions so require.

(B) At least 12 mm (0.5 inch) in height on packages having a gross weight of more than 30 kg (66 pounds).

(vi) Except when lithium cells or batteries are packed with, or contained in, equipment, each package must not exceed 30 kg (66 pounds) gross weight.

(2) *Packaging.* Lithium cells and batteries must be packed in inner packagings that completely enclose the cell or battery then placed in a strong rigid outer package unless the cell or battery is contained in equipment and is afforded equivalent protection by the equipment in which it is contained. Except when lithium cells or batteries are contained in equipment, each package of lithium cells or batteries, or the completed package when packed with equipment, must be capable of withstanding a 1.2 meter drop test, in any orientation, without damage to the cells or batteries contained in the package, without shifting of the contents that would allow battery-to-battery (or cell-to-cell) contact, and without release of the contents of the package.

(3) *Hazard communication.* Each package must display the lithium battery mark except when a package contains button cell batteries installed in equipment (including circuit boards), or no more than four lithium cells or two lithium batteries contained in equipment, where there are not more than two packages in the consignment.

(i) The mark must indicate the UN number: “UN3090” for lithium metal cells or

batteries; or “UN3480” for lithium ion cells or batteries. Where the lithium cells or batteries are contained in, or packed with, equipment, the UN number “UN3091” or “UN3481,” as appropriate, must be indicated. Where a package contains lithium cells or batteries assigned to different UN numbers, all applicable UN numbers must be indicated on one or more marks. The package must be of such size that there is adequate space to affix the mark on one side without the mark being folded.



(A) The mark must be in the form of a rectangle with hatched edging. The mark must be not less than 120 mm (4.7 inches) wide by 110 mm (4.3 inches) high and the minimum width of the hatching must be 5 mm (0.2 inches), except marks of 105 mm (4.1 inches) wide by 74 mm (2.9 inches) high may be used on a package containing lithium batteries when the package is too small for the larger mark;

(B) The symbols and letters must be black on white or suitable contrasting background and the hatching must be red;

(C) The “*” must be replaced by the appropriate UN number(s) and the “***” must be replaced by a telephone number for additional information; and

(D) Where dimensions are not specified, all features shall be in approximate

proportion to those shown.

(ii) [Reserved]

(iii) When packages are placed in an overpack, the lithium battery mark shall either be clearly visible through the overpack or be reproduced on the outside of the overpack and the overpack shall be marked with the word “OVERPACK”. The lettering of the “OVERPACK” mark shall be at least 12 mm (0.47 inches) high.

(4) *Air transportation.* (i) For transportation by aircraft, lithium cells and batteries may not exceed the limits in the following table 1 to paragraph (c)(4)(i). The limits on the maximum number of batteries and maximum net quantity of batteries in the following table may not be combined in the same package:

Table 1 to paragraph (c)(4)(i)

Contents	Lithium metal cells and/or batteries with a lithium content not more than 0.3 g	Lithium metal cells with a lithium content more than 0.3 g but not more than 1g	Lithium metal batteries with a lithium content more than 0.3 g but not more than 2 g	Lithium ion cells and/or batteries with a Watt-hour rating not more than 2.7 Wh	Lithium ion cells with a Watt-hour rating more than 2.7 Wh but not more than 20 Wh	Lithium ion batteries with a Watt-hour rating more than 2.7 Wh but not more than 100 Wh
Maximum number of cells/batteries per package	No Limit	8 cells	2 batteries	No Limit	8 cells	2 batteries
Maximum net quantity (mass) per package	2.5 kg	n/a	n/a	2.5 kg	n/a	n/a

(ii) When packages required to bear the lithium battery mark in paragraph (c)(3)(i)

are placed in an overpack, the lithium battery mark must either be clearly visible through the overpack, or the lithium battery mark must also be affixed on the outside of the overpack, and the overpack must be marked with the word "OVERPACK." The lettering of the "OVERPACK" mark shall be at least 12 mm (0.47 inches) high.

(iii) Each shipment with packages required to bear the lithium battery mark must include an indication on the air waybill of compliance with this paragraph (c)(4) (or the applicable ICAO Technical Instructions Packing Instruction), when an air waybill is used.

(iv) For lithium batteries packed with, or contained in, equipment, the number of batteries in each package is limited to the minimum number required to power the piece of equipment, plus two spare sets, each equal to the number of individual cells or batteries that are required to power each piece of equipment. The total net quantity (mass) of the lithium cells or batteries in the completed package must not exceed 5 kg.

(v) Lithium cells and batteries must not be packed in the same outer packaging with other hazardous materials. Packages prepared in accordance with this paragraph (c)(4) must not be placed into an overpack with packages containing hazardous materials and articles of Class 1 (explosives) other than Division 1.4S, Division 2.1 (flammable gases), Class 3 (flammable liquids), Division 4.1 (flammable solids) or Division 5.1 (oxidizers).

(vi) Each person who prepares a package for transport containing lithium cells or batteries, including cells or batteries packed with, or contained in, equipment in accordance with the conditions and limitations in this paragraph, must receive adequate instruction on these conditions and limitations, commensurate with their responsibilities.

(vii) A package that exceeds the number or quantity (mass) limits in the table shown in this paragraph (c)(4) is subject to all applicable requirements of this subchapter, except that a package containing no more than 2.5 kg lithium metal cells or batteries or 10 kg lithium ion cells or batteries is not subject to the UN performance packaging requirements in paragraphs (b)(3)(ii) of this section when the package displays both the lithium battery mark and the Class 9 label. This paragraph does not apply to batteries or cells packed with or contained in equipment.

(d) *Lithium cells or batteries shipped for disposal or recycling.* A lithium cell or battery, including a lithium cell or battery contained in equipment, that is transported by motor vehicle to a permitted storage facility or disposal site, or for purposes of recycling, is excepted from the testing and record keeping requirements of paragraph (a) and the specification packaging requirements of paragraph (b)(3) of this section, when packed in a strong outer packaging conforming to the requirements of §§173.24 and 173.24a.

(1) A lithium cell or battery that meets the size, packaging, and hazard communication conditions in paragraph (c)(1) through (3) of this section is excepted from subparts C through H of part 172 of this subchapter.

(2) For a single battery, and for batteries contained in a single item of equipment, the following rigid large packagings are authorized:

- (i) Metal (50A, 50B, 50N);
- (ii) Rigid plastic (50H);
- (iii) Plywood (50D).

(e) *Low production runs and prototypes.* Low production runs (i.e., annual production runs consisting of not more than 100 lithium cells or batteries), prototype

lithium cells or batteries transported for purposes of testing, and equipment containing such cells or batteries are excepted from the testing and record keeping requirements of paragraph (a) of this section, provided:

(1) Except as provided in paragraph (e)(5) of this section, each cell or battery is individually packed in a non-metallic inner packaging, inside an outer packaging, and is surrounded by cushioning material that is non-combustible and electrically non-conductive, or contained in equipment. Equipment must be constructed or packaged in a manner as to prevent accidental operation during transport;

(2) Appropriate measures shall be taken to minimize the effects of vibration and shocks and prevent movement of the cells or batteries within the package that may lead to damage and a dangerous condition during transport. Cushioning material that is non-combustible and electrically non-conductive may be used to meet this requirement;

(3) The lithium cells or batteries are packed in inner packagings or contained in equipment. The inner packaging or equipment is placed in one of the following outer packagings that meet the requirements of part 178, subparts L and M, of this subchapter at the Packing Group I level. Cells and batteries, including equipment of different sizes, shapes or masses must be placed into an outer packaging of a tested design type listed in this section provided the total gross mass of the package does not exceed the gross mass for which the design type has been tested. A cell or battery with a net mass of more than 30 kg is limited to one cell or battery per outer packaging;

- (i) Metal (4A, 4B, 4N), wooden (4C1, 4C2, 4D, 4F), or solid plastic (4H2) box;
- (ii) Metal (1A2, 1B2, 1N2), plywood (1D), or plastic (1H2) drum.

(4) For a single battery, and for batteries contained in a single item of equipment,

the following rigid large packagings are authorized:

(i) Metal (50A, 50B, 50N) metal packagings must be fitted with an electrically non-conductive lining material (e.g., plastics) of adequate strength for the intended use;

(ii) Rigid plastic (50H);

(iii) Plywood (50D).

(5) Lithium batteries, including lithium batteries contained in equipment, that weigh 12 kg (26.5 pounds) or more and have a strong, impact-resistant outer casing or assemblies of such batteries, may be packed in strong outer packagings, in protective enclosures (for example, in fully enclosed or wooden slatted crates), or on pallets or other handling devices, instead of packages meeting the UN performance packaging requirements in paragraphs (b)(3)(ii) and (iii) of this section. The battery or battery assembly must be secured to prevent inadvertent movement, and the terminals may not support the weight of other superimposed elements;

(6) Irrespective of the limit specified in column (9B) of the §172.101 Hazardous Materials Table, the battery or battery assembly prepared for transport in accordance with this paragraph may have a mass exceeding 35 kg gross weight when transported by cargo aircraft;

(7) Batteries or battery assemblies packaged in accordance with this paragraph are not permitted for transportation by passenger-carrying aircraft, and may be transported by cargo aircraft only if approved by the Associate Administrator prior to transportation; and

(8) Shipping papers must include the following notation: “Transport in accordance with §173.185(e).”

(f) *Damaged, defective, or recalled cells or batteries.* Lithium cells or batteries,

that have been damaged or identified by the manufacturer as being defective for safety reasons, that have the potential of producing a dangerous evolution of heat, fire, or short circuit (e.g., those being returned to the manufacturer for safety reasons) may be transported by highway, rail or vessel only, and must be packaged as follows:

(1) Each cell or battery must be placed in individual, non-metallic inner packaging that completely encloses the cell or battery;

(2) The inner packaging must be surrounded by cushioning material that is non-combustible, electrically non-conductive, and absorbent; and

(3) Each inner packaging must be individually placed in one of the following packagings meeting the applicable requirements of part 178, subparts L, M, P, and Q of this subchapter at the Packing Group I level:

(i) Metal (4A, 4B, 4N), wooden (4C1, 4C2, 4D, 4F), or solid plastic (4H2) box;

(ii) Metal (1A2, 1B2, 1N2), plywood (1D), or plastic (1H2) drum; or

(iii) For a single battery, and for batteries contained in a single item of equipment,

the following rigid large packagings are authorized:

(A) Metal (50A, 50B, 50N);

(B) Rigid plastic (50H);

(C) Plywood (50D); and

(4) The outer package must be marked with an indication that the package contains a “Damaged/defective lithium ion battery” and/or “Damaged/defective lithium metal battery” as appropriate. The marking required by this paragraph must be in characters at least 12 mm (0.47 inches) high.

(g) *Approval.* A lithium cell or battery that does not conform to the provisions of

this subchapter may be transported only under conditions approved by the Associate Administrator.

25. In § 173.218, paragraph (c) is revised to read as follows:

§ 173.218 Fish meal or fish scrap.

* * * * *

(c) When fish scrap or fish meal is offered for transportation by vessel in bulk in freight containers, the fish scrap or fish meal shall contain at least 50 ppm (mg/kg) of ethoxyquin, 100 ppm (mg/kg) of butylated hydroxytoluene (BHT) or 250 ppm (mg/kg) of tocopherol based antioxidant at the time of shipment.

26. In § 173.220, paragraph (b)(2)(ii)(C) is added and paragraph (d) is revised to read as follows:

§ 173.220 Internal combustion engines, vehicles, machinery containing internal combustion engines, battery-powered equipment or machinery, fuel cell-powered equipment or machinery.

* * * * *

(b) * * *

(2) * * *

(ii) * * *

(C) If a vehicle is powered by a flammable liquid and a flammable gas internal combustion engine, the requirements of paragraphs (b)(1) of this section must also be met.

* * * * *

(d) *Lithium batteries.* Except as provided in § 172.102, special provision

A101, of this subchapter, vehicles, engines, and machinery powered by lithium metal batteries that are transported with these batteries installed are forbidden aboard passenger-carrying aircraft. Lithium batteries contained in vehicles, engines, or mechanical equipment must be securely fastened in the battery holder of the vehicle, engine, or mechanical equipment, and be protected in such a manner as to prevent damage and short circuits (e.g., by the use of non-conductive caps that cover the terminals entirely). Except for vehicles, engines, or machinery transported by highway, rail, or vessel with prototype or low production lithium batteries securely installed, each lithium battery must be of a type that has successfully passed each test in the UN Manual of Tests and Criteria (IBR, see § 171.7 of this subchapter), as specified in § 173.185, unless approved by the Associate Administrator. Where a vehicle could possibly be handled in other than an upright position, the vehicle must be secured in a strong, rigid outer packaging. The vehicle must be secured by means capable of restraining the vehicle in the outer packaging to prevent any movement during transport which would change the orientation or cause the vehicle to be damaged. Where the lithium battery is removed from the vehicle and is packed separate from the vehicle in the same outer packaging, the package must be consigned as “UN 3481, Lithium ion batteries packed with equipment” or “UN 3091, Lithium metal batteries packed with equipment” and prepared in accordance with the requirements specified in § 173.185.

* * * * *

27. In § 173.222, paragraphs (c) and (d) are revised to read as follows:

§173.222 Dangerous goods in equipment, machinery or apparatus.

* * * * *

(c)(1) Except for transportation by aircraft, the total net quantity of hazardous materials contained in one item of machinery or apparatus must not exceed the following:

(i) In the case of solids or liquids, the limited quantity amount specified in the corresponding section referenced in Column (8A) of the §172.101 Table;

(ii) 0.5 kg (1.1 pounds) in the case of Division 2.2 gases.

(iii) When machinery or apparatus contains multiple hazardous materials, the quantity of each hazardous material must not exceed the quantity specified in the corresponding section referenced in Column (8A) of the § 172.101 Table, or for gases, paragraph (c)(1)(ii) of this section.

(2) For transportation by aircraft, the total net quantity of hazardous materials contained in one item of machinery or apparatus must not exceed the following:

(i) 1 kg (2.2 pounds) in the case of solids;

(ii) 0.5 L (0.1 gallons) in the case of liquids;

(iii) 0.5 kg (1.1 pounds) in the case of Division 2.2 gases. Division 2.2 gases with subsidiary risks and refrigerated liquefied gases are not authorized;

(iv) A total quantity of not more than the aggregate of that permitted in paragraphs (c)(2)(i) through (iii) of this section, for each category of material in the package, when a package contains hazardous materials in two or more of the categories in paragraphs (c)(2)(i) through (iii) of this section; and

(d) Except for transportation by aircraft, when a package contains hazardous materials in two or more of the categories listed in paragraph (c)(1) of this section the total quantity required by § 172.202(c) of this subchapter to be entered on the shipping paper must be either the aggregate quantity, or the estimated quantity, of all hazardous

materials, expressed as net mass.

28. 26. In § 173.224, paragraph (b)(4), the table following paragraph (b)(7), and paragraph (c) are revised to read as follows:

§173.224 Packaging and control and emergency temperatures for self-reactive materials.

* * * * *

(b) * * *

(4) *Packing method.* Column 4 specifies the highest packing method which is authorized for the self-reactive material. A packing method corresponding to a smaller package size may be used, but a packing method corresponding to a larger package size may not be used. The Table of Packing Methods in §173.225(d) defines the packing methods. Bulk packagings for Type F self-reactive substances are authorized by §173.225(f) for IBCs and §173.225(h) for bulk packagings other than IBCs. The formulations listed in §173.225(f) for IBCs and in §173.225(g) for portable tanks may also be transported packed in accordance with packing method OP8, with the same control and emergency temperatures, if applicable. Additional bulk packagings are authorized if approved by the Associate Administrator.

* * * * *

Table to paragraph (b): Self-Reactive Materials Table

Self-reactive substance (1)	Identification No. (2)	Concentration—(%) (3)	Packing method (4)	Control temperature—(°C) (5)	Emergency temperature (6)	Notes (7)
Acetone-pyrogallol copolymer 2-diazo-1-naphthol-5-sulphonate	3228	100	OP8			
Azodicarbonamide formulation type B, temperature controlled	3232	<100	OP5			1

Azodicarbonamide formulation type C	3224	<100	OP6			
Azodicarbonamide formulation type C, temperature controlled	3234	<100	OP6			1
Azodicarbonamide formulation type D	3226	<100	OP7			
Azodicarbonamide formulation type D, temperature controlled	3236	<100	OP7			1
2,2'-Azodi(2,4-dimethyl-4-methoxyvaleronitrile)	3236	100	OP7	-5	+ 5	
2,2'-Azodi(2,4-dimethylvaleronitrile)	3236	100	OP7	+ 10	+ 15	
2,2'-Azodi(ethyl 2-methylpropionate)	3235	100	OP7	+ 20	+ 25	
1,1-Azodi(hexahydrobenzoxazine)	3226	100	OP7			
2,2-Azodi(isobutyronitrile)	3234	100	OP6	+ 40	+ 45	
2,2'-Azodi(isobutyronitrile) as a water based paste	3224	≤50	OP6			
2,2-Azodi(2-methylbutyronitrile)	3236	100	OP7	+ 35	+ 40	
Benzene-1,3-disulphonylhydrazide, as a paste	3226	52	OP7			
Benzene sulphohydrazide	3226	100	OP7			
4-(Benzyl(ethyl)amino)-3-ethoxybenzenediazonium zinc chloride	3226	100	OP7			
4-(Benzyl(methyl)amino)-3-ethoxybenzenediazonium zinc chloride	3236	100	OP7	+ 40	+ 45	
3-Chloro-4-diethylaminobenzenediazonium zinc chloride	3226	100	OP7			
2-Diazo-1-Naphthol sulphonic acid ester mixture	3226	<100	OP7			4
2-Diazo-1-Naphthol-4-sulphonyl chloride	3222	100	OP5			
2-Diazo-1-Naphthol-5-sulphonyl chloride	3222	100	OP5			
2,5-Dibutoxy-4-(4-morpholinyl)-Benzenediazonium, tetrachlorozincate (2:1)	3228	100	OP8			
2,5-Diethoxy-4-morpholinobenzenediazonium zinc	3236	67-100	OP7	+ 35	+ 40	

chloride						
2,5-Diethoxy-4-morpholinobenzenediazonium zinc chloride	3236	66	OP7	+ 40	+ 45	
2,5-Diethoxy-4-morpholinobenzenediazonium tetrafluoroborate	3236	100	OP7	+ 30	+ 35	
2,5-Diethoxy-4-(phenylsulphonyl)benzenediazonium zinc chloride	3236	67	OP7	+ 40	+ 45	
2,5-Diethoxy-4-(4-morpholinyl)-benzenediazonium sulphate	3226	100	OP7			
Diethylene glycol bis(allyl carbonate) + Diisopropylperoxydicarbonate	3237	≥88 + ≤12	OP8	-10	0	
2,5-Dimethoxy-4-(4-methylphenylsulphonyl)benzenediazonium zinc chloride	3236	79	OP7	+ 40	+ 45	
4-Dimethylamino-6-(2-dimethylaminoethoxy)toluene-2-diazonium zinc chloride	3236	100	OP7	+ 40	+ 45	
4-(Dimethylamino)-benzenediazonium trichlorozincate (-1)	3228	100	OP8			
N,N'-Dinitroso-N, N'-dimethylterephthalamide, as a paste	3224	72	OP6			
N,N'-Dinitrosopentamethylenetetramine	3224	82	OP6			2
Diphenyloxide-4,4'-disulphohydrazide	3226	100	OP7			
Diphenyloxide-4,4'-disulphonylhydrazide	3226	100	OP7			
4-Dipropylaminobenzenediazonium zinc chloride	3226	100	OP7			
2-(N,N-Ethoxycarbonylphenylamino)-3-methoxy-4-(N-methyl-N-cyclohexylamino)benzenediazonium zinc chloride	3236	63-92	OP7	+ 40	+ 45	
2-(N,N-Ethoxycarbonylphenylamino)-3-methoxy-4-(N-methyl-N-cyclohexylamino)benzenediazonium zinc chloride	3236	62	OP7	+ 35	+ 40	

N-Formyl-2-(nitromethylene)-1,3-perhydrothiazine	3236	100	OP7	+ 45	+ 50	
2-(2-Hydroxyethoxy)-1-(pyrrolidin-1-yl)benzene-4-diazonium zinc chloride	3236	100	OP7	+ 45	+ 50	
3-(2-Hydroxyethoxy)-4-(pyrrolidin-1-yl)benzenediazonium zinc chloride	3236	100	OP7	+ 40	+ 45	
2-(N,N-Methylaminoethylcarbonyl)-4-(3,4-dimethyl-phenylsulphonyl)benzene diazonium zinc chloride	3236	96	OP7	+ 45	+ 50	
4-Methylbenzenesulphonylhydrazide	3226	100	OP7			
3-Methyl-4-(pyrrolidin-1-yl)benzenediazonium tetrafluoroborate	3234	95	OP6	+ 45	+ 50	
4-Nitrosophenol	3236	100	OP7	+ 35	+ 40	
Phosphorothioic acid, O-[(cyanophenyl methylene) azanyl] O,O-diethyl ester	3227	82-91 (Z isomer)	OP8			5
Self-reactive liquid, sample	3223		OP2			3
Self-reactive liquid, sample, temperature control	3233		OP2			3
Self-reactive solid, sample	3224		OP2			3
Self-reactive solid, sample, temperature control	3234		OP2			3
Sodium 2-diazo-1-naphthol-4-sulphonate	3226	100	OP7			
Sodium 2-diazo-1-naphthol-5-sulphonate	3226	100	OP7			
Tetramine palladium (II) nitrate	3234	100	OP6	+ 30	+ 35	

NOTES: 1. The emergency and control temperatures must be determined in accordance with § 173.21(f).

2. With a compatible diluent having a boiling point of not less than 150 °C.

3. Samples may only be offered for transportation under the provisions of paragraph (c)(3) of this section.

4. This entry applies to mixtures of esters of 2-diazo-1-naphthol-4-sulphonic acid and 2-diazo-1-naphthol-5-sulphonic acid.

5. This entry applies to the technical mixture in n-butanol within the specified concentration limits of the (Z) isomer.

(c) *New self-reactive materials, formulations and samples.* (1) Except as provided for samples in paragraph (c)(3) or (4) of this section, no person may offer, accept for transportation, or transport a self-reactive material which is not identified by technical name in the Self-Reactive Materials Table of this section, or a formulation of one or more self-reactive materials which are identified by technical name in the table, unless the self-reactive material is assigned a generic type and shipping description and is approved by the Associate Administrator under the provisions of § 173.124(a)(2)(iii).

(2) Except as provided by an approval issued under § 173.124(a)(2)(iii), intermediate bulk and bulk packagings are not authorized.

(3) *Samples.* Samples of new self-reactive materials or new formulations of self-reactive materials identified in the Self-Reactive Materials Table in paragraph (b) of this section, for which complete test data are not available, and which are to be transported for further testing or product evaluation, may be assigned an appropriate shipping description for Self-reactive materials Type C, packaged and offered for transportation under the following conditions:

(i) Data available to the person offering the material for transportation must indicate that the sample would pose a level of hazard no greater than that of a self-reactive material Type B and that the control temperature, if any, is sufficiently low to prevent any dangerous decomposition and sufficiently high to prevent any dangerous phase separation;

(ii) The sample must be packaged in accordance with packing method OP2;

(iii) Packages of the self-reactive material may be offered for transportation and

transported in a quantity not to exceed 10 kg (22 pounds) per transport vehicle; and

(iv) One of the following shipping descriptions must be assigned:

(A) Self-reactive, liquid, type C, 4.1, UN 3223.

(B) Self-reactive, solid, type C, 4.1, UN 3224.

(C) Self-reactive, liquid, type C, temperature controlled, 4.1, UN 3233.

(D) Self-reactive, solid, type C, temperature controlled, 4.1, UN 3234.

(4) *Samples of energetic materials for testing purposes.* Samples of organic substances carrying functional groups listed in tables A6.1 and/or A6.2 in Annex 6 (Screening Procedures) of the UN Manual of Tests and Criteria (IBR, see § 171.7 of this subchapter) may be transported under UN 3224 or UN 3223, as applicable, of Division 4.1 provided that:

(i) The samples do not contain any:

(A) Known explosives;

(B) Substances showing explosive effects in testing;

(C) Compounds designed with the view of producing a practical explosive or pyrotechnic effect;

(D) Components consisting of synthetic precursors of intentional explosives;

(ii) For mixtures, complexes or salts of inorganic oxidizing substances of Division 5.1 with organic material(s), the concentration of the inorganic oxidizing substance is:

(A) Less than 15%, by mass, if assigned to packing group I or II; or

(B) Less than 30%, by mass, if assigned to packing group III;

(iii) Available data does not allow a more precise classification;

(iv) The sample is not packed together with other goods;

(v) Must be packaged as follows:

(A) The quantity per individual inner cavity does not exceed 0.01 g for solids or 0.01 mL for liquids and the maximum net quantity per outer packaging does not exceed 20 g for solids or 20 mL for liquids, or in the case of mixed packing the sum of grams and mL does not exceed 20:

(1) The samples are carried in microtiter plates or multi-titer plates made of plastics, glass, porcelain or stoneware as an inner packaging;

(2) only combination packaging with outer packaging comprising boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1 and 4H2) are permitted; or

(B) The maximum content of each inner packaging does not exceed 1 g for solids or 1 mL for liquids and the maximum net quantity per outer packaging does not exceed 56 g for solids or 56 mL for liquids, or in the case of mixed packing the sum of grams and mL does not exceed 56:

(1) The individual substance is contained in an inner packaging of glass or plastics of maximum capacity of 30 mL placed in an expandable polyethylene foam matrix of at least 130 mm thickness having a density of 18 ± 1 g/L;

(2) Within the foam carrier, inner packagings are segregated from each other by a minimum distance of 40 mm and from the wall of the outer packaging by a minimum distance of 70 mm. The package may contain up to two layers of such foam matrices, each carrying up to twenty-eight inner packagings;

(3) The outer packaging consists only of corrugated fibreboard boxes (4G) having minimum dimensions of 60 cm (length) by 40.5 cm (width) by 30 cm (height) and minimum wall thickness of 1.3 cm.

(vi) When dry ice or liquid nitrogen is optionally used as a coolant for quality control measures, all applicable requirements of this subchapter must be met. Interior supports must be provided to secure the inner packagings in the original position after the ice or dry ice has dissipated. If ice is used, the outside packaging or overpack must be leakproof. If dry ice is used, the requirements in §173.217 must be met. The inner and outer packagings must maintain their integrity at the temperature of the refrigerant used as well as the temperatures and the pressures which could result if refrigeration were lost.

27. In § 173.225, the table following paragraph (c)(8), the heading of the table following paragraph (d)(4), paragraph (e), paragraph (g) introductory text, and the heading to the table in paragraph (g) are revised to read as follows:

§ 173.225 Packaging requirements and other provisions for organic peroxides.

* * * * *

(c) * * *

(8) * * *

Table to paragraph (c): Organic Peroxide Table

Technical name	ID number	Concentration (mass %)	Diluent (mass %)			Water (mass %)	Packaging method	Temperature (°C)		Notes
			A	B	I			Control	Emergency	
(1)	(2)	(3)	(4a)	(4b)	(4c)	(5)	(6)	(7a)	(7b)	(8)
Acetyl acetone peroxide	UN3105	≤42	≥48			≥8	OP7			2
Acetyl acetone peroxide [as a paste]	UN3106	≤32					OP7			21
Acetyl cyclohexanesulfonyl peroxide	UN3112	≤82				≥12	OP4	-10	0	
Acetyl cyclohexanesulfonyl peroxide	UN3115	≤32		≥68			OP7	-10	0	
tert-Amyl hydroperoxide	UN3107	≤88	≥6			≥6	OP8			

tert-Amyl peroxyacetate	UN3105	≤62	≥38				OP7			
tert-Amyl peroxybenzoate	UN3103	≤100					OP5			
tert-Amyl peroxy-2-ethylhexanoate	UN3115	≤100					OP7	20	25	
tert-Amyl peroxy-2-ethylhexyl carbonate	UN3105	≤100					OP7			
tert-Amyl peroxy isopropyl carbonate	UN3103	≤77	≥23				OP5			
tert-Amyl peroxyneodecanoate	UN3115	≤77		≥23			OP7	0	10	
tert-Amyl peroxyneodecanoate	UN3119	≤47	≥53				OP8	0	10	
tert-Amyl peroxy-pivalate	UN3113	≤77		≥23			OP5	10	15	
tert-Amyl peroxy-pivalate	UN3119	≤32	≥68				OP8	10	15	
tert-Amyl peroxy-3,5,5-trimethylhexanoate	UN3105	≤100					OP7			
tert-Butyl cumyl peroxide	UN3109	>42-100					OP8			9
tert-Butyl cumyl peroxide	UN3108	≤52			≥48		OP8			9
n-Butyl-4,4-di-(tert-butylperoxy)valerate	UN3103	>52-100					OP5			
n-Butyl-4,4-di-(tert-butylperoxy)valerate	UN3108	≤52			≥48		OP8			
tert-Butyl hydroperoxide	UN3103	>79-90				≥10	OP5			13
tert-Butyl hydroperoxide	UN3105	≤80	≥20				OP7			4, 13
tert-Butyl hydroperoxide	UN3107	≤79				>14	OP8			13, 16
tert-Butyl hydroperoxide	UN3109	≤72				≥28	OP8			13
tert-Butyl hydroperoxide [and] Di-tert-butylperoxide	UN3103	<82 + >9				≥7	OP5			13
tert-Butyl monoperoxy-maleate	UN3102	>52-100					OP5			
tert-Butyl monoperoxy-maleate	UN3103	≤52	≥48				OP6			
tert-Butyl monoperoxy-maleate	UN3108	≤52			≥48		OP8			
tert-Butyl monoperoxy-maleate [as a paste]	UN3108	≤52					OP8			
tert-Butyl peroxyacetate	UN3101	>52-77	≥23				OP5			
tert-Butyl peroxyacetate	UN3103	>32-52	≥48				OP6			
tert-Butyl peroxyacetate	UN3109	≤32		≥68			OP8			
tert-Butyl peroxybenzoate	UN3103	>77-100					OP5			
tert-Butyl peroxybenzoate	UN3105	>52-77	≥23				OP7			1

tert-Butyl peroxybenzoate	UN3106	≤52			≥48		OP7			
tert-Butyl peroxybenzoate	UN3109	≤32	≥68				OP8			
tert-Butyl peroxybutyl fumarate	UN3105	≤52	≥48				OP7			
tert-Butyl peroxyacrylate	UN3105	≤77	≥23				OP7			
tert-Butyl peroxydiethylacetate	UN3113	≤100					OP5	20	25	
tert-Butyl peroxy-2-ethylhexanoate	UN3113	>52-100					OP6	20	25	
tert-Butyl peroxy-2-ethylhexanoate	UN3117	>32-52		≥48			OP8	30	35	
tert-Butyl peroxy-2-ethylhexanoate	UN3118	≤52			≥48		OP8	20	25	
tert-Butyl peroxy-2-ethylhexanoate	UN3119	≤32		≥68			OP8	40	45	
tert-Butyl peroxy-2-ethylhexanoate [and] 2,2-di-(tert-Butylperoxy)butane	UN3106	≤12 + ≤14	≥14		≥60		OP7			
tert-Butyl peroxy-2-ethylhexanoate [and] 2,2-di-(tert-Butylperoxy)butane	UN3115	≤31 + ≤36		≥33			OP7	35	40	
tert-Butyl peroxy-2-ethylhexylcarbonate	UN3105	≤100					OP7			
tert-Butyl peroxyisobutyrate	UN3111	>52-77		≥23			OP5	15	20	
tert-Butyl peroxyisobutyrate	UN3115	≤52		≥48			OP7	15	20	
tert-Butylperoxy isopropylcarbonate	UN3103	≤77	≥23				OP5			
1-(2-tert-Butylperoxy isopropyl)-3-isopropenylbenzene	UN3105	≤77	≥23				OP7			
1-(2-tert-Butylperoxy isopropyl)-3-isopropenylbenzene	UN3108	≤42			≥58		OP8			
tert-Butyl peroxy-2-methylbenzoate	UN3103	≤100					OP5			
tert-Butyl peroxyneodecanoate	UN3115	>77-100					OP7	-5	5	
tert-Butyl peroxyneodecanoate	UN3115	≤77		≥23			OP7	0	10	
tert-Butyl peroxyneodecanoate [as a stable dispersion in water]	UN3119	≤52					OP8	0	10	
tert-Butyl peroxyneodecanoate [as a stable dispersion in water (frozen)]	UN3118	≤42					OP8	0	10	
tert-Butyl peroxyneodecanoate	UN3119	≤32	≥68				OP8	0	10	
tert-Butyl peroxyneoheptanoate	UN3115	≤77	≥23				OP7	0	10	
tert-Butyl peroxyneoheptanoate [as a stable dispersion in water]	UN3117	≤42					OP8	0	10	

tert-Butyl peroxy-pivalate	UN3113	>67-77	≥23				OP5	0	10	
tert-Butyl peroxy-pivalate	UN3115	>27-67		≥33			OP7	0	10	
tert-Butyl peroxy-pivalate	UN3119	≤27		≥73			OP8	30	35	
tert-Butylperoxy stearylcarbonate	UN3106	≤100					OP7			
tert-Butyl peroxy-3,5,5-trimethylhexanoate	UN3105	>37-100					OP7			
tert-Butyl peroxy-3,5,5-trimethylhexanoate	UN3106	≤42			≥58		OP7			
tert-Butyl peroxy-3,5,5-trimethylhexanoate	UN3109	≤37		≥63			OP8			
3-Chloroperoxybenzoic acid	UN3102	>57-86			≥14		OP1			
3-Chloroperoxybenzoic acid	UN3106	≤57			≥3	≥40	OP7			
3-Chloroperoxybenzoic acid	UN3106	≤77			≥6	≥17	OP7			
Cumyl hydroperoxide	UN3107	>90-98	≤10				OP8			13
Cumyl hydroperoxide	UN3109	≤90	≥10				OP8			13, 15
Cumyl peroxyneodecanoate	UN3115	≤87	≥13				OP7	-10	0	
Cumyl peroxyneodecanoate	UN3115	≤77		≥23			OP7	-10	0	
Cumyl peroxyneodecanoate [as a stable dispersion in water]	UN3119	≤52					OP8	-10	0	
Cumyl peroxyneoheptanoate	UN3115	≤77	≥23				OP7	-10	0	
Cumyl peroxy-pivalate	UN3115	≤77		≥23			OP7	-5	5	
Cyclohexanone peroxide(s)	UN3104	≤91				≥9	OP6			13
Cyclohexanone peroxide(s)	UN3105	≤72	≥28				OP7			5
Cyclohexanone peroxide(s) [as a paste]	UN3106	≤72					OP7			5, 21
Cyclohexanone peroxide(s)	Exempt	≤32		>68			Exempt			29
Diacetone alcohol peroxides	UN3115	≤57		≥26		≥8	OP7	40	45	5
Diacetyl peroxide	UN3115	≤27		≥73			OP7	20	25	8,13
Di-tert-amyl peroxide	UN3107	≤100					OP8			
([3R- (3R, 5aS, 6S, 8aS, 9R, 10R, 12S, 12aR**)]-Decahydro-10-methoxy-3, 6, 9-trimethyl-3, 12-epoxy-12H-pyrano [4, 3- j]-1, 2-benzodioxepin)	UN3106	≤100					OP7			
2,2-Di-(tert-amylperoxy)-butane	UN3105	≤57	≥43				OP7			
1,1-Di-(tert-amylperoxy)cyclohexane	UN3103	≤82	≥18				OP6			

Dibenzoyl peroxide	UN3102	>52-100			≤48		OP2			3
Dibenzoyl peroxide	UN3102	>77-94				≥6	OP4			3
Dibenzoyl peroxide	UN3104	≤77				≥23	OP6			
Dibenzoyl peroxide	UN3106	≤62			≥28	≥10	OP7			
Dibenzoyl peroxide [as a paste]	UN3106	>52-62					OP7			21
Dibenzoyl peroxide	UN3106	>35-52			≥48		OP7			
Dibenzoyl peroxide	UN3107	>36-42	≥18			≤40	OP8			
Dibenzoyl peroxide [as a paste]	UN3108	≤56.5				≥15	OP8			
Dibenzoyl peroxide [as a paste]	UN3108	≤52					OP8			21
Dibenzoyl peroxide [as a stable dispersion in water]	UN3109	≤42					OP8			
Dibenzoyl peroxide	Exempt	≤35			≥65		Exempt			29
Di-(4-tert-butylcyclohexyl)peroxydicarbonate	UN3114	≤100					OP6	30	35	
Di-(4-tert-butylcyclohexyl)peroxydicarbonate [as a stable dispersion in water]	UN3119	≤42					OP8	30	35	
Di-(4-tert-butylcyclohexyl)peroxydicarbonate [as a paste]	UN3116	≤ 42					OP7	35	40	
Di-tert-butyl peroxide	UN3107	>52-100					OP8			
Di-tert-butyl peroxide	UN3109	≤52		≥48			OP8			24
Di-tert-butyl peroxyazolate	UN3105	≤52	≥48				OP7			
2,2-Di-(tert-butylperoxy)butane	UN3103	≤52	≥48				OP6			
1,6-Di-(tert-butylperoxycarbonyloxy)hexane	UN3103	≤72	≥28				OP5			
1,1-Di-(tert-butylperoxy)cyclohexane	UN3101	>80-100					OP5			
1,1-Di-(tert-butylperoxy)cyclohexane	UN3103	>52-80	≥20				OP5			
1,1-Di-(tert-butylperoxy)-cyclohexane	UN3103	≤72		≥28			OP5			30
1,1-Di-(tert-butylperoxy)cyclohexane	UN3105	>42-52	≥48				OP7			
1,1-Di-(tert-butylperoxy)cyclohexane	UN3106	≤42	≥13		≥45		OP7			
1,1-Di-(tert-butylperoxy)cyclohexane	UN3107	≤27	≥25				OP8			22

1,1-Di-(tert-butylperoxy)cyclohexane	UN3109	≤42	≥58				OP8			
1,1-Di-(tert-Butylperoxy)cyclohexane	UN3109	≤37	≥63				OP8			
1,1-Di-(tert-butylperoxy)cyclohexane	UN3109	≤25	≥25	≥50			OP8			
1,1-Di-(tert-butylperoxy)cyclohexane	UN3109	≤13	≥13	≥74			OP8			
1,1-Di-(tert-butylperoxy)cyclohexane + tert-Butyl peroxy-2-ethylhexanoate	UN3105	≤43+≤16	≥41				OP7			
Di-n-butyl peroxydicarbonate	UN3115	>27-52		≥48			OP7	-15	-5	
Di-n-butyl peroxydicarbonate	UN3117	≤27		≥73			OP8	-10	0	
Di-n-butyl peroxydicarbonate [as a stable dispersion in water (frozen)]	UN3118	≤42					OP8	-15	-5	
Di-sec-butyl peroxydicarbonate	UN3113	>52-100					OP4	-20	-10	6
Di-sec-butyl peroxydicarbonate	UN3115	≤52		≥48			OP7	-15	-5	
Di-(tert-butylperoxyisopropyl)benzene(s)	UN3106	>42-100			≤57		OP7			1, 9
Di-(tert-butylperoxyisopropyl)benzene(s)	Exempt	≤42			≥58		Exempt			
Di-(tert-butylperoxy)phthalate	UN3105	>42-52	≥48				OP7			
Di-(tert-butylperoxy)phthalate [as a paste]	UN3106	≤52					OP7			21
Di-(tert-butylperoxy)phthalate	UN3107	≤42	≥58				OP8			
2,2-Di-(tert-butylperoxy)propane	UN3105	≤52	≥48				OP7			
2,2-Di-(tert-butylperoxy)propane	UN3106	≤42	≥13		≥45		OP7			
1,1-Di-(tert-butylperoxy)-3,3,5-trimethylcyclohexane	UN3101	>90-100					OP5			
1,1-Di-(tert-butylperoxy)-3,3,5-trimethylcyclohexane	UN3103	>57-90	≥10				OP5			
1,1-Di-(tert-butylperoxy)-3,3,5-trimethylcyclohexane	UN3103	≤77		≥23			OP5			
1,1-Di-(tert-butylperoxy)-3,3,5-trimethylcyclohexane	UN3103	≤90		≥10			OP5			30
1,1-Di-(tert-butylperoxy)-3,3,5-trimethylcyclohexane	UN3110	≤57			≥43		OP8			
1,1-Di-(tert-butylperoxy)-3,3,5-trimethylcyclohexane	UN3107	≤57	≥43				OP8			
1,1-Di-(tert-butylperoxy)-3,3,5-	UN3107	≤32	≥26	≥42			OP8			

trimethylcyclohexane										
Dicetyl peroxydicarbonate	UN3120	≤100					OP8	30	35	
Dicetyl peroxydicarbonate [as a stable dispersion in water]	UN3119	≤42					OP8	30	35	
Di-4-chlorobenzoyl peroxide	UN3102	≤77				≥23	OP5			
Di-4-chlorobenzoyl peroxide	Exempt	≤32				≥68	Exempt			29
Di-2,4-dichlorobenzoyl peroxide [as a paste]	UN3118	≤52					OP8	20	25	
Di-4-chlorobenzoyl peroxide [as a paste]	UN3106	≤52					OP7			21
Dicumyl peroxide	UN3110	>52-100				≤48	OP8			9
Dicumyl peroxide	Exempt	≤52				≥48	Exempt			29
Dicyclohexyl peroxydicarbonate	UN3112	>91-100					OP3	10	15	
Dicyclohexyl peroxydicarbonate	UN3114	≤91				≥9	OP5	10	15	
Dicyclohexyl peroxydicarbonate [as a stable dispersion in water]	UN3119	≤42					OP8	15	20	
Didecanoyl peroxide	UN3114	≤100					OP6	30	35	
2,2-Di-(4,4-di(tert-butylperoxy)cyclohexyl)propane	UN3106	≤42				≥58	OP7			
2,2-Di-(4,4-di(tert-butylperoxy)cyclohexyl)propane	UN3107	≤22				≥78	OP8			
Di-2,4-dichlorobenzoyl peroxide	UN3102	≤77				≥23	OP5			
Di-2,4-dichlorobenzoyl peroxide [as a paste with silicone oil]	UN3106	≤52					OP7			
Di-(2-ethoxyethyl) peroxydicarbonate	UN3115	≤52				≥48	OP7	-10	0	
Di-(2-ethylhexyl) peroxydicarbonate	UN3113	>77-100					OP5	-20	-10	
Di-(2-ethylhexyl) peroxydicarbonate	UN3115	≤77				≥23	OP7	-15	-5	
Di-(2-ethylhexyl) peroxydicarbonate [as a stable dispersion in water]	UN3119	≤62					OP8	-15	-5	
Di-(2-ethylhexyl) peroxydicarbonate [as a stable dispersion in water]	UN3119	≤52					OP8	-15	-5	
Di-(2-ethylhexyl) peroxydicarbonate [as a stable dispersion in water (frozen)]	UN3120	≤52					OP8	-15	-5	
2,2-Dihydroperoxypropane	UN3102	≤27				≥73	OP5			

Di-(1-hydroxycyclohexyl)peroxide	UN3106	≤100					OP7			
Diisobutryl peroxide	UN3111	>32-52		≥48			OP5	-20	-10	
Diisobutryl peroxide [as a stable dispersion in water]	UN3119	≤ 42					OP8	-20	-10	
Diisobutryl peroxide	UN3115	≤32		≥68			OP7	-20	-10	
Diisopropylbenzene dihydroperoxide	UN3106	≤82	≥5			≥5	OP7			17
Diisopropyl peroxydicarbonate	UN3112	>52-100					OP2	-15	-5	
Diisopropyl peroxydicarbonate	UN3115	≤52		≥48			OP7	-20	-10	
Diisopropyl peroxydicarbonate	UN3115	≤32	≥68				OP7	-15	-5	
Dilauroyl peroxide	UN3106	≤100					OP7			
Dilauroyl peroxide [as a stable dispersion in water]	UN3109	≤42					OP8			
Di-(3-methoxybutyl) peroxydicarbonate	UN3115	≤52		≥48			OP7	-5	5	
Di-(2-methylbenzoyl)peroxide	UN3112	≤87				≥13	OP5	30	35	
Di-(4-methylbenzoyl)peroxide [as a paste with silicone oil]	UN3106	≤52					OP7			
Di-(3-methylbenzoyl) peroxide + Benzoyl (3-methylbenzoyl) peroxide + Dibenzoyl peroxide	UN3115	≤20 + ≤18 + ≤4		≥58			OP7	35	40	
2,5-Dimethyl-2,5-di-(benzoylperoxy)hexane	UN3102	>82-100					OP5			
2,5-Dimethyl-2,5-di-(benzoylperoxy)hexane	UN3106	≤82				≥18	OP7			
2,5-Dimethyl-2,5-di-(benzoylperoxy)hexane	UN3104	≤82				≥18	OP5			
2,5-Dimethyl-2,5-di-(tert-butylperoxy)hexane	UN3103	>90-100					OP5			
2,5-Dimethyl-2,5-di-(tert-butylperoxy)hexane	UN3105	>52—90	≥10				OP7			
2,5-Dimethyl-2,5-di-(tert-butylperoxy)hexane	UN3108	≤77				≥23	OP8			
2,5-Dimethyl-2,5-di-(tert-butylperoxy)hexane	UN3109	≤52	≥48				OP8			
2,5-Dimethyl-2,5-di-(tert-butylperoxy)hexane [as a paste]	UN3108	≤47					OP8			
2,5-Dimethyl-2,5-di-(tert-butylperoxy)hexyne-3	UN3101	>86-100					OP5			
2,5-Dimethyl-2,5-di-(tert-	UN3103	>52-86	≥14				OP5			

butylperoxy)hexyne-3									
2,5-Dimethyl-2,5-di-(tert-butylperoxy)hexyne-3	UN3106	≤52			≥48		OP7		
2,5-Dimethyl-2,5-di-(2-ethylhexanoylperoxy)hexane	UN3113	≤100					OP5	20	25
2,5-Dimethyl-2,5-dihydroperoxyhexane	UN3104	≤82				≥18	OP6		
2,5-Dimethyl-2,5-di-(3,5,5-trimethylhexanoylperoxy)hexane	UN3105	≤77	≥23				OP7		
1,1-Dimethyl-3-hydroxybutylperoxyneoheptanoate	UN3117	≤52	≥48				OP8	0	10
Dimyristyl peroxydicarbonate	UN3116	≤100					OP7	20	25
Dimyristyl peroxydicarbonate [as a stable dispersion in water]	UN3119	≤42					OP8	20	25
Di-(2-neodecanoylperoxyisopropyl)benzene	UN3115	≤52	≥48				OP7	-10	0
Di-(2-neodecanoylperoxyisopropyl) benzene, as stable dispersion in water	UN3119	≤42					OP8	-15	-5
Di-n-nonanoyl peroxide	UN3116	≤100					OP7	0	10
Di-n-octanoyl peroxide	UN3114	≤100					OP5	10	15
Di-(2-phenoxyethyl)peroxydicarbonate	UN3102	>85-100					OP5		
Di-(2-phenoxyethyl)peroxydicarbonate	UN3106	≤85				≥15	OP7		
Dipropionyl peroxide	UN3117	≤27		≥73			OP8	15	20
Di-n-propyl peroxydicarbonate	UN3113	≤100					OP3	-25	-15
Di-n-propyl peroxydicarbonate	UN3113	≤77		≥23			OP5	-20	-10
Disuccinic acid peroxide	UN3102	>72-100					OP4		18
Disuccinic acid peroxide	UN3116	≤72				≥28	OP7	10	15
Di-(3,5,5-trimethylhexanoyl) peroxide	UN3115	>52-82	≥18				OP7	0	10
Di-(3,5,5-trimethylhexanoyl)peroxide [as a stable dispersion in water]	UN3119	≤52					OP8	10	15
Di-(3,5,5-trimethylhexanoyl) peroxide	UN3119	>38-52	≥48				OP8	10	15
Di-(3,5,5-trimethylhexanoyl)peroxide	UN3119	≤38	≥62				OP8	20	25

Ethyl 3,3-di-(tert-amylperoxy)butyrate	UN3105	≤67	≥33				OP7			
Ethyl 3,3-di-(tert-butylperoxy)butyrate	UN3103	>77-100					OP5			
Ethyl 3,3-di-(tert-butylperoxy)butyrate	UN3105	≤77	≥23				OP7			
Ethyl 3,3-di-(tert-butylperoxy)butyrate	UN3106	≤52			≥48		OP7			
1-(2-ethylhexanoylperoxy)-1,3-Dimethylbutyl peroxyvalate	UN3115	≤52	≥45	≥10			OP7	-20	-10	
tert-Hexyl peroxyneodecanoate	UN3115	≤71	≥29				OP7	0	10	
tert-Hexyl peroxyvalate	UN3115	≤72		≥28			OP7	10	15	
3-Hydroxy-1,1-dimethylbutyl peroxyneodecanoate	UN3115	≤77	≥23				OP7	-5	5	
3-Hydroxy-1,1-dimethylbutyl peroxyneodecanoate [as a stable dispersion in water]	UN3119	≤52					OP8	-5	5	
3-Hydroxy-1,1-dimethylbutyl peroxyneodecanoate	UN3117	≤52	≥48				OP8	-5	5	
Isopropyl sec-butyl peroxydicarbonat + Di-sec-butyl peroxydicarbonate + Di-isopropyl peroxydicarbonate	UN3111	≤52 + ≤28 + ≤22					OP5	-20	-10	
Isopropyl sec-butyl peroxydicarbonate + Di-sec-butyl peroxydicarbonate + Di-isopropyl peroxydicarbonate	UN3115	≤32 + ≤15 -18 + ≤12 -15	≥38				OP7	-20	-10	
Isopropylcumyl hydroperoxide	UN3109	≤72	≥28				OP8			13
p-Menthyl hydroperoxide	UN3105	>72-100					OP7			13
p-Menthyl hydroperoxide	UN3109	≤72	≥28				OP8			
Methylcyclohexanone peroxide(s)	UN3115	≤67		≥33			OP7	35	40	
Methyl ethyl ketone peroxide(s)	UN3101	≤52	≥48				OP5			5, 13
Methyl ethyl ketone peroxide(s)	UN3105	≤45	≥55				OP7			5
Methyl ethyl ketone peroxide(s)	UN3107	≤40	≥60				OP8			7
Methyl isobutyl ketone peroxide(s)	UN3105	≤62	≥19				OP7			5, 23
Methyl isopropyl ketone peroxide(s)	UN3109	(See remark 31)	≥70				OP8			31
Organic peroxide, liquid, sample	UN3103						OP2			12
Organic peroxide, liquid, sample, temperature controlled	UN3113						OP2			12

Organic peroxide, solid, sample	UN3104						OP2			12
Organic peroxide, solid, sample, temperature controlled	UN3114						OP2			12
3,3,5,7,7-Pentamethyl-1,2,4-Trioxepane	UN3107	≤100					OP8			
Peroxyacetic acid, type D, stabilized	UN3105	≤43					OP7			13, 20
Peroxyacetic acid, type E, stabilized	UN3107	≤43					OP8			13, 20
Peroxyacetic acid, type F, stabilized	UN3109	≤43					OP8			13, 20, 28
Peroxyacetic acid or peracetic acid [with not more than 7% hydrogen peroxide]	UN3107	≤36				≥15	OP8			13, 20, 28
Peroxyacetic acid or peracetic acid [with not more than 20% hydrogen peroxide]	Exempt	≤6				≥60	Exempt			28
Peroxyacetic acid or peracetic acid [with not more than 26% hydrogen peroxide]	UN3109	≤17					OP8			13, 20, 28
Peroxyauric acid	UN3118	≤100					OP8	35	40	
1-Phenylethyl hydroperoxide	UN3109	≤ 38			≥ 62		OP8			
Pinanyl hydroperoxide	UN3105	>56-100					OP7			13
Pinanyl hydroperoxide	UN3109	≤56	≥44				OP8			
Polyether poly-tert-butylperoxycarbonate	UN3107	≤52			≥48		OP8			
Tetrahydronaphthyl hydroperoxide	UN3106	≤100					OP7			
1,1,3,3-Tetramethylbutyl hydroperoxide	UN3105	≤100					OP7			
1,1,3,3-Tetramethylbutyl peroxy-2-ethylhexanoate	UN3115	≤100					OP7	15	20	
1,1,3,3-Tetramethylbutyl peroxyneodecanoate	UN3115	≤72			≥28		OP7	-5	5	
1,1,3,3-Tetramethylbutyl peroxyneodecanoate [as a stable dispersion in water]	UN3119	≤52					OP8	-5	5	
1,1,3,3-tetramethylbutyl peroxy-pivalate	UN3115	≤77	≥23				OP7	0	10	
3,6,9-Triethyl-3,6,9-trimethyl-1,4,7-triperoxonane	UN3110	≤17	≥18		≥65		OP8			

3,6,9-Triethyl-3,6,9-trimethyl-1,4,7-triperoxonane	UN3105	≤42	≥58				OP7			26
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NOTES

1. For domestic shipments, OP8 is authorized.
2. Available oxygen must be <4.7%.
3. For concentrations <80% OP5 is allowed. For concentrations of at least 80% but <85%, OP4 is allowed. For concentrations of at least 85%, maximum package size is OP2.
4. The diluent may be replaced by di-tert-butyl peroxide.
5. Available oxygen must be ≤9% with or without water.
6. For domestic shipments, OP5 is authorized.
7. Available oxygen must be ≤8.2% with or without water.
8. Only non-metallic packagings are authorized.
9. For domestic shipments this material may be transported under the provisions of paragraph (h)(3)(xii) of this section.
10. [Reserved]
11. [Reserved]
12. Samples may only be offered for transportation under the provisions of paragraph (b)(2) of this section.
13. “Corrosive” subsidiary risk label is required.
14. [Reserved]
15. No “Corrosive” subsidiary risk label is required for concentrations below 80%.
16. With <6% di-tert-butyl peroxide.
17. With ≤8% 1-isopropylhydroperoxy-4-isopropylhydroxybenzene.

18. Addition of water to this organic peroxide will decrease its thermal stability.
19. [Reserved]
20. Mixtures with hydrogen peroxide, water and acid(s).
21. With diluent type A, with or without water.
22. With $\geq 36\%$ diluent type A by mass, and in addition ethylbenzene.
23. With $\geq 19\%$ diluent type A by mass, and in addition methyl isobutyl ketone.
24. Diluent type B with boiling point >100 C.
25. No “Corrosive” subsidiary risk label is required for concentrations below 56%.
26. Available oxygen must be $\leq 7.6\%$.
27. Formulations derived from distillation of peroxyacetic acid originating from peroxyacetic acid in a concentration of not more than 41% with water, total active oxygen less than or equal to 9.5% (peroxyacetic acid plus hydrogen peroxide).
28. For the purposes of this section, the names “Peroxyacetic acid” and “Peracetic acid” are synonymous.
29. Not subject to the requirements of this subchapter for Division 5.2.
30. Diluent type B with boiling point >130 °C (266 °F).
31. Available oxygen $\leq 6.7\%$.

(d) * * *

(4) * * *

Table to paragraph (d): Maximum Quantity per Packaging/Package

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(e) *Organic Peroxide IBC Table*. The following Organic Peroxide IBC Table specifies, by technical name, those organic peroxides that are authorized for

transportation in certain IBCs and not subject to the approval provisions of §173.128 of this part. The formulations listed below may also be transported packed in accordance with packing method OP8 of this section, with the same control and emergency temperatures, if applicable. Additional requirements for authorized IBCs are found in paragraph (f) of this section.

Table to paragraph (e): Organic Peroxide IBC Table

UN No.	Organic peroxide	Type of IBC	Maximum quantity (liters)	Control temperature	Emergency temperature
3109	ORGANIC PEROXIDE, TYPE F, LIQUID.				
	tert-Butyl cumyl peroxide	31HA1	1000		
	tert-Butyl hydroperoxide, not more than 72% with water	31A	1250		
		31HA1	1000		
	tert-Butyl peroxyacetate, not more than 32% in diluent type A	31A	1250		
		31HA1	1000		
	tert-Butyl peroxybenzoate, not more than 32% in diluent type A	31A	1250		
	tert-Butyl peroxy-3,5,5-trimethylhexanoate, not more than 37% in diluent type A	31A	1250		
		31HA1	1000		
	Cumyl hydroperoxide, not more than 90% in diluent type A	31HA1	1250		
	Dibenzoyl peroxide, not more than 42% as a stable dispersion	31H1	1000		

	2,5-Dimethyl-2,5-di(tert-butylperoxy)hexane, not more than 52% in diluent type A	31HA1	1000		
	Di-tert-butyl peroxide, not more than 52% in diluent type B	31A	1250		
		31HA1	1000		
	1,1-Di-(tert-Butylperoxy) cyclohexane, not more than 37% in diluent type A	31A	1250		
	1,1-Di-(tert-butylperoxy) cyclohexane, not more than 42% in diluent type A	31H1	1000		
	Dicumyl peroxide, less than or equal to 100%	31A	1250		
		31HA1	1000		
	Dilauroyl peroxide, not more than 42%, stable dispersion, in water	31HA1	1000		
	Isopropylcumyl hydroperoxide, not more than 72% in diluent type A	31HA1	1250		
	p-Menthyl hydroperoxide, not more than 72% in diluent type A	31HA1	1250		
	Peroxyacetic acid, stabilized, not more than 17%	31A	1500		
		31H1	1500		
		31H2	1500		
		31HA1	1500		
	Peroxyacetic acid, not more than 26% hydrogen peroxide	31A	1500		
		31HA1	1500		
	Peroxyacetic acid, type F, stabilized	31A	1500		

		31HA1	1500		
	3,6,9-Triethyl-3,6,9-trimethyl-4,7-triperoxonane not more than 27% diluent type A	31HA1	1000		
3110	ORGANIC PEROXIDE TYPE F, SOLID.				
	Dicumyl peroxide, less than or equal to 100%	31A	2000		
		31H1			
		31HA1			
3119	ORGANIC PEROXIDE, TYPE F, LIQUID, TEMPERATURE CONTROLLED				
	tert-Amyl peroxy-2-ethylhexanoate, not more than 62% in a diluent type A	31HA1	1000	+15 °C	+20 °C
	tert-Amyl peroxy-pivalate, not more than 32% in diluent type A	31A	1250	+ 10 °C	+ 15 °C
	tert-Butyl peroxy-2-ethylhexanoate, not more than 32% in diluent type B	31HA1	1000	+ 30 °C	+ 35 °C
		31A	1250	+ 30 °C	+ 35 °C
	tert-Butyl peroxyneodecanoate, not more than 32% in diluent type A	31A	1250	0 °C	+ 10 °C
	tert-Butyl peroxyneodecanoate, not more than 52%, stable dispersion, in water	31A	1250	-5 °C	+ 5 °C
	tert-Butyl peroxy-pivalate, not more than 27% in diluent type B	31HA1	1000	+ 10 °C	+ 15 °C
		31A	1250	+ 10 °C	+ 15 °C
	Cumyl peroxyneodecanoate, not more than 52%, stable dispersion, in water	31A	1250	-15 °C	-5 °C

Di-(4-tert-butylcyclohexyl) peroxydicarbonate, not more than 42%, stable dispersion, in water	31HA1	1000	+ 30 °C	+ 35 °C
Dicetyl peroxydicarbonate, not more than 42%, stable dispersion, in water	31HA1	1000	+ 30 °C	+ 35 °C
Dicyclohexylperoxydicarbonate, not more than 42% as a stable dispersion, in water	31A	1250	+ 10 °C	+ 15 °C
Di-(2-ethylhexyl) peroxydicarbonate, not more than 62%, stable dispersion, in water	31A	1250	-20 °C	-10 °C
	31HA1	1000	-20 °C	-10 °C
Diisobutyl peroxide, not more than 28% as a stable dispersion in water	31HA1	1000	-20 °C	-10 °C
	31A	1250	-20 °C	-10 °C
Diisobutyl peroxide, not more than 42% as a stable dispersion in water	31HA1	1000	-25 °C	-15 °C
	31A	1250	-25 °C	-15 °C
Dimyristyl peroxydicarbonate, not more than 42%, stable dispersion, in water	31HA1	1000	+ 15 °C	+ 20 °C
Di-(2-neodecanoylperoxyisopropyl) benzene, not more than 42%, stable dispersion, in water	31A	1250	-15 °C	-5 °C
Di-(3,5,5-trimethylhexanoyl) peroxide, not more than 52% in diluent type A	31HA1	1000	+ 10 °C	+ 15 °C
	31A	1250	+ 10 °C	+ 15 °C
Di-(3,5,5-trimethylhexanoyl) peroxide, not more than 52%, stable dispersion, in water	31A	1250	+ 10 °C	+ 15 °C
3-Hydroxy-1,1-dimethylbutyl peroxy-neodecanoate, not more than 52%, stable	31A	1250	-15 °C	-5 °C

	dispersion, in water				
	1,1,3,3-Tetramethylbutyl peroxy-2-ethylhexanoate, not more than 67%, in diluent type A	31HA1	1000	+15 °C	+20 °C
	1,1,3,3-Tetramethylbutyl peroxyneodecanoate, not more than 52%, stable dispersion, in water	31A	1250	-5 °C	+ 5 °C
		31HA1	1000	-5 °C	+ 5 °C

* * * * *

(g) *Organic Peroxide Portable Tank Table*. The following Organic Peroxide Portable Tank Table provides certain portable tank requirements and identifies, by technical name, those organic peroxides that are authorized for transportation in the bulk packagings listed in paragraph (h). Organic peroxides listed in this table, provided they meet the specific packaging requirements found in paragraph (h), are not subject to the approval provisions of §173.128 of this part. In addition, the formulations listed below may also be transported packed in accordance with packing method OP8 of this section, with the same control and emergency temperatures, if applicable.

Table to paragraph (g): Organic Peroxide Portable Tank Table

* * * * *

28. Section 173.232 is added to subpart E to read as follows:

§ 173.232 Articles containing hazardous materials, n.o.s.

(a) Articles containing hazardous materials may be classified as otherwise provided by this subchapter under the proper shipping name for the hazardous materials they contain or in accordance with this section. For the purposes of this section, “article”

means machinery, apparatus, or other devices containing one or more hazardous materials (or residues thereof) that are an integral element of the article, necessary for its functioning, and that cannot be removed for the purpose of transport. An inner packaging is not an article. For articles that do not have an existing proper shipping name and that contain only hazardous materials within the permitted limited quantity amounts specified in column (8A) of the § 172.101 Table, see UN3363, Dangerous goods in machinery or apparatus, as prescribed in § 172.102(c)(1), Special provision 136, and § 173.222.

(b) Such articles may contain batteries. Lithium batteries that are integral to the article must be of a type proven to meet the testing requirements of the UN Manual of Tests and Criteria, Part III, subsection 38.3 (IBR, *see* § 171.7 of this subchapter), except when otherwise specified by this subchapter.

(c) This section does not apply to articles for which a more specific proper shipping name already exists in the § 172.101 Table. This section does not apply to hazardous materials of Class 1, Division 6.2, Class 7, or radioactive material contained in articles.

(d) Articles containing hazardous materials must be assigned to the appropriate class or division determined by the hazards present using, where applicable, the precedence criteria prescribed in § 173.2a for each of the hazardous materials contained in the article. If hazardous materials classified as Class 9 are contained within the article, all other hazardous materials present in the article must be considered to present a higher hazard.

(e) Subsidiary hazards must be representative of the primary hazard posed by the other hazardous materials contained within the article. When only one item of hazardous

materials is present in the article, the subsidiary hazard(s), if any, is the subsidiary hazard(s) identified in column 6 of the § 172.101 Table. If the article contains more than one item of hazardous materials and these could react dangerously with one another during transport, each of the hazardous materials must be enclosed separately.

(f)(1) Packagings must conform to the Packing Group II performance level. The following packagings are authorized:

- (i) Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G);
- (ii) Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2); and
- (iii) Jerricans (3A2, 3B2, 3H2).

(2) In addition, for robust articles, the following non-specification packagings are authorized:

- (i) Strong outer packagings constructed of suitable material and of adequate strength and design in relation to the packaging capacity and its intended use. Each package must conform to the packaging requirements of subpart B of this part, except for the requirements in §§ 173.24(a)(1) and 173.27(e).
- (ii) Articles may be transported unpackaged or on pallets when the hazardous materials are afforded equivalent protection by the article in which they are contained.

(g) The nature of the containment must be as follows—

(1) In the event of damage to the receptacles containing the hazardous materials, no leakage of the hazardous materials from the machinery or apparatus is possible. A leakproof liner may be used to satisfy this requirement.

(2) Receptacles containing hazardous materials must be secured and cushioned so as to prevent their breakage or leakage and to control their movement within the machinery or apparatus during normal conditions of transportation. Cushioning material must not react dangerously with the content of the receptacles. Any leakage of the contents must not substantially impair the protective properties of the cushioning material.

(3) Receptacles for gases, their contents, and filling densities must conform to the applicable requirements of this subchapter, unless otherwise approved by the Associate Administrator.

29. In § 173.301b paragraphs (c)(1) and (d)(1) are revised to read as follow:

§ 173.301b Additional general requirements for shipment of UN pressure receptacles.

* * * * *

(c) * * *

(1) When the use of a valve is prescribed, the valve must conform to the requirements in ISO 10297:2014(E) (IBR, *see* §171.7 of this subchapter). Quick release cylinder valves for specification and type testing must conform to the requirements in ISO 17871:2015(E) Gas cylinders — Quick-release cylinder valves — Specification and type testing (IBR, *see* §171.7 of this subchapter). Until December 31, 2020, the manufacture of a valve conforming to the requirements in ISO 10297:2006(E) is authorized. Until December 31, 2008, the manufacture of a valve conforming to the requirements in ISO 10297:1999(E) (IBR, *see* §171.7 of this subchapter) is authorized.

* * * * *

(d) * * *

(1) When the use of a valve is prescribed, the valve must conform to the requirements in ISO 11118:2015(E), (IBR, see §171.7 of this subchapter). Manufacture of valves to ISO 13340:2001(E) is authorized until December 31, 2020;

* * * * *

30. In § 173.304b, paragraph (b)(5) is revised to read as follows:

§ 173.304b Additional requirements for shipment of liquefied compressed gases in UN pressure receptacles.

* * * * *

(b) * * *

(5) For liquefied gases charged with compressed gases, both components—the liquefied gas and the compressed gas—must be taken into consideration in the calculation of the internal pressure in the pressure receptacle. The maximum mass of contents per liter of water capacity shall not exceed 95 percent of the density of the liquid phase at 50 °C (122 °F); in addition, the liquid phase shall not completely fill the pressure receptacle at any temperature up to 60 °C (140 °F). When filled, the internal pressure at 65 °C (149 °F) shall not exceed the test pressure of the pressure receptacles. The vapor pressures and volumetric expansions of all substances in the pressure receptacles shall be considered. The maximum filling limits may be determined using the procedure in (3)(e) of P200 of the UN Recommendations.

* * * * *

31. In, § 173.422 paragraphs (d) and (e) are revised and paragraph (f) is added to read as follows:

§ 173.422 Additional requirements for excepted packages containing Class 7 (radioactive) materials.

* * * * *

(d) The training requirements of subpart H of part 172 of this subchapter;

(e) For a material that meets the definition of a hazardous substance or a hazardous waste, the shipping paper requirements of subpart C of part 172 of this subchapter, except that such shipments are not subject to shipping paper requirements applicable to Class 7 (radioactive) materials in §§172.202(a)(5), 172.202(a)(6), 172.203(d) and 172.204(c)(4); and

(f) For transportation by vessel—

(1) The following information must be shown on a special transport document such as a bill of lading, air waybill, or other similar document:

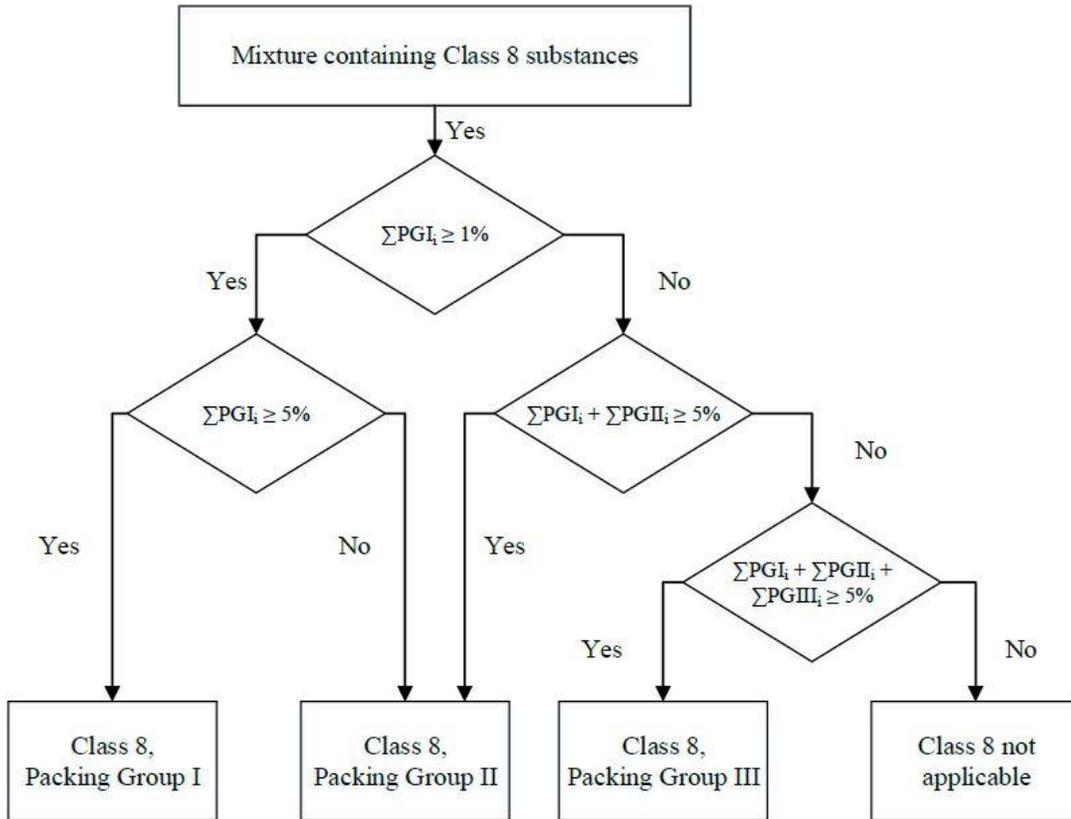
(i) The UN identification number for the material preceded by the letters “UN”, as shown in column (4) of the Hazardous Materials Table in §172.101 of this subchapter; and

(ii) The name and address of the consignor and the consignee.

(2) The certificate requirements in §176.27 must be met.

32. Add appendix I to part 173 to read as follows:

Appendix I to Part 173—Calculation Method



PART 174—CARRIAGE BY RAIL

33. The authority citation for part 174 continues to read as follows:

Authority: 49 U.S.C. 5101–5128; 49 CFR 1.81 and 1.97.

34. Revise § 174.50 to read as follows:

§ 174.50 Nonconforming or leaking packages.

A leaking non-bulk package may not be forwarded until repaired, reconditioned, or overpacked in accordance with § 173.3 of this subchapter. Except as otherwise provided in this section, a bulk packaging that no longer conforms to this subchapter may not be forwarded by rail unless repaired or approved for movement by the Associate Administrator for Safety, Federal Railroad Administration, or for cross-border movements to or from Canada, moved in accordance with the TDG Regulations (see §

171.12) or a Temporary Certificate issued by the Competent Authority of Canada, as applicable. For FRA Approval, notification and approval must be in writing, or through telephonic or electronic means, with subsequent written confirmation provided within two weeks. For the applicable address and telephone number, see § 107.117(d)(4) of this chapter. A leaking bulk package containing a hazardous material may be moved without repair or approval only so far as necessary to reduce or to eliminate an immediate threat or harm to human health or to the environment when it is determined its movement would provide greater safety than allowing the package to remain in place. In the case of a liquid leak, measures must be taken to prevent the spread of liquid.

PART 175—CARRIAGE BY AIRCRAFT

35. The authority citation for part 175 continues to read as follows:

Authority: 49 U.S.C. 5101–5128, 44701; 49 CFR 1.81 and 1.97.

36. In § 175.10, revise paragraphs (a)(2) and (3), (a)(14) and (15), (a)(17)(v) introductory text, and (a)(18) and (19), and add paragraph (a)(26) to read as follows:

§ 175.10 Exceptions for passengers, crewmembers, and air operators.

(a) * * *

(2) One packet of safety matches or a lighter intended for use by an individual when carried on one's person or in carry-on baggage only. Lighter fuel, lighter refills, and lighters containing unabsorbed liquid fuel (other than liquefied gas) are not permitted on one's person or in carry-on or checked baggage. For lighters powered by lithium batteries (e.g., laser plasma lighters, tesla coil lighters, flux lighters, arc lighters and double arc lighters), each battery must be of a type which meets the requirements of each test in the

UN Manual of Tests and Criteria, Part III, Subsection 38.3. Measures must be taken to prevent unintentional activation of the heating element while on board the aircraft.

Recharging of the devices and/or the batteries on board the aircraft is not permitted. Each battery must not exceed the following:

- (i) For lithium metal batteries, a lithium content of 2 grams; or
- (ii) For lithium ion batteries, a Watt-hour (Wh) rating of 100 Wh.

(3) Implanted or externally fitted medical devices in humans or animals that contain radioactive materials (e.g., cardiac pacemaker), as the result of medical treatment; and radiopharmaceuticals that have been injected or ingested.

* * * * *

(14) Battery powered heat-producing devices (e.g., battery-operated equipment such as diving lamps and soldering equipment) as checked or carry-on baggage and with the approval of the operator of the aircraft. The heating element, the battery, or other component (e.g., fuse) must be isolated to prevent unintentional activation during transport. Any battery that is removed must be carried in accordance with the provisions for spare batteries in paragraph (a)(18) of this section.

Each installed or spare lithium battery:

- (i) For a lithium metal battery, a lithium content must not exceed 2 grams; or
- (ii) For a lithium ion battery, the Watt-hour rating must not exceed 100 Wh.

(15) A wheelchair or other battery-powered mobility aid equipped with a non-spillable battery or a dry sealed battery when carried as checked baggage, provided—

(i) The battery conforms to the requirements of §173.159a(d) of this subchapter for non-spillable batteries;

(ii) The battery conforms to the requirements of § 172.102(c)(1), Special provision 130 of this subchapter for dry sealed batteries, as applicable;

(iii) Visual inspection including removal of the battery, where necessary, reveals no obvious defects (removal of the battery from the housing should be performed by qualified airline personnel only);

(iv) The battery is disconnected and the battery terminals are protected to prevent short circuits, unless the wheelchair or mobility aid design provides an effective means of preventing unintentional activation;

(v) The non-spillable battery is—

(A) Securely attached to the wheelchair or mobility aid;

(B) Removed and placed in a strong, rigid packaging marked “NONSPILLABLE BATTERY” (unless fully enclosed in a rigid housing that is properly marked); or

or

(C) Is handled in accordance with paragraph (a)(16)(iv) of this section; and

(vi) The dry sealed battery is—

(A) Securely attached to the wheelchair or mobility aid; or

(B) Removed and placed in a strong, rigid packaging marked with the words “not restricted” in accordance with § 172.102(c)(2), special provision 130, of this subchapter;

(vii) A maximum of one spare battery that conforms to the requirements in (a)(15)(i) or (ii) may be carried per passenger if handled in accordance with paragraph (a)(15)(v) or (vi) of this section, as applicable.

* * * * *

(17) * * *

(v) Where a lithium ion battery-powered wheelchair or other mobility aid does not provide adequate protection to the battery:

* * * * *

(18) Except as provided in §173.21 of this subchapter, portable electronic devices (e.g., watches, calculating machines, cameras, cellular phones, laptop and notebook computers, camcorders, medical devices, etc.) containing dry cells or dry batteries (including lithium cells or batteries) and spare dry cells or batteries for these devices, when carried by passengers or crew members for personal use. Portable electronic devices powered by lithium batteries may be carried in either checked or carry-on baggage. When carried in checked baggage, portable electronic devices powered by lithium batteries must be completely switched off (not in sleep or hibernation mode) and protected to prevent unintentional activation or damage. Spare lithium batteries must be carried in carry-on baggage only. Each installed or spare lithium battery must be of a type proven to meet the requirements of each test in the UN Manual of Tests and Criteria, Part III, Sub-section 38.3, and each spare lithium battery must be individually protected so as to prevent short circuits (e.g., by placement in original retail packaging, by otherwise insulating terminals by taping over exposed terminals, or placing each battery in a separate plastic bag or protective pouch). In addition, each installed or spare lithium battery:

(i) For a lithium metal battery, the lithium content must not exceed 2 grams;

(ii) For a lithium ion battery, the Watt-hour rating must not exceed 100 Wh. With the approval of the operator, portable electronic devices may contain lithium ion batteries exceeding 100 Wh, but not exceeding 160 Wh and no more than two individually

protected lithium ion batteries each exceeding 100 Wh, but not exceeding 160 Wh, may be carried per person as spare batteries in carry-on baggage.

(iii) For a non-spillable battery, the battery and equipment must conform to §173.159a(d). Each battery must not exceed a voltage greater than 12 volts and a watt-hour rating of not more than 100 Wh. No more than two individually protected spare batteries may be carried. Such equipment and spare batteries must be carried in checked or carry-on baggage.

(iv) Articles containing lithium metal or lithium ion cells or batteries the primary purpose of which is to provide power to another device must be carried as spare batteries in accordance with the provisions of this paragraph.

(19) Except as provided in §173.21 of this subchapter, battery-powered portable electronic smoking devices (e.g., e-cigarettes, e-cigs, e-cigars, e-pipes, e-hookahs, personal vaporizers, electronic nicotine delivery systems) when carried by passengers or crewmembers for personal use must be carried on one's person or in carry-on baggage only. Measures must be taken to prevent unintentional activation of the heating element while on board the aircraft. Spare lithium batteries also must be carried on one's person or in carry-on baggage only and must be individually protected so as to prevent short circuits (by placement in original retail packaging or by otherwise insulating terminals, e.g., by taping over exposed terminals or placing each battery in a separate plastic bag or protective pouch). Each lithium battery must be of a type which meets the requirements of each test in the UN Manual of Tests and Criteria, Part III, Subsection 38.3. Recharging of the devices and/or the batteries on board the aircraft is not permitted. Each installed or spare lithium battery:

(i) For a lithium metal battery, the lithium content must not exceed 2 grams; or

(ii) For a lithium ion battery, the Watt-hour rating must not exceed 100 Wh.

* * * * *

(26) Baggage equipped with lithium battery(ies) must be carried as carry-on baggage unless the battery(ies) is removed from the baggage. Removed battery(ies) must be carried in accordance with the provision for spare batteries prescribed in paragraph (a)(18) of this section. The provisions of this paragraph do not apply to baggage equipped with lithium batteries not exceeding:

(i) For lithium metal batteries, a lithium content of 0.3 grams; or

(ii) For lithium ion batteries, a Watt-hour rating of 2.7 Wh

* * * * *

37. In § 175.33, paragraphs (a)(12) and (a)(13)(i) are revised to read as follows:

§ 175.33 Shipping paper and notification of pilot-in-command.

(a) * * *

(12) For UN1845, Carbon dioxide, solid (dry ice), the information required by paragraph (a) of this section may be replaced by the UN number, proper shipping name, hazard class, total quantity in each cargo compartment aboard the aircraft, and the airport at which the package(s) is to be unloaded must be provided.

(13)(i) For UN3480, Lithium ion batteries, and UN3090, Lithium metal batteries, the information required by paragraph (a) of this section may be replaced by the UN number, proper shipping name, class, total quantity at each specific loading location, the airport at which the package(s) is to be unloaded, and whether the package must be carried on cargo aircraft only. UN3480 (Lithium ion batteries) and UN3090 (Lithium

metal batteries) carried under a special permit or a State exemption as prescribed in the ICAO Technical Instructions must meet all of the requirements of this section.

* * * * *

38. In § 175.78, paragraph (b) is revised and paragraph (c)(8) is added to read as follows:

§ 175.78 Stowage compatibility of cargo.

* * * * *

(b)(1) At a minimum, the segregation instructions prescribed in the following Segregation Table must be followed to maintain acceptable segregation between packages containing hazardous materials with different hazards. The Segregation Table instructions apply whether or not the class or division is the primary or subsidiary risk.

(2) Packages and overpacks containing articles of Identification Numbers UN3090 and UN3480 prepared in accordance with § 173.185(b)(3) and (c)(4)(vi) must not be stowed on an aircraft next to, in contact with, or in a position that would allow interaction with packages or overpacks containing hazardous materials that bear a Class 1 (other than Division 1.4S), Division 2.1, Class 3, Division 4.1, or Division 5.1 hazard label. To maintain acceptable segregation between packages and overpacks, the segregation requirements shown in the Segregation Table must be followed. The segregation requirements apply based on all hazard labels applied to the package or overpack, irrespective of whether the hazard is the primary or subsidiary hazard.

Table to paragraph (b): Segregation Table

Hazard label	Class or division										
	1	2.1	2.2, 2.3	3	4.1	4.2	4.3	5.1	5.2	8	9 see

											(b)(2)
1	Note 1	Note 2	Note 2	Note 2	Note 2	Note 2	Note 2	Note 2	Note 2	Note 2	Note 2
2.1	Note 2										X
2.2, 2.3	Note 2										
3	Note 2							X (Note 3)			X
4.1	Note 2										X
4.2	Note 2							X			
4.3	Note 2									X	
5.1	Note 2			X (Note 3)		X					X
5.2	Note 2										
8	Note 2						X				
9 see (b)(2)	Note 2	X		X	X			X			

* * * * *

(c) * * *

(8) Note 3. “Note 3” at the intersection of a row and column means that UN 3528, Engines, internal combustion, flammable liquid powered; Engines, fuel cell, flammable liquid powered; Machinery internal combustion, flammable liquid powered; and Machinery, fuel cell, flammable liquid powered need not be segregated from packages containing dangerous goods in Division 5.1.

PART 176—CARRIAGE BY VESSEL

39. The authority citation for part 176 continues to read as follows:

Authority: 49 U.S.C. 5101–5128; 49 CFR 1.81 and 1.97.

40. In § 176.30, paragraph (a)(9) is added to read as follows:

§ 176.30 Dangerous cargo manifest.

* * * * *

(a) * * *

(9) For excepted packages containing Class 7 materials only the following information is required:

- (i) The UN identification number for the material preceded by the letters “UN”;
- (ii) The name and address of the consignor and the consignee; and
- (iii) The stowage location of the hazardous material on board the vessel.

* * * * *

41. In § 176.84, paragraph (b) table provisions 151, 152, 153, and 154 are added to read as follows:

§ 176.84 Other requirements for stowage, cargo handling, and segregation for cargo vessels and passenger vessels.

* * * * *

(b) * * *

Code	Provisions
* * * * *	* * * * *
151	Segregation as for Class 7.
152	Segregation as for Class 8. However, in relation to Class 7, no segregation needs to be applied.
153	Stow “separated longitudinally by an intervening complete compartment or hold from” Divisions 1.1, 1.2, and 1.5.
154	Notwithstanding the stowage category indicated in column 10A of the § 172.101 Table, may be stowed in accordance with the provisions of packing instruction US 1

	in § 173.62.
* * * * *	* * * * *

* * * * *

PART 178--SPECIFICATIONS FOR PACKAGINGS

42. The authority citation for part 178 continues to read as follows:

Authority: 49 U.S.C. 5101–5128; 49 CFR 1.81 and 1.97.

43. In § 178.71, revise paragraphs (d)(2) and (f) introductory text, add paragraph (f)(4), and revise paragraphs (i), (j), and (q)(12) are revised to read as follows:

§ 178.71 Specifications for UN pressure receptacles.

* * * * *

(d) * * *

(2) Service equipment must be configured or designed to prevent damage that could result in the release of the pressure receptacle contents during normal conditions of handling and transport. Manifold piping leading to shut-off valves must be sufficiently flexible to protect the valves and the piping from shearing or releasing the pressure receptacle contents. The filling and discharge valves and any protective caps must be secured against unintended opening. The valves must conform to ISO 10297:2014(E) or, for non-refillable pressure receptacles valves manufactured until December 31, 2020, ISO 13340:2001(E) (IBR, *see* § 171.7 of this subchapter), and be protected as specified in § 173.301b(f) of this subchapter. Until December 31, 2020, the manufacture of a valve conforming to the requirements in ISO 10297:2006(E) (IBR, *see* § 171.7 of this subchapter) is authorized. Until December 31, 2008, the manufacture of a valve

conforming to the requirements in ISO 10297:1999(E) (IBR, *see* § 171.7 of this subchapter) is authorized. Additionally, valves must be initially inspected and tested in accordance with ISO 14246:2014(E) Gas cylinders — Cylinder valves — Manufacturing tests and examinations (IBR, *see* §171.7 of this subchapter).

* * * * *

(f) *Design and construction requirements for UN refillable welded cylinders and UN pressure drums.* In addition to the general requirements of this section, UN refillable welded cylinders and UN pressure drums must conform to the following ISO standards, as applicable:

* * * * *

(4) ISO 21172-1:2015(E) Gas cylinders — Welded steel pressure drums up to 3,000 litres capacity for the transport of gases — Design and construction —Part 1: Capacities up to 1,000 litres (IBR, *see* §171.7 of this subchapter). Irrespective of section 6.3.3.4 of this standard, welded steel gas pressure drums with dished ends convex to pressure may be used for the transport of corrosive substances provided all applicable additional requirements are met.

* * * * *

(i) *Design and construction requirements for UN non-refillable metal cylinders.* In addition to the general requirements of this section, UN non-refillable metal cylinders must conform to ISO 11118:2015(E) Gas cylinders—Non-refillable metallic gas cylinders—Specification and test methods (IBR, *see* § 171.7 of this subchapter). Until December 31, 2020, cylinders conforming to ISO 11118:1999(E) Gas cylinders—

Non-refillable metallic gas cylinders—Specification and test methods (IBR, see § 171.7 of this subchapter) are authorized.

(j) *Design and construction requirements for UN refillable seamless steel tubes.* In addition to the general requirements of this section, UN refillable seamless steel tubes must conform to ISO 11120:2015(E) Gas cylinders—Refillable seamless steel tubes of water capacity between 150 L and 3,000 L—Design, construction and testing (IBR, see § 171.7 of this subchapter). Until December 31, 2022, UN refillable seamless steel tubes may be manufactured in accordance with ISO 11120: Gas cylinders—Refillable seamless steel tubes of water capacity between 150 L and 3,000 L—Design, construction and testing (IBR, see § 171.7 of this subchapter)

* * * * *

(q) * * *

(12) Identification of the cylinder thread type (e.g., 25E). Information on the marks that may be used for identifying threads for cylinders is given in ISO/TR 11364, Gas Cylinders—Compilation of national and international valve stem/gas cylinder neck threads and their identification and marking system (IBR, see §171.7 of this subchapter).

* * * * *

44. In § 178.75 paragraph (d)(3)(v) is revised to read as follows:

§ 178.75 Specifications for UN pressure receptacles.

* * * * *

(d) * * *

(3) * * *

(v) ISO 11120:2015(E) Gas cylinders—Refillable seamless steel tubes of water capacity between 150 L and 3000 L—Design, construction and testing (IBR, see §171.7 of this subchapter). Until December 31, 2020, pressure receptacles of a MEGC may be constructed and tested in accordance with ISO 11120:1999(E) Gas cylinders—Refillable seamless steel tubes of water capacity between 150 L and 3000 L—Design, construction and testing (IBR, see §171.7 of this subchapter).

* * * * *

45. In § 178.601, paragraph (l)(2)(viii) is revised to read as follows:

§ 178.601 General requirements.

* * * * *

(1) * * *

(2) * * *

(viii) Characteristics of test contents, including for plastic packagings subject to the hydrostatic pressure test in § 178.605 of this subpart, the temperature of the water used;

* * * * *

46. In § 178.801, paragraph (l)(2)(viii) is revised to read as follows:

§ 178.801 General Requirements.

* * * * *

(1) * * *

(2) * * *

(viii) Characteristics of test contents, including for rigid plastics and composite IBCs subject to the hydrostatic pressure test in § 178.814 of this subpart, the temperature

of the water used;

* * * * *

47. In § 178.810, paragraph (c)(1) is revised to read as follows:

§ 178.810 Drop test.

* * * * *

(c) * * *

(1) Samples of all IBC design types must be dropped onto a rigid, non-resilient, smooth, flat, and horizontal surface. The point of impact must be the most vulnerable part of the base of the IBC being tested. Following the drop, the IBC must be restored to the upright position for observation. The same IBC or a different IBC of the same design may be used for each drop.

* * * * *

PART 180—CONTINUING QUALIFICATION AND MAINTENANCE OF PACKAGINGS

48. The authority citation for part 180 continues to read as follows:

Authority: 49 U.S.C. 5101–5128; 49 CFR 1.81 and 1.97.

49. In § 180.207, paragraphs (a)(2) and (d)(1) and (4) are revised and paragraph

(d)(6) is added to read as follows:

§ 180.207 Requirements for requalification of UN pressure receptacles.

* * * * *

(a) * * *

(2) No pressure receptacle due for requalification may be filled with a hazardous material and offered for transportation in commerce unless that pressure receptacle has

been successfully requalified and marked in accordance with this subpart. A pressure receptacle may be requalified at any time during or before the month and year that the requalification is due. However, a pressure receptacle filled before the requalification becomes due may remain in service until it is emptied. In accordance with the Transport Canada TDG Regulations (IBR, *see* § 171.7) a CAN marked UN cylinder may be requalified in the United States by a domestic requalifier, provided the requirements in §§ 178.69, 178.70, and 178.71, as applicable, are met.

* * * * *

(d) * * *

(1) Seamless steel: Each seamless steel UN pressure receptacle, including MEGC's pressure receptacles, must be requalified in accordance with ISO 6406:2005(E) (IBR, *see* § 171.7 of this subchapter). However, UN cylinders with a tensile strength greater than or equal to 950 MPa must be requalified by ultrasonic examination in accordance with ISO 6406:2005(E). For seamless steel cylinders and tubes, the internal inspection and hydraulic pressure test may be replaced by a procedure conforming to ISO 16148:2016(E) (IBR, *see* § 171.1).

* * * * *

(4) Composite UN cylinders: Each composite cylinder must be inspected and tested in accordance with ISO 11623:2015(E) (IBR, *see* §171.7 of this subchapter). Until December 31, 2020, ISO 11623:2002(E) (IBR, *see* §171.7 of this subchapter) may be used.

* * * * *

(6) Valves: Inspection and maintenance of cylinder valves must be carried out in

accordance with ISO 22434:2006 Transportable gas cylinders — Inspection and maintenance of cylinder valves (IBR, see § 171.7 of this subchapter).

Issued in Washington, DC on November 6, 2018, under authority delegated in 49 CFR 1.97.

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[FR Doc. 2018-24620 Filed: 11/26/2018 8:45 am; Publication Date: 11/27/2018]