DEPARTMENT OF TRANSPORTATION

Pipeline and Hazardous Materials Safety Administration

49 CFR Parts 171, 172, 173, 174, 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: Final rule.

SUMMARY: PHMSA is issuing this final rule 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 is adopting several amendments to the HMR that would allow for increased alignment with the Transport Canada, Transportation of Dangerous Goods Regulations.

DATES:

Effective date: This rule is effective May 11, 2020, except for instruction 17, which is effective January 2, 2023.

Voluntary compliance date: January 1, 2019.

Delayed compliance date: May 10, 2021.

Incorporation by reference date: The incorporation by reference of certain publications listed in this rule is approved by the Director of the Federal Register as of May 11, 2020.

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.

SUPPLEMENTARY INFORMATION:

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I. Executive Summary

The Pipeline and Hazardous Materials Safety Administration (PHMSA) is amending 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 PHMSA's ongoing biennial process to harmonize the HMR with international regulations and standards.

As part of this biennial process, PHMSA is amending the HMR to incorporate changes from the 20th Revised Edition of the UN Model Regulations, Amendment 39–18 of the International Maritime Dangerous Goods (IMDG) Code, and the 2019–2020 International Civil Aviation Organization (ICAO) Technical Instructions, which became effective January 1, 2019.[1] Notable amendments to the HMR in this final rule include the following:

• *Incorporation by Reference:* PHMSA incorporates 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 are updating our incorporation by reference of the Transport Canada, Transportation of Dangerous Goods (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, PHMSA is adopting various updated International Organization for Standardization (ISO) standards.

• *Hazardous Materials Table:* PHMSA amends the Hazardous Materials Table (HMT; § 172.101) consistent with recent changes in the Dangerous Goods List of the UN Model Regulations, the IMDG Code, and the ICAO Technical Instructions. Specifically, PHMSA is making 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 adds a classification system for articles containing hazardous materials that do not already have a proper shipping name. This addresses situations in which hazardous materials or hazardous materials residues are present in articles, and authorizes a safe method to transport articles that may be too large to fit into typical packages.

• *Lithium Battery Test Summary:* PHMSA adds requirements regarding lithium battery test summaries. The HMR requires lithium battery manufacturers to subject lithium batteries and cells to appropriate UN design tests to ensure they are classified correctly for transport, and to develop records of successful test completion, called a test report. The test summary includes a standardized set of elements that provide traceability and accountability, thereby ensuring that lithium cell and battery designs offered for transport contain specific information on the required UN tests. The test summary must be made available to subsequent distributors.

• *Baggage Equipped with Lithium Batteries:* PHMSA is amending the aircraft passenger provisions for carriage

[1] Amendment 39–18 to the IMDG Code may be voluntarily applied on January 1, 2019; however, the previous amendment remained effective through December 31, 2019.

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 will be required to be carried in the cabin of the aircraft unless the battery or batteries are removed. This restriction in checked baggage does 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 (Wh) rating not exceeding 2.7 Wh.

• *Segregation of Lithium Batteries from Specific Hazardous Materials:* PHMSA is adding 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 to implement a National Transportation Safety Board (NTSB) Safety Recommendation (A–16–001) 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 the flammable materials and lithium ion batteries that were loaded together in either the same or adjacent pallets as a contributing factor to the accident.

• *Alternative Criteria for Classification of Corrosive Materials:* PHMSA is including non-testing alternatives for classifying corrosive mixtures using existing data on its chemical properties. Currently, the HMR require offerors to classify Class 8 corrosive material and assign a packing group based on test data. The HMR authorizes 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. The alternatives added in this final rule 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 extending the sunset dates for provisions concerning the transportation of polymerizing substances from January 2, 2019 to January 2, 2023. This additional time will allow PHMSA to conduct research and analyze comments and data concerning the issue submitted to the docket for this rulemaking, to have a more comprehensive understanding of polymerizing substances and further consider the most appropriate transport provisions for these materials.

II. Background

Federal hazardous materials transportation law (Federal hazmat law; 49 U.S.C. 5101 *et seq.*) directs PHMSA to participate in relevant international standard-setting bodies and promotes consistency of the HMR with international transport standards to the extent practicable. Federal hazmat law permits PHMSA to depart from international standards where a more stringent standard or requirement is necessary in the public interest or if a different standard or requirement is unnecessary or unsafe. However, Federal hazmat law otherwise encourages domestic and international harmonization (*see* 49 U.S.C. 5120).

Harmonization facilitates international trade by minimizing the costs and other burdens of complying with multiple or inconsistent safety requirements for transportation of hazardous materials. Safety is enhanced by creating a uniform framework for compliance. As the volume of hazardous materials transported in international commerce continues to grow, harmonization is increasingly important.

PHMSA published a notice of proposed rulemaking (NPRM) under Docket HM–215O [83 FR 60970 (November 27, 2018)] to incorporate various amendments to harmonize the HMR with recent changes to the IMDG Code, ICAO Technical Instructions, and the United Nations Recommendations on the Transport of Dangerous Goods—Model Regulations (UN Model Regulations). When considering alignment of the HMR with international standards, PHMSA reviews and evaluates each amendment on its own merit, on the basis of its overall impact on transportation safety, and on the basis of the economic implications associated with its adoption into the HMR. PHMSA's goal is to harmonize without diminishing the level of safety currently provided by the HMR or imposing undue burdens on the regulated community.

III. Incorporation by Reference Discussion Under 1 CFR Part 51

The UN Model Regulations, Manual of Tests and Criteria, and GHS, 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 either print or electronic versions through the parent organization websites. The specific standards are discussed in greater detail in the section-by-section review (see § 171.7).

IV. NPRM Comment Discussion

In response to the November 27, 2018 NPRM [83 FR 60970], PHMSA received comments from the following organizations and individuals:

- Air Line Pilots Association, International (ALPA)
- Alaska Airlines
- Amazon
- American Coatings Association (ACA)
- Anonymous
- Anonymous 2
- Association of American Railroads and the American Short Line and Regional Railroad Association (AAR and ASLRRA)
- Association of Hazmat Shippers (AHS)
- The Basic Acrylic Monomer Manufacturers, Inc. (BAMM)
- Compressed Gas Association (CGA)
- Council on Safe Transportation of Hazardous Articles (COSTHA)
- Dangerous Goods Advisory Council (DGAC)
- The Dow Chemical Company (Dow)
- Frits Wybenga
- Gases and Welding Distributors Association
- Institute of Makers of Explosives (IME)
- Interested Parties for Hazardous Materials Transportation (Interested Parties)
- International Air Transport Association (IATA)
- International Vessel Operators Dangerous Goods Association (IVODGA)
- Yvonne Keller
- Medical Device Battery Transport Council (MDBTC)
- National Retail Federation (NRF)
- The Rechargeable Battery Association (PRBA)
- Reusable Industrial Packaging Association (RIPA)
- Transport Canada (TC)
- U.S. Chamber of Commerce (Chamber)
- Utility Solid Waste Activities Group (USWAG)

PHMSA received comments from the ACA, CGA, ALPA, IATA, DGAC, and the Chamber all providing general support for harmonization with international standards and additional support from CGA for the incorporation by reference of the proposed ISO standards. In addition, PHSMA received a comment from IME in support of updating the edition of the GHS that is incorporated by reference.

Comments concerning the issuance of a direct final rule, the sunset provisions for polymerizing substances, compliance and applicability dates for the test summary, fuel gas containment systems, damaged and defective lithium batteries, competency based training, and safety devices in dedicated handling devices are discussed below. PHMSA concluded that comments made by Anonymous 2, portions of comments made by MDBTC concerning ''receipted for in one lot,'' in § 173.185,[2] portions of comments made by Alaska Airlines concerning air transport provisions for fish meal, and portions of comments made by IME concerning amendments to packaging instruction US 1 in § 173.62,[3] are outside the scope of this rulemaking. Therefore, PHMSA did not address these comments in this rulemaking. All other comments specific to the respective HMR sections are addressed in the ''Section-by-Section Review'' of this document.[4]

Delays in Issuing the Final Rule

PHMSA received a comment from AAR and ASLRRA that indicated the delay associated with publication of a final rule ''presents immediate challenges for shippers and carriers involved in the transportation of hazardous materials across U.S. borders'' and suggested alternative ways for proceeding with the rulemaking. PHMSA recognizes that a delay in publication of this final rule may have presented challenges for shippers and carriers. To mitigate these challenges, on December 18, 2018, PHMSA issued a Notice of Enforcement Policy Regarding International Standards authorizing the use of the applicable international standards.[5] The notice explained that PHMSA would not take enforcement action against any offeror or carrier using the updated standards when all or part of the transportation is by air with respect to the ICAO TI, or all or part of the transportation is by vessel with respect to the IMDG code.

Sunset Provisions for Polymerizing Substances

In the March 30, 2017, final rule [HM–215N; 82 FR 15796], PHMSA added four new Division 4.1 entries for polymerizing substances to the HMT, and added defining criteria, authorized packagings, and safety requirements including, but not limited to, stabilization methods and operational controls into the HMR. 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 that 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. In the HM–215O NPRM, PHMSA proposed to extend the sunset dates for provisions concerning the transportation of polymerizing substances from January 2, 2019 to January 2, 2021 as the research is still in progress. PHMSA received comments from BAMM, DGAC, and Dow expressing support for the extension of the sunset provisions proposed in the HM–215O NPRM. These commenters also requested that PHMSA harmonize the requirements for temperature control of polymerizing substances in portable tanks and testing requirements for these substances intended to be carried in portable tanks or intermediate bulk containers (IBCs) with those found in the transport international standards while awaiting the results of a currently underway research project.

DGAC and Dow requested that the previously adopted changes to § 173.21 in the March 30, 2017, final rule [HM–215N; 82 FR 15796], requiring temperature control at 50 °C for portable tanks carrying polymerizing substances be harmonized with the internationally adopted 45 °C, while PHMSA awaits the outcome of ongoing research into polymerizing substances. BAMM, DGAC, and Dow requested that PHMSA not require polymerizing substances intended to be transported in portable tanks or IBCs to undergo the Test Series E heating under confinement testing. The commenters requested that the provisions for polymerizing substances be harmonized with those found in the applicable international standards while PHMSA awaits the outcome of ongoing research into polymerizing substances. DGAC and Dow commented that differing domestic and international temperature control thresholds before temperature control is required would result in materials with a self-accelerating polymerization temperature (SAPT) greater than 45 °C and less than or equal to 50 °C being subject to temperature control when transported in portable tanks in the United States, but not elsewhere in the world. BAMM, DGAC, and Dow expressed their view that because the recommended test methods for Test Series E were not specifically designed for polymerizing substances that the test results would be meaningless. The commenters did not raise any new reasons for not adopting the provisions beyond those previously addressed in the March 30, 2017 final rule [HM–215N; 82 FR 15796]. PHMSA understands the concerns raised by the commenters, but to ensure the safe and efficient transportation of these commodities, PHMSA is adopting the provisions as proposed in the NPRM and codified in the March 30, 2017, final rule for the reasons that were previously outlined [HM–215N; 82 FR 15796, 15798–99]. In brief, the rationale for adopting the 50 °C SAPT threshold before temperature control is required for transport in portable tanks is primarily that 50 °C is the maximum temperature reasonable expected to be experienced by any selfreactive, organic peroxide, and/or polymerizing substance. The rationale for requiring Test Series E testing for polymerizing substances intended to be transported in portable tanks or IBC is that Test Series E (or an equivalent performance measure) provides information on how the material behaves when heated under confinement. For additional discussion of these issues refer to the March 30, 2017 final rule [HM–215N; 82 FR 15796, 15798–99].

To accommodate additional potential delays in completion and reviewing the results of the research project on polymerizing substances, PHMSA is extending the date for the sunset provisions for an additional two years beyond the date proposed in the NPRM. The new sunset date for transport provisions concerning polymerizing substances is January 2, 2023.

Lithium Battery Test Summary

In the NPRM, PHMSA proposed the inclusion of lithium battery test summary requirements. The test summary includes a standardized set of elements that provide traceability and accountability to ensure that lithium cell and battery designs offered for transport contain specific information on the required UN tests. PHMSA proposed that manufacturers and subsequent distributers of lithium cells and batteries manufactured after June 30, 2003 must make test summaries available to others in the supply chain.

[2] Section 173.185 defines consignment to mean ''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.''

[3] Section 173.62 establishes specific packing requirements for explosives. US 1 is a packing instruction that is ''particular to the United States and not found in applicable international regulations.''

[4] Comments which were outside the scope of this rulemaking are not addressed in this final rule.

[5] *https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/international-program/70251/notice-enforcement-policy-international-standards.pdf.*

In the international standards, and as proposed in the NPRM, the lithium battery test summary requirements would have an effective date of January 1, 2020.

In response to the comments received, in this final rule, PHMSA is providing additonal background on the test summary. The development of the test summary by the United Nations Sub-Committee of Experts on the Transport of Dangerous Goods spanned several years. The work was the outgrowth of an industry-identified problem concerning lack of availability of information needed to verify compliance and facilitate transportation. Specifically, the inability of shippers to access documentation verifying that lithium cells and batteries have successfully passed the tests prescribed in part III, sub-section 38.3 of the UN Manual of Tests and Criteria. In 2014, a trade association representing major rechargeable battery manufacturers relayed to the UN Sub-Committee that shippers were experiencing difficulties in verifying compliance with the UN 38.3 tests (See UN/SCETDG/46/INF.11, paragraph 15).[6] It was the industry group's suggestion to work within the UN Sub-Committee towards a summary format that would facilitate making available essential compliance information to all concerned. This suggestion led the UN Sub-Committee over the next two years in cooperation with government and industry stakeholders to develop a standardized list of information to be included in a test summary (see ST/SG/AC.10/C.3/100, paragraph 56).[7] PHMSA received several comments, which are discussed throughout this rulemaking and the associated RIA, concerning the potential costs of the test summary provisions. While providing no specific cost estimates, these commenters indicated that they believed implementing the test summary provisions as proposed would be more burdensome than PHMSA estimated. In this final rule, PHMSA is adopting changes to the compliance date, the implementation date, and several other variatons from the NPRM proposals that will reduce the burden on lithium cell and battery manufacturers and distributors.

Compliance Date

PHMSA received comments from Alaska Airlines, Amazon, Chamber, COSTHA, DGAC, MDBTC, NRF, PRBA, and an anonymous commenter concerning the proposed effective date of January 1, 2020 for the proposed test summary requirements. These commenters requested that PHMSA provide additional time to comply. Alaska Airlines commented that they hope the test summary requirements can be implemented by January 1, 2021. PRBA, Amazon, MDBTC, the Chamber, and NRF indicated that PHMSA should allow manufacturers and subsequent distributors until January 1, 2022 to comply with the test summary requirements. The DGAC recommended a one-year transition period following publication of the final rule. The commenters opined that the proposed compliance deadline of January 1, 2020 would not allow sufficient time for U.S. manufacturers and subsequent distributors of these products to establish procedures for preparing and securing test summaries. In their comments, NRF commented that it will take significant time for manufacturers and shippers, especially small companies, to develop and prepare the test summaries for their products. NRF opined that a longer implementation time will give companies enough time to identify, develop, and prepare the materials that are needed for compliance.

PHMSA agrees that additional time may be required to fully integrate systems, processes, and policies for preparing test summaries. The additional time can be used to help ensure the availability of test summaries and to prepare procedures for making test summaries available to subsequent distributors. In this final rule, the required compliance date for both the creation of and subsequent distribution upon request for test summaries is January 1, 2022.

COSTHA noted that using the same implementation date for both battery manufacturers and distributors presents the possibility that manufacturers could wait until December 31, 2021 to prepare the documents and distributors would not have any additional time to receive and make available the test summaries throughout the supply chain. COSTHA requested a staggered implementation date that would allow distributors an additional year to comply. PHMSA believes that the extended transition period for domestic implementation of the test summary requirements (two years after the requirements enter the IMDG Code and ICAO Technical Instructions) will mitigate this concern over shared implementation dates for shippers and distributors by providing additional time for battery distributers to work with manufacturers to acquire the necessary information and establish mechanisms for further distribution.

Applicability Date

PHMSA received comments from PRBA, NRF, DGAC, MDBTC, Amazon, and the Chamber requesting that PHMSA reconsider which lithium batteries require a test summary be created and made available. PHMSA proposed a requirement that a test summary be made available for all lithium cells and batteries manufactured after June 30, 2003, and that manufacturers and subsequent distributers of lithium cells and batteries manufactured after June 30, 2003, must make this information available to others in the supply chain.

PRBA commented that ''[i]t is not practicable to require the post-hoc generation of a Test Summary for batteries that were manufactured as far back as 2003,'' and asked that PHMSA adopt a date that requires the creation of test summaries and subsequent distribution for only batteries and cells manufactured after the effective date of the provisions. In conjunction with its request to extend the compliance date for the test summary generally to January 1, 2022, PRBA requests that only batteries and cells manufactured after this date require test summaries and subsequent distribution. The Chamber also requested that the applicability be limited to lithium cells and batteries manufactured after January 1, 2022 noting that ''there may be times when distributors are shipping older battery designs that were manufactured by a company that is no longer in business. In instances like this, it may be impossible for shippers to acquire the necessary information for the TS.'' The NRF and Amazon commented with similar requests to limit the scope of batteries subject to the test summary by using the effective date of the requirement which would then apply the requirements to cells and batteries currently in production and those made going forward. The NRF noted that it would be incredibly difficult and burdensome to locate a test certification and create a test summary for batteries dating back up to 17 years. MDBTC supported requiring test summary documents for only lithium cells and batteries manufactured after January 1, 2014.

PHMSA recognizes the comments noting the potential difficulty in obtaining test summaries for older batteries, particularly in cases where a manufacturer may no longer be in business or has merged with another company. Therefore, PHMSA is applying the test summary requirements

[6] *https://www.unece.org/fileadmin/DAM/trans/doc/2014/dgac10c3/UN-SCETDG-46-INF11e.pdf.*

[7] *https://www.unece.org/fileadmin/DAM/trans/doc/2016/dgac10c3/ST-SG-AC10-C3-100e.pdf.*

only to cells and batteries manufactured after January 1, 2008. This date is the effective date of the final rule that required all lithium batteries (including small batteries) be of the type proven to meet the criteria in part III, sub-section 38.3 of the UN Manual of Tests and Criteria (''Hazardous Materials; Transportation of Lithium Batteries,'' August 9, 2007, 72 FR 44929). As of January 1, 2008, all batteries transported in accordance with the HMR should have valid test reports that will help facilitate the creation of and availability of test summaries. PHMSA believes that amending the scope of cells and batteries that require a test summary to those manufactured after January 1, 2008 will lead to fewer instances where insufficient information will be available to create the required test summary while still capturing the majority of batteries and cells being offered for transportation.

PHMSA reiterates the importance of the test summary in providing confirmation 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. Additionally, PHMSA maintains that the creation and subsequent distribution of test summaries for lithium batteries provides an enhanced mechanism for shippers to meet their existing requirement to only offer lithium cells and batteries of a type proven to meet the criteria in part III, sub-section 38.3 of the UN Manual of Tests and Criteria. The availability of specific information in the test summary document will enhance the users' ability to obtain the information needed to ensure they are receiving, and potentially reoffering for transportation, a battery that is of a tested and approved type.

Fuel Gas Containment Systems

In the NPRM, PHMSA discussed amendments to international standards that are not being considered for adoption. As stated in the NPRM, the 20th Revised Edition to the UN Model Regulations added a special provision to allow for the transportation of vehicle fuel gas containment systems containing certain gases, such as compressed natural gas and liquified petroleum gas, transported for disposal, recycling, repair, inspection, maintenance, or from where they are manufactured to a vehicle assembly plant. The provisions allow for gaseous fuels to be transported in fuel tanks designed for vehicles meeting certain European automotive standards rather than specification pressure receptacles. In the NPRM, PHMSA explained that the vehicle specification pressure vessels that are incorporated and authorized by the UN Model Regulations do not apply to U.S. domestic transportation as most of the fuel gas containment standards that are addressed in the UN Model Regulations are more appropriate for European road and rail regulations. PHMSA solicited comments on the fuel gas containment systems amendment in the UN Model Regulations and asked whether it would benefit industry to include a similar amendment in the HMR.

PHMSA received a comment from COSTHA on the decision not to include provisions for fuel gas containment decisions. The commenter disagreed with the view that the amendments are more appropriate for European regulations. COSTHA commented on the benefits of adopting the provisions into the HMR. COSTHA opined that when fuel tanks are removed from the vehicle and offered for transportation they are constructed to meet motor vehicle standards, but the tanks will not be permitted for transport of gaseous fuels under the HMR without the gas being completely removed from the tank. COSTHA further commented that the gas removal process has the potential to lead to dangerous situations at repair shops, dealers, and disposal locations not equipped to properly empty these fuel tanks. COSTHA notes that U.S. automobile manufacturers often use UN or Global Technical Regulations to demonstrate compliance with equivalent Federal Motor Vehicle Safety Standards (FMVSS).[8] In addition, COSTHA supports referencing applicable FMVSS in the HMR to facilitate U.S. domestic gas containment system transport.

PHMSA thanks COSTHA for its comments on this topic, and PHMSA understands the concerns related to difficulties in ensuring gas is removed from these cylinders prior to transport, but it would be premature to adopt the FMVSS requirements into the HMR. The FMVSS requirements are not presently incorporated in the UN Model Regulations, and adoption of the FMVSS requirements would require additional coordination with Federal agencies outside of PHMSA. PHMSA may consider this action in a future rulemaking and invites COSTHA to file a petition for rulemaking in accordance with 49 CFR 106.95, 106.100 and 106.105, to formally request this change be made in the HMR. Additonally, PHMSA believes that a more comprehensive review of the current domestic standards used by vehicle fuel gas containment systems is necessary prior to incorporation in the HMR to help ensure safety standards that most closely align with existing practices are incorporated. The request could be further evaluated for merit to address in an upcoming rulemaking.

[8] National Highway Transportation Safety Administration issues FMVSS. The regulations establishing the FMVSS are primarily found at 49 CFR part 571. *https://www.nhtsa.gov/laws-regulations/fmvss.*

Damaged and Defective Lithium Batteries

In the NPRM, PHMSA discussed amendments to international standards not being considered for adoption. As stated in the NPRM, the 20th Revised Edition of the UN Model Regulations adopted transportation provisions for damaged and defective cells and batteries 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 (UN Nos. 3090, 3091, 3480 and 3481). In the NPRM, PHMSA explained that the existing packaging and hazard communication requirements in § 173.185(f) sufficiently address consignments of this nature. PHMSA received one comment from MDBTC in support of not adopting the provisions for damaged and defective lithium batteries.

Competency-Based Training

PHMSA received comments from AAR and ASLRRA, ACA, AHS, Alaska Airlines, CGA, COSTHA, DGAC, Dow, IATA, IME, Interested Parties, IVODGA, MDBTC, and RIPA in response to our request for comments on the principles of Competency-Based Training, recently published in the attachments of the ICAO Technical Instructions. As noted in the NPRM, the provisions concerning Competency-Based Training were not finalized or adopted in the 2017–2018 ICAO Technical Instructions and there were no proposals concerning this topic in the NPRM. PHMSA thanks all commenters for their views on the issue and, as noted in the NPRM, comments will be considered for the betterment of PHMSA's work in various international forums.

Safety Devices in Dedicated Handling Devices

PHMSA received a comment from COSTHA concerning safety devices in dedicated handling devices. COSTHA commented that PHMSA should align the provisions of § 173.166(e)(4)(i) with the UN Model Regulations and the IMDG Code to authorize unpackaged articles in dedicated handling devices, vehicles, or containers to, from, or between where they are manufactured and an assembly plant including intermediate handling locations. PHMSA notes that the provisions adopted by the UN and the IMDG Code are currently authorized in §§ 173.166(e)(4)(i) and (ii), therefore no additional action is required.

V. Section-By-Section Review

The following is a section-by-section review of the amendments adopted in this final rule:

Part 171—General Information, Regulations, and Definitions

Section 171.7 Reference Material

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 1995.'' 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,'' and in accordance with Sec 12(d)(1) of the ''National Technology Transfer and Advancement Act of 1995,'' government agencies must use voluntary consensus standards wherever practical in the development of regulations. When properly conducted, 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 it 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 final rule, PHMSA is adding and revising the following incorporation by reference materials:

- Paragraph (s)(2) is 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 addition of this paragraph corrects 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), 2017–2018 Edition, is revised to incorporate the 2019–2020 Edition. These instructions contain the detailed instructions for the international transport of hazardous materials by air. In a previous rulemaking, [Docket No. PHMSA–2015–0102 (HM–219A); 83 FR 55792], PHMSA added § 172.407 to the list of sections in paragraph (t)(1) and (v)(2). The NPRM did not account for this addition, and in this final rule § 172.407 has been added to the list in paragraphs (t)(1) and (v)(2) consistent with the earlier published final rule.
- Paragraph (v)(2), which incorporates the *International Maritime Organization* International Maritime Dangerous Goods Code (IMDG Code), incorporating Amendment 38–16 (English Edition), is revised to incorporate the 39–18 (English Edition), 2018 Edition. This code contains detailed instructions for the international transport of hazardous materials by vessel.
- Paragraph (w), which incorporates various *International Organization for Standardization* entries, is 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 is 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. The updated version of ISO 11118 includes, among other edits, clarified requirements for the processing of carbon steel to avoid strain aging and the inclusion of alternative temperatures for artificial aging of carbon steel cylinders prior to burst testing.

—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 is 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. The updated version of ISO 11120 includes, among other edits, the modification of ultrasonic provisions for ultrasonic examination in 8.3 to include ultrasonic examination for wall thickness and for imperfections also on the supplied tubing and revision of the provisions for design of tubes for embrittling gases.

—ISO 11623(E), Transportable gas cylinders—Periodic inspection and testing of composite gas cylinders, First edition, March 2002 is replaced by ISO 11623:2015(E), Gas cylinders—Composite construction—Periodic inspection and testing 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. The updated version of ISO 11623 includes, among other edits, updated terminology, particularly for the various types of composite cylinders, and moves information regarding intervals between periodic inspection and testing based on cylinder type into the new Annex C (formerly listed in Tables 1 through 4).

—ISO 14246:2014(E), Gas cylinders—Cylinder valves—Manufacturing tests and examination is added in paragraph (w)(69). This standard covers the function of a cylinder valve as a closure.

—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 is added 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 is added in paragraph (w)(72). This standard covers the function of a quick-release cylinder valve as a closure.

—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 added in paragraph (w)(75). This standard provides 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 is added in paragraph (w)(76). This standard specifies the requirements for the inspection and maintenance of cylinder valves, including valves with integrated pressure regulators.

—ISO/TR 11364:2012(E), Gas cylinders—Compilation of national and international valve stem/gas cylinder neck threads and their identification and marking system is 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.

• Paragraphs (aa)(1)–(4), which updates four (4) existing *Organization for Economic Cooperation and Development* (OECD) guidelines concerning corrosivity testing (Nos. 404, 430, 431, & 435). The references to these standards are updated to the 2015 versions of the standards. Updated 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. Updated OECD Guideline 430 and OECD Guideline 431 include references to a developed document on integrated approaches to testing and assessment.

• Paragraph (bb)(1), which incorporates the *Transport Canada* Transportation of Dangerous Goods Regulations, adds 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 additions are to incorporate changes to the *Transport Canada* Transportation of Dangerous Goods Regulations. SOR/2016–95 contains amendments concerning reporting requirements and international restrictions on lithium batteries. SOR/2017–137 contains amendments related to international harmonization. SOR/2017–253 containes amendments related to marine transportation.

• Paragraph (bb)(2) is 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, is 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. In a previous rulemaking, [Docket No. PHMSA–2015–0102 (HM–219A); 83 FR 55792], PHMSA added § 172.519 to the list of sections in paragraph (dd)(1). The NPRM did not account for this addition and in this final rule, § 172.519 has been added to the list in paragraph (dd)(1) consistent with the earlier published final rule.

• Paragraph (dd)(2)(ii) is 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), is revised to incorporate the *United Nations* Recommendations on the Transport of Dangerous Goods, Globally Harmonized System of Classification and Labelling of Chemicals (GHS), Seventh revised edition (2017). This standard helps identify the intrinsic hazards found in substances and mixtures and to convey information about these hazards.

Section 171.8 Definitions and Abbreviations

Section 171.8 defines terms generally used throughout the HMR that have broad or multi-modal applicability. In this final rule, PHMSA is amending the definition of ''UN pressure receptacle'' to include pressure drums. Additionally, PHMSA is adding 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 incorporated in § 178.71.

Section 171.12 North American Shipments

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 15796], PHMSA amended the HMR to expand recognition of cylinders and pressure receptacles, cargo tank repair facilities, and certificates of equivalency (an authorization to conduct an activity in compliance with the conditions of that authorization instead of the standard requirements) 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 final rule, PHMSA is clarifying 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 final rule, PHMSA is amending paragraph (a)(1) to clarify the extent of reciprocity regarding certificates of equivalency.

Additionally, PHMSA is amending 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).

PHMSA received comments of general support from the Dow and DGAC. Dow specifically mentioned support for the incorporation by reference of the Containers for Transport of Dangerous Goods by Rail and clarification of the certificates of equivalency.

PHMSA received a comment from Transport Canada suggesting that the terms ''pressure drum'' and ''pressure receptacle'' addressed in § 171.8 of this final rule, also be included in § 171.12 in a manner that promotes reciprocity between the United States and Canada. We agree with the commenter and in this final rule are adding the terms ''pressure drum'' and ''UN pressure receptacle'' to § 171.12 and authorizing use of these packages when marked with the letters ''CAN.''

Part 172—Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, Training Requirements, and Security Plans

Section 172.101 Purpose and Use of Hazardous Materials Table

Section 172.101 contains the HMT and provides instructions for its use. In this final rule, PHMSA is revising 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. In the NPRM, PHMSA proposed a revision to paragraph (e) to indicate that NA numbers are only recognized for use in the United States. In the NPRM, PHMSA stated that NA numbers are not authorized in Canada because the TDG limit the use of NA numbers to materials classified as ''Consumer commodity,'' and do not allow for the use of other NA numbers. Transport Canada made this amendment in August 15, 2001 with SOR 2001–186.[9] The TDG, Part 9.1 Transporting Dangerous Goods from the United States into or through Canada state that the HMR may be followed as an alternative to the TDG if certain conditions are met, including that ''the classification in Schedule 1 or in the UN Recommendations, for dangerous goods that have the letter ''D'' assigned to them in column 1 of the table to section 172.101 of 49 CFR, except for dangerous goods with the shipping name 'Consumer commodity'.'' The letter ''D'' is assigned to NA numbers. Therefore, NA numbers are not recognized for shipments from a place in the United States to a place in Canada or from a place in the United States through Canada to a place outside Canada. As such, PHMSA is revising the HMR to be consistent with Canada's national regulations. PHMSA received comments from DGAC on the use of NA numbers in § 172.101(e), North American Shipments. Specifically, DGAC stated this change will eliminate mutual recognition of NA numbers between the United States and Canada. Although the text in § 172.101(e), stating that NA numbers are not recognized for international transportation, except to and from Canada, was not previously amended to align with the TDG, the mutual recognition of NA numbers has not been permitted under the TDG since the August 15, 2001 publication. NA numbers will continue to be recognized for shipments within the United States.

1. Hazardous Materials Table (HMT)

In this final rule, PHMSA is amending the HMT. Readers should review all changes for a complete understanding of the amendments. For purposes of the U.S. 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.'' The amendments to the HMT include the following:

2. 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 in contact with water emits flammable gases, 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 is adding 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 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 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 (PG) 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 that are 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. PHMSA received one comment on the proposed changes to § 172.101 from PRBA supporting the new entry of UN3536 in the table.

3. 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,

[9] *http://www.gazette.gc.ca/rp-pr/p2/2001/2001-08-15-s/pdf/g2-135s1.pdf.*

as the substance has been determined to polymerize in certain conditions.

4. 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 reverts 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 addresses situations where materials in the kits are not assigned to a packing group or have Packing Group I assigned, as permitted by § 173.161.

5. 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 modifications to the entries in the HMT are discussed below.

In an October 18, 2018, final rule, entitled ''Notification of the Pilot-in-Command and Response to Air Related Petitions for Rulemaking'' [(HM–259); 83 FR 52878], PHMSA removed special provision A6 from UN numbers 2789, 2790, 1715, 1717, 1723, 1732, 1739, 1758, 2240, 3264, 3265, 1764, 1765, 1768, 1775, 1776, 1778, 1777, 1782, 1786, 1790, 2031, 2308, 1808, 2258, 2879, 1818, 2564, 2699, 2502, 2443, and 2444. However, the HM–215O NPRM incorrectly showed special provision A6 as still being applicable to these entries. Therefore, in this final rule, A6 is not assigned to these HMT entries consistent with the previously published HM–259 final rule.

Similarly, in the HM–259 final rule, PHMSA removed special provision A3 from UN numbers 1739, 2604, 1758, 2240, 1183, 1777, 1242, 1798, 1873, 2879, 1828, 1831, 2699, and 2444. However, the HM–215O NPRM incorrectly showed special provision A3 as still being applicable to these entries. Therefore, in this final rule, A3 is not assigned to these HMT entries consistent with the previously published HM–259 final rule.

Finally, in a March 6, 2019, interim final rule (IFR) [(HM–224I); 84 FR 8006], PHMSA removed special provision A51 from UN3480 and added special provision A100 to UN 3480. However, the HM–215O NPRM did not account for this action and in this final rule, A51 is removed from UN3480 and A100 is added to UN 3480 consistent with the previously published HM–224I IFR.

See ''Section 172.102 special provisions'' below for a detailed discussion of the additions, revisions, and deletions to the special provisions addressed in this final rule.

• *Special provision 325.* Special provision 325 is added to the following HMT entries:

UN2912 Radioactive material, low specific activity (LSA–I) *non-fissile or fissile-excepted*
UN2913 Radioactive material, surface contaminated objects (SCO–I or SCO–II) *non-fissile or fissile-excepted*
UN2915 Radioactive material, Type A package *non-special form, non-fissile or fissile-excepted*
UN2916 Radioactive material, Type B(U) package *non-fissile or fissile-excepted*
UN2917 Radioactive material, Type B(M) package *non-fissile or fissile-excepted*
UN2919 Radioactive material, transported under special arrangement, *non-fissile or fissile-excepted*
UN3321 Radioactive material, low specific activity (LSA–II) *non-fissile or fissile-excepted*
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. The 6(d) test is a test on a single package to determine if there are hazardous effects outside the package arising from accidental ignition or initiation of the contents. 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 Division 1.4S articles and substances that are generic or ''not otherwise specified'' (n.o.s.), and to UN 0367 (Fuzes, detonating) that are normally package dependent. The UN Working Group noted that generic entries normally warrant more systematic testing. In the NPRM, PHMSA requested comment on whether this provision is likely to have net benefits. PHMSA received one comment from IME stating that the ''addition of the special provision will benefit transportation safety and that the additional costs are, accordingly justified.'' Therefore, in this final rule, consistent with the UN Model Regulations, PHMSA is adding 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.

• *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 Sub-Committee of Experts (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 final rule, PHMSA is assigning special provision 368 to the following entry to aid shippers:

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.* Consistent with the deletion of this special provision in section 172.102, 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 388.* New special provision 388 is added to the following HMT entries:

UN3090 Lithium metal batteries *including lithium alloy batteries*
UN3091 Lithium metal batteries contained in equipment *including lithium alloy batteries*
UN3091 Lithium metal batteries packed with equipment *including lithium alloy batteries*
UN3480 Lithium ion batteries *including lithium ion polymer batteries*
UN3481 Lithium ion batteries contained in equipment *including lithium ion polymer batteries*
UN3481 Lithium ion batteries packed with equipment *including lithium ion polymer batteries*

• *Special provision 389.* New special provision 389 providing applicable transport conditions is added to the following new HMT entry:

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

• *Special provision 391.* New special provision 391 is added 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.
UN3543Articles containing a substance which in contact with water emits flammable gases, 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 B136.* PHMSA is adding 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*
UN1386 Seed cake *with more than 1.5 percent oil and not more than 11 percent moisture*
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*

• *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 *or* Caesium	UN1407
Metal hydrides, water reactive, n.o.s.	UN1409
Lithium aluminum hydride	UN1410
Lithium borohydride	UN1413
Lithium hydride	UN1414
Lithium	UN1415
Magnesium, powder *or* 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
Metallic substance, water-reactive, n.o.s.	UN3208
Metallic substance, water-reactive, self-heating, n.o.s.	UN3209 (All PGs)
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 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, special provision W40 is removed from the following HMT entries:

UN1396 Aluminum powder, uncoated (PG III)
UN1398 Aluminum silicon powder, uncoated
UN1403 Calcium cyanamide *with more than 0.1 percent of calcium carbide*
UN1405 Calcium silicide (PG III)
U3208 Metallic substance, water-reactive, n.o.s. (PG III)

Additionally, PHMSA is adding special provision W40 to the following HMT entry:

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

6. 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.

In the NPRM, PHMSA proposed to amend various vessel stowage codes assigned to explosives articles to allow under deck stowage of these articles when not in closed cargo transport units (CCTUs). PHMSA received a comment from IME noting support for the changes, but indicating that the commercial ports used by their industry in the United States require commercial explosives to be containerized regardless of whether they are shipped on deck or under deck. PHMSA reiterates that these changes also allow the shipment of large and robust articles that while generally contained in some manner (*e.g.* a custom built crate, cradle, or box) may not fit in a traditional CCTU. The changes made in this final rule authorize such transport when not in a traditional CCTU. While these changes do not authorize the break bulk stowage of explosive substances, they do facilitate the movement of larger explosive articles.

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 changes listed in numerical order by UN identification number and additionally lists the proper shipping name, the previous column (10A) entry, and the adopted column (10A) entry.

TABLE 2

Proper shipping name	UN No.	Previous code column (10A)	Adopted code column (10A)
Cartridges for weapons, *with bursting charge*	0005	05	03
Cartridges for weapons, *with bursting charge*	0006	04	03
Cartridges for weapons, *with bursting charge*	0007	05	03
Bombs, *with bursting charge*	0033	05	03
Bombs, *with bursting charge*	0034	04	03
Bombs, *with bursting charge*	0035	04	03
Bombs, photo-flash	0037	05	03
Bombs, photo-flash	0038	04	03
Boosters, *without detonator*	0042	04	03
Bursters, *explosive*	0043	04	03
Charges, demolition	0048	04	03
Charges, depth	0056	04	03
Charges, shaped, *without detonator*	0059	04	03
Charges, supplementary explosive	0060	04	03
Cord, detonating, *flexible*	0065	04	03
Fracturing devices, explosive, *without detonators for oil wells*	0099	04	03
Cord, detonating *or* Fuze, detonating *metal clad*	0102	04	03
Jet perforating guns, charged *oil well without detonator*	0124	04	03
Mines *with bursting charge*	0136	05	03
Mines *with bursting charge*	0137	04	03
Mines *with bursting charge*	0138	04	03
Projectiles, *with bursting charge*	0167	05	03
Projectiles, *with bursting charge*	0168	04	03
Projectiles, *with bursting charge*	0169	04	03
Rockets, *with bursting charge*	0180	05	03
Rockets, *with bursting charge*	0181	04	03
Rockets, *with bursting charge*	0182	04	03
Rockets, *with inert head*	0183	04	03
Rocket motors	0186	04	03
Sounding devices, explosive	0204	05	03
Warheads, torpedo *with bursting charge*	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, *without detonator*	0283	04	03
Grenades, *hand or rifle, with bursting charge*	0284	04	03
Grenades, *hand or rifle, with bursting charge*	0285	04	03
Warheads, rocket *with bursting charge*	0286	04	03
Warheads, rocket *with bursting charge*	0287	04	03
Cord, detonating *or* Fuze, detonating *metal clad*	0290	04	03
Bombs, *with bursting charge*	0291	05	03
Grenades, *hand or rifle, with bursting charge*	0292	05	03
Grenades, *hand or rifle, with bursting charge*	0293	05	03
Mines *with bursting charge*	0294	05	03
Rockets, *with bursting charge*	0295	05	03
Sounding devices, explosive	0296	05	03
Cartridges for weapons, *with bursting charge*	0321	04	03
Projectiles, *with bursting charge*	0324	05	03
Cartridges for weapons, blank	0326	04	03
Cartridges for weapons, blank *or* Cartridges, small arms, blank	0327	04	03
Cartridges for weapons, inert projectile	0328	04	03
Torpedoes *with bursting charge*	0329	04	03
Torpedoes *with bursting charge*	0330	05	03
Projectiles, *with burster or expelling charge*	0346	04	03
Cartridges for weapons, *with bursting charge*	0348	05	03
Warheads, rocket *with bursting charge*	0369	05	03
Warheads, rocket *with burster or expelling charge*	0371	05	03
Sounding devices, explosive	0374	04	03
Sounding devices, explosive	0375	04	03
Cartridges, power device	0381	04	03
Fuzes, detonating, *with protective features*	0408	04	03

TABLE 2—Continued

Proper shipping name	UN No.	Previous code column (10A)	Adopted code column (10A)
Fuzes, detonating, *with protective features*	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 *or* Cartridges, small arms	0417	04	03
Projectiles, *with burster or expelling charge*	0426	05	03
Projectiles, *with burster or expelling charge*	0427	05	03
Rockets, *with expelling charge*	0436	04	03
Rockets, *with expelling charge*	0437	04	03
Charges, shaped*, without detonator*	0439	04	03
Charges, explosive, commercial *without detonator*	0442	04	03
Charges, explosive, commercial *without detonator*	0443	04	03
Cases, combustible, empty, without primer	0447	04	03
Torpedoes *with bursting charge*	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, *with inert head*	0502	02	03

Consistent with changes to Amendment 39–18 of the IMDG Code, PHMSA is making 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 is applying 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 is adding 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 is adding 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 is adding stowage code 25 to Dipropylamine, UN 2383 consistent with changes adopted in Amendment 39–18 of the IMDG Code.

PHMSA is adding 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 final rule, PHMSA is adding existing vessel stowage code 74 and new vessel stowage codes 151 and 153 to UN 2977 and UN 2978. Additionally, PHMSA is adding new vessel stowage code 152 to UN 3507. Stowage code 74 requires stowage separated from oxidizers. See a section-by-section discussion on the proposed changes to § 176.84 for a description of stowage codes 151, 152 and 153. These amendments are necessary to ensure appropriate stowage and segregation provisions that account for the subsidiary and tertiary hazards of these commodities.

Finally, we are adding new stowage provision 154 and assigning it to the NA 0124, NA 0494, UN 0494, and UN 0124 jet perforating gun HMT entries. This 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 *oil well, with detonator*	NA0124	154
Jet perforating guns, charged *oil well, without detonator*	UN0124	154

TABLE 3—Continued

Proper shipping name	UN No.	Addition(s)
Jet perforating guns, charged *oil well, with detonator*	NA0494	154
Jet perforating guns, charged, *oil well, without detonator*	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
Ethyldichlorosilane	UN1183	53, 58
Isobutylamine	UN1214	52
Isopropylamine	UN1221	52
Methyl chloroformate	UN1238	53, 58
Methyldichlorosilane	UN1242	53, 58
Methyltrichlorosilane	UN1250	53, 58
Propylamine	UN1277	52
Trichlorosilane	UN1295	53, 58
Trimethylamine, aqueous solutions *with not more than 50 percent trimethylamine by mass*	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 *and* solid	UN1733	53, 58
Benzoyl chloride	UN1736	53, 58
Benzyl bromide	UN1737	53, 58
Benzyl chloride *and* Benzyl chloride *unstabilized*	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

TABLE 3—Continued

Proper shipping name	UN No.	Addition(s)
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, *with more than 49 percent hydrobromic acid*	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
Isopropyl acid phosphate	UN1793	53, 58
Lead sulfate *with more than 3 percent free acid*	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 *with not more than 50 percent acid by mass*	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 PGs	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 *with less than 30 percent free sulfur trioxide*	UN1831	53, 58
Sulfuric acid, fuming *with 30 percent or more free sulfur trioxide*	UN1831	53, 58
Sulfuric acid, spent	UN1832	53, 58
Sulfurous acid	UN1833	53, 58
Sulfuryl chloride	UN1834	53, 58
Thionyl chloride	UN1836	53, 58
Thiophosphoryl chloride	UN1837	53, 58
Titanium tetrachloride	UN1838	53, 58
Trichloroacetic acid	UN1839	53, 58
Zinc chloride, solution	UN1840	53, 58
Propionic acid *with not less than 10% and less than 90% acid by mass*	UN1848	53, 58
Perchloric acid *with more than 50 percent but not more than 72 percent acid, by mass*	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 PGs	53, 58
Phosphorus oxybromide	UN1939	53, 58
Thioglycolic acid	UN1940	53, 58
Nitric acid *other than red fuming*	UN2031 all entries	53, 58
Nitric acid, red fuming	UN2032	53, 58
2-Dimethylaminoethanol	UN2051	52
Phthalic anhydride *with more than .05 percent maleic anhydride*	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

TABLE 3—Continued

Proper shipping name	UN No.	Addition(s)
Tripropylamine	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	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
Isobutyryl chloride	UN2395	53, 58
Isopropyl chloroformate	UN2407	53, 58
Dibenzyldichlorosilane	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 *with not less than 25 percent alcohol by mass, and with not more than 12.6 percent nitrogen, by dry mass.*	UN2556	12, 25
Trichloroacetic acid, solution	UN2564 all PGs	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 *or* Aryl sulfonic acids, solid, *with more than 5 percent free sulfuric acid*	UN2583	53, 58
Alkyl sulfonic acids, liquid *or* Aryl sulfonic acids, liquid *with more than 5 percent free sulfuric acid*	UN2584	53, 58
Alkyl sulfonic acids, solid *or* Aryl sulfonic acids, solid *with not more than 5 percent free sulfuric acid*	UN2585	53, 58
Alkyl sulfonic acids, liquid *or* Aryl sulfonic acids, liquid *with not more than 5 percent free sulfuric acid*	UN2586	53, 58
Boron trifluoride diethyl etherate	UN2604	53, 58
Triallylamine	UN2610	52
Benzyldimethylamine	UN2619	52
Chloric acid aqueous solution, *with not more than 10 percent chloric acid*	UN2626	53
Fluoroacetic acid	UN2642	53, 58
Cyanuric chloride	UN2670	53, 58
3-Diethyamino-propylamine	UN2684	52
N,N-Diethylethylenediamine	UN2685	52
2-Diethylaminoethanol	UN2686	52
Phosphorus pentabromide	UN2691	58
Boron tribromide	UN2692	53, 58
Tetrahydrophthalic anhydrides *with more than 0.05 percent of maleic anhydride*	UN2698	53, 58
Trifluoroacetic acid	UN2699	53, 58

TABLE 3—Continued

Proper shipping name	UN No.	Addition(s)
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 *or* Acetic acid solution, *with more than 80 percent acid, by mass*	UN2789	53, 58
Acetic acid solution	UN2790 all entries	53, 58
Batteries, wet, filled with acid, *electric storage*	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 PGs	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 dehydrate	UN2851	53, 58
Hydroxylamine sulfate	UN2865	52, 53, 58
Titanium trichloride mixtures	UN2869 all PGs	53, 58
Selenium oxychloride	UN2879	53, 58
N-Methylbutylamine	UN2945	52
Sulfamic acid	UN2967	53, 58
Radioactive material, uranium hexafluoride *non fissile or fissile-excepted*	UN2978	74, 151, 153
Radioactive material, uranium hexafluoride, fissile	UN2977	74, 151, 153
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
Methanesulfonyl chloride	UN3246	53, 58
Chloroacetic acid, molten	UN3250	53, 58
Corrosive solid, acidic, inorganic, n.o.s	UN3260 all PGs	53, 58
Corrosive solid, acidic, organic, n.o.s	UN3261 all PGs	53, 58
Corrosive liquid, acidic, inorganic, n.o.s	UN3264 all PGs	53, 58
Corrosive liquid, acidic, organic, n.o.s	UN3265 all PGs	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 PGs	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 PGs	53, 58
Bromoacetic acid, solid	UN3425	53, 58
Phosphoric acid, solid	UN3453	53, 58
Nitrosylsulphuric acid, solid	UN3456	53, 58
Propionic acid *with not less than 90% acid by mass*	UN3463	53, 58
Crotonic acid, liquid	UN3472	53, 58
Iodine monochloride, liquid	UN3498	53, 58
Uranium hexafluoride, radioactive material, excepted package, *less than 0.1 kg per package, non-fissile or fissile-excepted.*	UN3507	152

7. Appendix B to § 172.101—List of Marine Pollutants

Appendix B to § 172.101 lists marine pollutants regulated under the HMR. Based on the 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 final rule, PHMSA is amending 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 final rule, PHMSA is revising the following § 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 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 final rule, PHMSA is revising 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 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 final rule, PHMSA is revising 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 the requirements for neutron radiation detectors containing boron trifluoride. In a final rule published under [(HM–215N); 82 FR 15796], 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. Therefore, PHMSA is removing 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 is adding 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 final rule, PHMSA is assigning special provision 325 to the following entries to aid shippers:

UN2912 Radioactive material, low specific activity (LSA–I) *non fissile or fissile-excepted*

UN2913 Radioactive material, surface contaminated objects (SCO–I or SCO–II), *non-fissile or fissile excepted*

UN2915 Radioactive material, Type A package *non-special form, non fissile or fissile-excepted*

UN2916 Radioactive material, Type B(U) package *non fissile or fissile-excepted*

UN2917 Radioactive material, Type B(M) package *non fissile or fissile-excepted*

UN2919 Radioactive material, transported under special arrangement, *non fissile or fissile-excepted*

UN3321 Radioactive material, low specific activity (LSA–II) *non fissile or fissile-excepted*

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

• *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 final rule, PHMSA is revising 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 is removing 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). Amendments to § 173.121 in this final rule 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 special provision 383 currently offers, and is deleting special provision 383 and removing the special provision from the HMT for those entries to which it is assigned.

• *Special provision 387.* Special provision 387 is revised to extend the sunset dates for provisions concerning the transportation of polymerizing substances from January 2, 2019, to January 2, 2023.

• *Special provision 388.* Consistent with the UN Model Regulations, PHMSA is adding 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 is adding 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.

This special provision, which captures many of the safety elements included in previous approvals issued by PHMSA, specifies 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, other hazardous materials 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'' adopted in this rulemaking, PHMSA is adding 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 421.* Special provision 421 is revised to extend the sunset dates for provisions concerning the transportation of polymerizing substances from January 2, 2019 to January 2, 2023.

• *Special provision 422.* PHMSA is 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 the requirements for radioactive materials with subsidiary hazards when transported by aircraft. In this final rule, PHMSA is revising special provision A56 consistent with the revisions made to special provision A78 in the 2019–2020 ICAO Technical Instructions. Specifically, where the subsidiary hazard material is listed as ''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.

• *Special provision A105.* PHMSA is revising 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 is adding 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*
UN1386 Seed cake *with more than 1.5 percent oil and not more than 11 percent moisture*
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 is revising Portable Tank Special Provision TP10, assigned to UN 1744, to authorize a three-month extension for the transportation of bromine portable tanks for the purposes of performing the next required liner 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 flammable gases when in contact with water at the rate and quantity meeting the classification requirements for a Division 4.3 material, 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. Consistent with the IMDG Code PHMSA is deleting special provision W32 and assigning W31, which requires non-bulk packagings to be hermetically sealed regardless of the form of the material.

Section 172.203 Additional Description Requirements

Section 172.203 prescribes additional description requirements for shipping papers. In the NPRM, PHMSA proposed revising § 172.203(o)(2), to require that the words ''TEMPERATURE CONTROLLED,'' when appropriate, be added to the proper shipping name for Division 4.1 (polymerizing substance and self-reactive) and Division 5.2 (organic peroxide), if not already indicated in the HMT. PHMSA received a comment from DGAC noting that the HMT lists only four (4) n.o.s. entries for ''polymerizing materials,'' two of which identify that the material is stabilized and the other two of which already include the words ''temperature controlled.'' Therefore, the commenter states that the addition of ''polymerizing substances'' to this listing is unnecessary. PHMSA points out that polymerizing substances are not limited to the four (4) n.o.s. entries, but also include HMT entries assigned special provision 387. While it may be the case that all organic peroxides and self-reactive materials that require temperature control are assigned to HMT entries that include the words ''temperature control'' the same does not apply to polymerizing substances. Therefore, in this final rule PHMSA is revising paragraph (o)(2) as proposed in the NPRM. This amendment provides notice to those in the transport chain that a material is being offered under temperature control.

In the NPRM, PHMSA proposed revising paragraph § 172.203(o)(3) by requiring that for samples of polymerizing substances, the word ''SAMPLE'' must be included in association with the basic description.

PHMSA received comments from DGAC and Dow. Both commented that the corresponding regulatory reference in paragraph (o)(3) to § 173.224(c)(3) applies to self-reactive substances but not to polymerizing substances, and noted that there are no equivalent requirements in the HMR for samples of polymerizing substances. DGAC also noted that requiring the word ''SAMPLE'' for all polymerizing substances would create disharmony with the provisions in the IMDG code, which only require ''SAMPLE'' to be included on the transport document for self-reactive materials and organic peroxides. PHMSA agrees with the commenters and is not revising paragraph (o)(3) in this final rule.

Additionally, PHMSA is adding polymerizing substances to the list of types of materials that the additional documentation requirements in paragraph (o) apply to.

Section 172.407 Label Specifications

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 amending 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 amending 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 October 1, 2014) to continue to be used until December 31, 2018, is removed and reserved. PHMSA received comments from IME, DGAC and MDBTC expressing support for the revision of label border specifications. Yvonne Keller commented that changes to § 172.407 (c)(1) that were made in a previous final rule on Nov. 7, 2018 [(HM–219A); 83 FR 55792], would be overwritten by the proposed changes in the NPRM. The changes to (c)(1) in this rulemaking were intentional and consistent with changes made to international standards and adequately account for the changes to this paragraph in HM–219A.

Section 172.514 Bulk Packagings

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 final rule, PHMSA is allowing flexible bulk containers to be placarded on two opposing sides. PHMSA received a comment from DGAC supporting the changes to placarding requirements for flexible bulk containers.

Section 172.604 Emergency Response Telephone Number

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 15796], PHMSA harmonized the HMR with international regulations by adopting separate HMT entries for internal combustion engines based on the fuel, (*e.g.,* 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 final rule, PHMSA is amending paragraph (d)(2) to list all possible proper shipping names for engines per the original intent. PHMSA received a comment from DGAC supporting the change to the requirements for shipping descriptions of internal combustion engines. In a previous rulemaking [(HM–219A); 83 FR 55792], PHMSA made amendments to § 172.604 to clarify that excepted quantities do not require an emergency response telephone number. This final rule amends the same section, but accounts for the changes made in HM–219A.

Section 172.800 Purpose and Applicability

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 material that is incorporated by reference into the HMR it was noted that the International Atomic Energy Agency (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 final rule, PHMSA is incorporating by reference the IAEA Code of Conduct on the Safety and Security of Radioactive Sources into paragraph (b)(15). Furthermore, we are revising 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 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—Shippers—General Requirements for Shipments and Packagings

Section 173.2a Classification of a Material Having More Than One Hazard

Section 173.2a outlines classification requirements for materials having more than one hazard. PHMSA is amending paragraph (a) to indicate the appropriate classification precedence for the new ''Articles'' HMT entries added in this final rule. This change gives guidance to offerors and shippers using the new HMT entries numbers that do not conform to a single hazard class.

Section 173.6 Materials of Trade Exceptions

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 15796], 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 specific articles containing hazardous materials indicated in Table 4 below. This removal of an indication of packing group for these materials and articles has led to questions about the ability of these materials and articles to utilize the MOTs exceptions provided in § 173.6. Further, this final rule adds 12 new proper shipping names for articles that are also not assigned a packing group. See ''Section 172.101 Hazardous Materials Table (HMT)'' for a detailed discussion of this addition.

It was not the intention of these previous rulemakings 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 final rule, PHMSA is adding a new paragraph (a)(7) to clarify that materials and articles for which Column (5) of the HMT 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. For all materials and articles for which a packing group was recently removed from the HMT, the corresponding section referenced in Column (8) of the § 172.101 Table requires packaging meeting either Packing Group II or III performance level or non-specification packaging. Therefore, the quantity limits in the new paragraph (a)(7) will reference the PG II or PG III limits in § 173.6(a)(1)(ii) or § 173.6(a)(3) for articles containing Division 4.3 materials, as appropriate. PHMSA received a supporting comment from USWAG stating: ''We are pleased to note that PHMSA has proposed this change in the current rulemaking. We appreciate PHMSA's efforts to correct this important oversight.'' In addition, PHMSA is revising paragraph (b)(3) to clarify the securement requirement for the transportation of articles under the MOTs exceptions.

TABLE 4

Proper shipping name	UN No.	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 *including lithium ion polymer batteries*	UN3480	9
Lithium ion batteries contained in equipment *including lithium ion polymer batteries*	UN3481	9
Lithium ion batteries packed with equipment *including lithium ion polymer batteries*	UN3481	9
Lithium metal batteries *including lithium alloy batteries*	UN3090	9
Lithium metal batteries contained in equipment *including lithium alloy batteries*	UN3091	9
Lithium metal batteries packed with equipment *including lithium alloy batteries*	UN3091	9
Mercury contained in manufactured articles	UN3506	8
Oxygen generator, chemical *(including when contained in associated equipment, e.g., passenger service units (PSUs), portable breathing equipment (PBE), etc).*	UN3356	5.1
Safety devices, *electrically initiated**	UN3268	9
Tear gas candles	UN1700	6.1

Section 173.21 Forbidden Materials and Packages

Section 173.21 describes the situations in which the offering for transport or transportation of materials or packages is forbidden. In this final rule, PHMSA is reinstating the provisions adopted in the HM–215N final rule. A delayed effective date of January 2, 2019 was placed on amendment 22 of the HM–215N final rule, which reinstated the provisions of § 173.21 in place prior to publication of that rule. Section 173.21 was not mentioned in the NPRM for this final rule because there was no amendment to make at the time, as the effective text of the section on the date of publication of the NPRM was the text we are reinstating in this final rule. The provisions that previously sunset on January 2, 2019 are reinstated in this final rule. PHMSA is extending the date for the sunset provisions for an additional two years versus the date proposed in the NPRM. The new sunset date for transport provisions concerning polymerizing substances is January 2, 2023. This addition is consistent with the discussion above on polymerizing substances and associated research in the background and comment discussion sections of this rulemaking.

Section 173.62 Specific Packaging Requirements for Explosives

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 increasing 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 adopting this additional requirement for steel end caps noting the safe transportation record of these explosive articles under the existing requirements of the HMR. PHMSA received one comment from IME supporting the increase in the maximum authorized amount of explosive contents per tool pallet and cargo vessel compartment and PHMSA's decision to not require steel end caps, leaving the existing HMR requirement intact.

Section 173.121 Class 3—Assignment of Packing Group

Section 173.121 provides the 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 amending 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 noted that both the UN Model Regulations and The European Agreements Concerning the International Carriage of Dangerous Goods by Road and Rail 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.

This change will increase the allowed volume of viscous liquids in a single package and will be applicable to all modes except for air. Specifically, in this final rule, PHMSA is increasing the packaging limits for viscous flammable liquids of Packing Group II material that may be assigned Packing Group III. For transport by vessel, PHMSA is increasing the limit from 30 L to 450 L. For transport by rail and highway, PHMSA is increasing the limit from 100 L to 450 L. Consistent with the ICAO Technical Instructions, the packaging quantity limits for air will remain 30 L for passenger aircraft and 100 L for cargo aircraft.

Section 173.124 Class 4, Divisions 4.1, 4.2 and 4.3—Definitions

Section 173.124 contains definitions for Class 4, Divisions 4.1, 4.2, and 4.3. In this final rule, PHMSA is amending paragraph (a)(4)(iv) to extend the sunset dates for provisions concerning the transportation of polymerizing substances from January 2, 2019, to January 2, 2023. See the background and comment discussion sections of this rulemaking for a more detailed discussion on polymerizing substances.

Section 173.127 Class 5, Division 5.1—Definition and Assignment of Packing Groups

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 UN Manual of Tests and Criteria and the UN Model Regulations was amended or removed to avoid duplicative provisions in both publications. In this final rule, PHMSA is revising the classification criteria for 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 changes will not result in changes to the current classification provisions for ammonium nitrate fertilizers, but rather consolidate the provisions for ease of use and to prevent inadvertent misclassification.

Section 173.134 Class 6, Division 6.2—Definitions and Exceptions

Section 173.134 provides definitions and exceptions for infectious substances. Consistent with the UN Model Regulations, PHMSA is revising the definition for ''patient specimen'' in paragraph (a)(4) by removing redundant references to humans and animals.

Section 173.136 Class 8—Definitions

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 text in Chapter 3.2 of the UN GHS and the OECD Test Guidelines for Testing of Chemicals. PHMSA is amending the definition in paragraph (a) for a corrosive material by replacing the text ''full thickness destruction'' with ''irreversible damage.'' Harmonized terminology increases understanding and reduces the potential for confusion between those in the transport and storage and use sectors.

Section 173.137 Class 8—Assignment of Packing Group and Appendix I to Part 173

Section 173.137 prescribes the requirements for assigning a packing group to Class 8 (corrosive) materials. Currently, the HMR require offerors to classify Class 8 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. Data obtained from the currently authorized test methods is the only data acceptable for classification and assignment of a packing group. In this final rule, consistent with changes to the UN Model Regulations, PHMSA is adding alternative packing group assignment methods for making a corrosivity classification determination for mixtures that do not involve testing. These amendments include bridging principles and a calculation method for the classification of mixtures. Bridging principles include; dilution, batching, concentration of mixtures of PG I, interpolation within one packing group, and provisions for substantially similar mixtures.

In a new paragraph (d), PHMSA is 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. When there is not sufficient information to determine a packing group using the non-testing methods described in paragraph (d), the testing and criteria in § 173.137 introductory paragraph and (a)–(c) must be applied. To emphasize this point, PHMSA is adding an additional line to Figure 1 in paragraph (d) to state that in such cases the testing and criteria in § 173.137 introductory paragraph and (a)–(c) must be applied to the mixture. This tiered approach ensures an appropriate level of safety in situations where reliable test data on that specific mixture may not be available. These alternatives for classifying corrosive mixtures provide opportunities for offerors 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 UN Model Regulations corrosivity requirements. For example, the use of extreme pH values to assign corrosivity was not addressed in the UN Model Regulations, and as such is not adopted in this final rule.

PHMSA is replacing all instances of the text ''full thickness destruction'' with ''irreversible damage'' consistent with the change to the definition of a corrosive material in § 173.136. PHMSA is also adding a new Appendix I to part 173, containing a flow chart for use with the calculation method.

The corrigendum to the 20th Revised edition of the UN Model Regulations made several corrections to the calculation method classification criteria that were not included in the NPRM. Consistent with the UN Model Regulations, the last sentence of paragraph (d)(2)(i)(B) in the NPRM was added to a new paragraph (d)(2)(i)(B) and the following subparagraphs were renumbered accordingly. The new paragraph (d)(2)(i)(B) provides additional guidance on the use of the flow chart added in Appendix I to part 173.

Finally, PHMSA is updating 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 addresses in vivo testing and OECD Guidelines 430, 431, and 435 address in vitro testing. 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.

Section 173.159 Batteries, Wet

Section 173.159 prescribes the 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 making 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 Lithium Cells and Batteries

Section 173.185 prescribes requirements for lithium cells and batteries. The introductory paragraph defines terms as used in this section. 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 final rule, PHMSA clarifies in paragraph (a)(1) that a single cell battery is considered a ''cell'' and must be transported in accordance with the requirements for cells. PHMSA is also amending § 173.185(a) to include a lithium cell and battery test summary (TS) with a standardized set of elements. Manufacturers and subsequent distributers of lithium cells and batteries manufactured on or after January 1, 2008 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 that are offered and reoffered for transport contain specific information on the required UN tests.

PHMSA received comments on the test summary from Alaska Airlines, Amazon, the Chamber, COSTHA, DGAC, IATA, MDBTC, NRF, and PRBA. MDBTC noted ''our Council understands the rationale behind the TS Document and, if implemented effectively, agrees with PHMSA and international regulators that making vital battery information more accessible will enhance the safety of all lithium battery shipments.'' IATA commented that it believes ''the availability of the test summary will improve safety by providing clear visibility that the lithium cell and battery types have been tested as required.'' Amazon commented that there are other effective methods for improving the safe transportation of lithium batteries, including common safety messaging across the supply chain, expanding supplier outreach, and improved packaging methods. Amazon noted that the test summary requirements, if implemented strategically and with appropriate clarity, could complement these other measures. However, Amazon suggested that additional outreach may be needed to ensure manufacturers and suppliers are informed of the new test summary requirements. Amazon further states that there is no publicly available data that supports the claim that the test summary requirement would improve the safe transport of lithium batteries. PHMSA recognizes that internal process improvements implemented by shippers (*e.g.,* supplier outreach and common safety messaging) may also positively impact lithium battery transportation safety. Additionally, PHMSA is aware of, and is participating in, ongoing research into packaging solutions and classification criteria for lithium batteries. As previously stated, PHMSA believes that the test summary will ensure shippers are verifying that a cell or battery is from a legitimate and compliant source, and allow those in the transport chain to more easily identify non-counterfeit products.

Comments on the compliance date and applicability date for the lithium battery test summary are addressed in the ''Comments Received'' section of this rulemaking. The requests that PHMSA reexamine the test summary document's impact for businesses, specifically small businesses, are addressed in the ''Information Collection'' section of this rulemaking and the Regulatory Impact Analysis (RIA). The remaining comments received regarding the proposed test summary requirements requested clarifications on terminology and when the document must be made available, exceptions for button cell batteries, and additional clarification of the docketed guidance document.

Requests for Clarification on Terminology and When the TS Must Be Made Available

PHMSA received a comment from COSTHA that asked for clarification that in addition to being required for cells and batteries, a test summary is only required for equipment where the safety components of the equipment are necessary for the cells or batteries contained to pass the relevant UN sub-section 38.3 tests (*e.g.,* when the overcharge protection for a battery is part of the equipment circuit board and not installed in the battery), and would not be required for all devices containing lithium batteries. In response to this comment, PHMSA would like to clarify that a test summary document is required for all *cells and batteries* manufactured on or after January 1, 2008, without regard to whether they are transported as standalone shipments, contained in equipment, packed with equipment, or used in vehicles. As noted in the ''New UN Requirements for Lithium Battery Test Summaries'' [10] guidance document found in the docket for this rulemaking, product manufacturers of devices containing lithium batteries are not required to create new test summary documents for their products if compliant test summaries have been created and are made available for the batteries contained in those products. Product manufactuerers may use existing test summaries for the batteries in their devices to meet their obligation to make them available to subsequent distributors. PHMSA also understands that there may be instances where device manufacturers desire to create a test summary for a product containing a lithium cell or battery. While not required, creating a test summary for a specific device rather than using an existing test summary applicable to a battery installed in the device is authorized if the required elements of the test summary are provided.

Amazon requested that PHMSA require that manufacturers create a complete test summary for each lithium battery and lithium battery product and require that manufacturers post the summary online for widespread access for anyone in the supply chain. As proposed in the NPRM and adopted in this final rule, manufacturers and each subsequent distributor of lithium cells or batteries must make available test summaries as specified in § 173.185. PHMSA expects that the first entity offering the cell or battery into transport would likely create the document for use by subsequent offerors or end users. However, the HMR intentionally do not specify who must create the test summary to provide implementation flexibility. The ''make available'' phrase is also intentional to allow for compliance through any means manufacturers and subsequent distributors find best fits their business needs and capabilities. Any method that ensures the information is made available to downstream distributors would be acceptable. This includes the envisioned least burdensome method of posting the information or links to the information on websites. Other possible methods include, but are not limited to, emailing copies of the required

[10] *https://www.regulations.gov/document?D=PHMSA-2017-0108-0008.*

information or providing physical hard copies with shipments.

PHMSA received comments from Amazon, COSTHA, MDBTC, and NRF regarding the entity in the transportation chain that must make the test summary available and the phrase ''each manufacturer and subsequent distributor.'' Amazon and NRF commented that because the supply chain for lithium batteries involves many different entities acting in different roles, the phrase ''subsequent distributor'' should be defined. Amazon and NRF suggested that PHMSA clarify ''subsequent distributor'' by defining it as limited to entities and persons who possess and transfer title to lithium batteries and lithium battery products. MDBTC commented that one of the most challenging aspects of implementing the test summary requirement will be to clearly delineate the role of a ''subsequent distributor.'' COSTHA requested that PHMSA confirm that the use of the term ''distributor'' is only to emphasize that proof of successful design type testing is needed by shippers of lithium batteries, and that distributors are the logical persons to have such information needed for the TS, and that ultimately it is the shipper's responsibility to obtain the information for proof of classification. COSTHA also commented that the terms ''offerors'' and ''subsequent offerors,'' which are more commonly used in transportation regulations, would provide more clarity. We confirm COSTHA's understanding that in addition to manufacturers, distributors of lithium batteries are a logical entity to have information needed for a TS and that a shipper or offeror of lithium batteries is the person ultimately responsible for ensuring that lithium cells and batteries offered for transport contain specific information on the required UN tests. In response to the requests to define ''subsequent distributor,'' PHMSA does not believe that a definition of ''subsequent distributor'' is necessary, as the intent is simply to indicate in broad terms the persons responsible for providing test summary information. PHMSA does not believe that the language proposed by Amazon and NRF defining ''subsequent distributor'' as those who possess and transfer title to lithium batteries and lithium battery products provides additional clarity as the phrase ''transfer title to'' is not understood in the context of the HMR. We note that the phrase ''subsequent distributor'' is also used in section § 178.2(c) of the HMR, applicable to package closure notifications, requiring manufacturers and subsequent distributors to notify each person to whom the package is transferred with appropriate closure information.

In its comments, MDBTC stated that the proposed requirement for subsequent distributors to verify that a test summary document is available for all of the products it ships could be ''extremely burdensome'' and could potentially require the hiring of additional staff to verify the presence of a test summary. MDBTC suggests that a more reasonable approach would be for shippers of lithium cells and batteries to notify upstream distributors of test summary requirements but not to require the explicit verification for each shipment. MDBTCs comment contains no specific cost estimates, other than referencing the potential need to hire additional staff to manage the test summary requirements. PHMSA is cognizant of the costs associated with compliance such as creation of the test summary and activities related to subsequent distribution (see the ''Information Collection'' section of this rulemaking and the Regulatory Impact Analysis (RIA)), but notes that lithium batteries are already subject to the design testing requirements. Other than contacting the manufacturer, shippers currently have no way to confirm compliance with the UN design testing requirements. The proposed requirement provides a means for shippers to comply with the HMR when previously no such mechanism existed. Retrieving a test summary and ensuring it is made available to subsequent distributors will result in most instances in a one-time action and cost for each cell or battery design type offered for transportation (*e.g.,* verifying the existence of the information and procuring a copy or creating a link for their own further use). It is expected to streamline what is currently a difficult process. While it is a requirement to make a test summary available for shipments of lithium cells or batteries, PHMSA does not intend to require a positive verification that the information has been received by each downstream customer. For instance, a distributor who has posted copies of test summaries or links to the appropriate test summaries on a website accessible to the next downstream distributor has made the test summaries available. There would be no additional burden on the initial distributor unless contact was initiated by the subsequent distributor who is unable to locate a test summary.

MDBTC also submitted comments concerning who can make a request for a test summary, suggesting that requests should be limited to an actual distributor and not just anyone from the public or a person that is attempting to collect information not related to transport. MDBTC indicates that this limitation would be especially critical with respect to new product development and protecting proprietary information. While it is not envisioned that consumers of lithium batteries or products containing lithium batteries would generally request a test summary, if they are going to be offering the batteries back into transportation it would be necessary for them to have access to this information. The information required in the test summary was specifically crafted so as not to require proprietary information or information that would hinder product development.

Amazon commented that PHMSA should clarify that if a subsequent distributor cannot obtain a test summary, but has a process in place to accurately classify lithium batteries, that distributor will not be subject to enforcement action for failure to provide a test summary for a specific product. PHMSA disagrees with the commenter. In accordance with § 173.185(a)(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. Therefore, a lithium cell or battery could not be classified unless the information provided on the test summary was available. If a distributor or other person in the transportation chain is classifying lithium cells or batteries, the information needed to develop a test summary must be available to that person.

COSTHA compared the test summary requirements to those for safety data sheets (SDS) required by the Occupational Safety and Health Administration (OSHA) under their Hazard Communication Standard in 29 CFR, § 1910.1200. Manufacturers of hazardous chemicals are required to develop and make available safety data sheets that indicate the hazards associated with the hazardous chemicals that may be encountered in the workplace. COSTHA notes that SDSs are required to be provided by distributors to commercial customers, but not to non-commercial customers. COSTHA notes that test summary distributors would be required to provide the testing summary to a greater relative population than OSHA requires SDSs to be made available. PHMSA reiterates that the HMR require that shippers of lithium cells and batteries know that their batteries are of a tested type. If a non-commercial customer does not intend to offer the battery or cell for transportation there would be no requirement for them to further make the test summary available.

Requests for Exceptions for Button Cell Batteries

DGAC and MDBTC requested PHMSA provide an exception from the requirement to provide a test summary for button cells installed in equipment or articles. The commenters noted that button cells installed in equipment are excepted from packaging and marking requirements under existing regulations. While lithium button cell batteries are excepted from certain requirements in the HMR and international standards, they are not excepted from the requirement to be of a tested type. The purpose of the test summary is provide information to downstream shippers that the lithium battery passed required tests and can be accepted or offered for transport. The primary benefit of the test summary is the increased visibility of the presence of lithium batteries particularly in products, and the ability of individuals in the transport chain to determine that that the lithium cells and batteries they offer for transport are of a tested type. If PHMSA was to accept the suggestions of MDBTC and DGAC to except equipment containing lithium button cell batteries from the test summary requirements, the benefits attributed to these provisions would not be gained. Excepting certain button cells and batteries from the test summary requirement does not enhance compliance and could lead to confusion on whether these cells and batteries are even subject to the design tests.

Requests for Clarification on the Docketed Guidance Document

PHMSA drafted 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. In the NPRM, PHMSA requested comment on the usefulness of the guidance. PHMSA also requested comment to help improve its clarity and provide additional questions to add to the guidance. PHMSA received comments from COSTHA, MDBTC, PRBA, and the Chamber concerning the guidance document, which are categorized as follows:

- Must the test summary accompany the shipment
- Additional input on the development of the guidance document
- Devices containing different battery types
- Test summary availability

Must the Test Summary Accompany the Shipment

In their comments, COSTHA and MDBTC provided general support for PHMSA's effort to issue a guidance document. COSTHA suggested that the HMR and guidance document should be amended to clarify that the test summary document is not required to be provided as documentation with each shipment, noting that PHMSA cannot prohibit industry from implementing its own procedures, such as requiring additional documentation be provided with a shipment. The guidance document available in the docket addressed this question. Specifically, on page 5 of the guidance document, question and answer number 7. The question: ''Must a manufacturer or distributor include the TS with product shipments?'' The answer: ''No, the product manufacturer or distributor would have to make the information available. This may be achieved by placing this information on a website or through alternative means.''

PHMSA is not amending the HMR, as it believes the text in paragraph (a)(3) sufficiently addresses the commenters concern by indicating that the test summary must be made ''available upon request.'' The summary document does not need to physically accompany a shipment containing lithium batteries. PHMSA supports making the test summary available by electronic means and may revise the guidance document for clarification.

Additional Input on the Development of the Guidance Document

COSTHA requested that PHMSA revise the guidance document once the final rule is issued and subsequently update it on a periodic basis with input from stakeholders. COSTHA also requested that PHMSA solicit additional input on the guidance document before the end of 2019 as experience gained both domestically and internationally could be captured in the guidance document for future reference. MDBTC requested that PHMSA revise the guidance document prior to issuing a final rule and consider soliciting additional input on the document. PHMSA does not believe an additional round of comments is necessary prior to publishing the final rule since comments were already received. PHMSA does intend to update the guidance to account for comments received in response to the NPRM. PHMSA also intends to update the guidance document as regulations change and when experience and feedback from stakeholders dictate a need.

Devices Containing Different Battery Types

In its comments, MDBTC suggested that the guidance document should address situations where any number of different commercially available cells or batteries may be installed in a medical device. Specifically, the commenter indicated that while each battery supplier may have made the test summary available, it is a challenge to identify which battery is in the product, especially when it may be one of several similar batteries produced by different suppliers. PHMSA answered this question on page 5 of guidance document. The test summary requirement may be satisfied by using multiple, different test summaries for the batteries themselves, or by issuing a comprehensive test summary for the device that includes information for all of the batteries contained within the device.

Test Summary Availability

PHMSA received comments from Amazon, DGAC, MDBTC, NRF, PRBA, and the Chamber concerning the timeframe in which the test summary must be provided following a request. The commenters asked for clarification as to what constitutes a ''reasonable time and location.'' NRF, PRBA, and the Chamber suggested PHMSA clarify that a ''reasonable'' time does not mean that the test summary must be made available immediately upon request. Amazon suggested that PHMSA should clarify that ''subsequent distributors'' will not be required to have test summaries on hand and will be afforded a reasonable amount of time to obtain one from the manufacturer. Amazon further suggested that PHMSA should clarify that it is the responsibility of the manufacturer to respond in a timely manner. PRBA and the Chamber suggested that PHMSA's final rule and guidance document should be consistent with the IATA's lithium battery guidance [11] and industry test summary Q&A [12] that states: ''Due to the large volume of lithium batteries and lithium battery powered products that are shipped daily, manufacturers and distributors should not be expected to immediately provide a test summary for every product they ship. Manufacturers and distributors should be provided a reasonable amount of time to provide

[11] *https://www.iata.org/whatwedo/cargo/dgr/Documents/lithium-battery-shipping-guidelines.pdf.*

[12] *http://www.prba.org/wp-content/uploads/Q-A-on-Lithium-Battery-Test-Summary-September-2018-Version-A.pdf.*

the required test summary.'' MDBTC recommended that PHMSA revise the text in paragraph § 173.185(a)(3) from, ''must make available upon request at reasonable times and locations,'' to mirror the language in the UN Model Regulations, which reads ''shall make available.'' PHMSA agrees with the commenters that the test summary does not need to be made available immediately upon request, as that was not the intent of this requirement in the UN Model Regulations. As a result, PHMSA is amending the guidance document to clarify that manufacturers and distributors should make available the test summary in a reasonable amount of time but should not be expected to immediately provide a test summary for every product they ship. In addition, in this final rule, PHMSA is revising paragraph (a)(3) consistent with text in the international standards (a)(3) with the phrase ''must make available'' instead of ''must make available upon request at reasonable times and locations.'' The language proposed in the NPRM was an attempt to add clarity to the UN text by using similar language found in other sections of the HMR. Based on the comments received and upon further consideration, PHMSA believes aligning with the UN text will better reflect the intent of the regulation and avoid the possibility of imposing an undue burden.

Section 173.185(b) requires lithium cells and batteries to be packed in inner packagings in such a manner as to prevent short circuits, including movement that could lead to short circuits. These inner packagings must be placed in an outer package that conforms to the requirements of part 178, subparts L and M, at the Packing Group II performance level. PHMSA is making several amendments to § 173.185(b) to update and clarify various provisions. PHMSA is amending § 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 amendment minimizes the ambiguity in the current requirements and only prohibits movement that leads to damage within the package. PHMSA received a comment from MBDTC in support of this amendment.

Further, PHMSA is amending § 173.185(b)(3)(i) to specify that inner packagings must be separated from *electrically* conductive materials. This 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. In the NPRM, PHMSA had proposed adding ''except for transportation by passenger-carrying aircraft,'' to the beginning of § 173.185(b)(5). This paragraph provides an exception from specification packaging for lithium batteries that weigh 12 kg (26.5 pounds) or more and have a strong, impact-resistant outer casing. This proposed addition is not being adopted, as the last sentence of this paragraph indicates that shipments 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.

PHMSA is amending § 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 clarifies 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 cells or batteries. Additionally, consistent with revisions to the ICAO Technical Instructions, PHMSA is adding 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. This action promotes consistency with the ICAO Technical Instructions and responds to a recommendation (A–16–001) from the 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(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 final rule, PHMSA is making 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 is amending § 173.185(c)(2) to except equipment that is robust enough to protect lithium batteries from damage or short circuits from the requirement to be packaged. The current regulations provide an exception from the requirement for the package to be rigid, but otherwise require the equipment to be placed into a package. This amendment removes an unnecessary requirement to package otherwise robust equipment that protects lithium batteries from damage or short circuits. This amendment further aligns the HMR with the UN Model Regulations provisions found in special provision 188 for packaging of lithium cells, batteries, and equipment. PHMSA is removing the expired transitional provision in paragraph § 173.185(c)(3)(ii), applicable to marking requirements. PHMSA is adding 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 is amending § 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 received a comment from MBDTC in support of the amendments that align the ''OVERPACK'' marking requirements. PHMSA is clarifying the limits for spare batteries in § 173.185(c)(4)(vi) 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 received a comment from MBDTC in support of this amendment. PHMSA is adding a new § 173.185(c)(4)(viii) 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).

Section 173.185(d) of the HMR describes provisions for the transport of lithium cells and batteries for disposal or recycling. In the NPRM, PHMSA proposed to authorize the use of certain rigid large packagings to transport a single large battery or a single large item of equipment when transported for disposal or recycling. PRBA noted that the existing regulations for disposal or recycling of lithium batteries authorize strong outer packaging conforming to the requirements of §§ 173.24 and 173.24a for batteries and equipment of all sizes and do not require the use of UN packaging. PHMSA agrees with the commenter. Lithium batteries and equipment transported for disposal or recycling are not required to be placed in UN packagings. PHMSA did not intend to implement more burdensome packaging requirements for large lithium batteries transported for disposal or recycling where packages prepared in accordance with the current requirements have a demonstrated record of safe transport. Accordingly, PHMSA is not adopting this proposal and amends § 173.185(d) to clarify this point. The use of UN specification packagings, including large packagings, will remain an option.

Section 173.185(e) of the HMR sets forth provisions for the transport of low production and prototype lithium cells and batteries, including equipment. In this final rule, PHMSA is making 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 received a comment from MBDTC in support of this amendment. PHMSA is also making 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 is adding 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 provides 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) is renumbered and remain unchanged.

Section 173.185(f) of the HMR describes the 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 is making an editorial amendment to § 173.185(f)(2) to specify that cushioning material must be electrically non-conductive, which harmonizes the HMR with the international standards. PHMSA is also amending § 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 clarifies 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.

ALPA commented that they did not see any proposed amendments for harmonization with three emergency amendments to the 2015–2016 ICAO Technical Instructions concerning the transport of lithium batteries by air. PHMSA published an interim final rule entitled ''Enhanced Safety Provisions for Lithium Batteries Transported by Aircraft'' on March 6, 2019 [(HM–224I); 84 FR 8006], that amended and added multiple paragraphs in § 173.185 incorporating these ICAO Technical Instructions amendments. The NPRM did not account for these amendments and additions. Therefore, in this final rule, we are revising this section consistent with the March 6, 2019 interim final rule. Specifically, we are including text added or revised in the March 6, 2019 interim final rule in the following paragraphs: § 173.185(c)(1)(iii); (c)(4)(ii) through (vii); (c)(5); redesignated paragraph (g) as paragraph (h); and a new paragraph (g).

Section 173.218 Fish Meal or Fish Scrap

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 [13] 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 final rule, PHMSA is amending 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 will reduce cost and add flexibility while maintaining an equivalent level of safety.

Section 173.220 Internal Combustion Engines, Vehicles, Machinery Containing Internal Combustion Engines, Battery-Powered Equipment or Machinery, Fuel Cell-Powered Equipment or Machinery

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 specifies that if a vehicle is powered by both a flammable liquid and a

[13] *https://www.unece.org/fileadmin/DAM/trans/doc/2016/dgac10c3/ST-SG-AC.10-C.3-2016-82e.pdf.*

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 a flammable gas-powered vehicle. Consistent with the ICAO Technical Instructions, PHMSA is clarifying 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 final rule, PHMSA is making 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 metal 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 Dangerous Goods in Equipment, Machinery or Apparatus

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. An example of the current authorizations is for an article containing ''Heptanes UN 1206, Class 3'' the HMR and ICAO Techinical Instructions authorize the use of UN 3363 for machinery or apparatus up to a total net quantity of .5 L. For the same material the UN Model Regulations and the IMDG Code authorize 1 L total net quantity of heptanes. The authorized limited quantity amounts in the IMDG Code and the UN Model Regulations generally align the ''methodology for determining limited quantities'' indicated in the Guiding Principles for the Development of the UN Model Regulations.[14]

In a previous final rule published on March 5, 1999 [Docket No. RSPA–98–4185 (HM–215C); 64 FR 10742], 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 were 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.

[14] *https://www.unece.org/fileadmin/DAM/trans/danger/publi/unrec/GuidingPrinciples/Guiding_Principles_Rev19.pdf.*

In the 20th Revised Edition of UN Model Regulations and Amendment 39–18 of the IMDG Code, the new ''Articles containing hazardous materials, n.o.s.'' entries apply to articles that 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 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. The use of the new ''Articles containing hazardous materials, n.o.s.'' requires in all cases require competent authority approval prior to being offered for transport in accordance with the ICAO Technical Instructions.

To more closely align with the UN Model Regulations and IMDG Code, for other than air transportation, PHMSA is increasing 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 remains unchanged for all modes of transport.

Section 173.224 Packaging and Control and Emergency Temperatures for Self-Reactive Materials

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. Consistent with the UN

Model Regulations, in paragraph (b)(7), PHMSA is adding a new entry ''Phosphorothioic acid, O-[(cyanophenyl methylene) azanyl] O,O-diethyl ester'' to the Self-Reactive Materials Table. In addition, consistent with the UN Model Regulations, a new ''Note 5'' assigned to this entry is added to the list following the table stating that this entry applies to the technical mixture in n-butanol within the specified concentration limits of the (Z) isomer.

Paragraph (c) of this section prescribes requirements for new self-reactive materials, formulations, and samples. In paragraph (c)(4), PHMSA is authorizing 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 adopted 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 United Nations SCOE on the Transport of Dangerous Goods showing the effectiveness of the packaging methods.

Consistent with the UN Model Regulations, PHMSA is revising 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 change allows materials that are authorized in bulk packagings to also be transported in appropriate non-bulk packagings.

Section 173.225 Packaging Requirements and Other Provisions for Organic Peroxides

Section 173.225 prescribes packaging requirements and other provisions for organic peroxides. The Organic Peroxide Table in the UN Model Regulations is continually updated based on data submitted by governments and industry groups to account for new peroxides and formulations that have become commercially available. Consistent with revisions to the UN Model Regulations, PHMSA is revising the Organic Peroxide Table in paragraph (c) by adding the entries: ''Di-(4-tert-butylcyclohexyl) peroxydicarbonate [as a paste],'' ''Diisobutyryl peroxide [as a stable dispersion in water],'' and ''1-Phenylethyl hydroperoxide.'' The table in paragraph (d)(4) currently titled ''Maximum Quantity per Packaging/Package'' is amended to read ''Table to paragraph (d): Maximum Quantity per Packaging/Package.'' This change is being made in response to a request made during the publishing of the NPRM by the **Federal Register** to align with their requirements for table headings in regulations. The Organic Peroxide IBC Table in paragraph (e) is revised 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-1,4,7-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 amending paragraphs (e) and (g) to authorize organic peroxides to 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 Articles Containing Hazardous Materials, n.o.s.

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 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 new section authorizes a safe method to transport articles that may be too large to fit into typical packages. The packaging section 173.232 added in this final rule for the new proper shipping names for articles requires packaging at the Packing Group II performance level. Non-specification packaging, and transportation in an unpackaged manner or on pallets when the hazardous materials are afforded equivalent protection by the article in which they are contained, are also authorized. 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.

Section 173.301b Additional General Requirements for Shipment of UN Pressure Receptacles

Section 173.301b describes additional requirements when shipping gases in UN pressure receptacles. In paragraph (c)(1), PHMSA is incorporating 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 Additional Requirements for Shipment of Liquefied Compressed Gases in UN Pressure Receptacles

Section 173.304b contains additional requirements for the shipment of liquefied compressed gases in UN pressure receptacles. In this final rule, consistent with a change made in the 20th Revised Edition of the UN Model Regulations, PHMSA is amending 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 Additional Requirements for Excepted Packages Containing Class 7 (Radioactive) Materials

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. Amendment 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 final rule, PHMSA is amending the DCM requirements in § 176.30 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 final rule, 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 an ocean bill of lading 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 amendment provides for the conveyance of necessary information to the vessel operator for creation of the DCM.

Appendix I to Part 173

PHMSA is also adding a new Appendix I to part 173, containing a flow chart for use with the calculation method for corrosive classification. Please see the section-by-section discussion for § 173.137 for further information on Appendix I to Part 173.

Part 174—Carriage by Rail

Section 174.50 Nonconforming or Leaking Packages

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) Associate Administrator for Railroad Safety.

Approvals issued by FRA's Associate Administrator for Railroad Safety are commonly referred to as One-Time Movement Approvals (OTMA).[15] 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 is amending 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 U.S.-Canadian border.

On July 12, 2007, Transport Canada published, ''Regulations Amending the Transportation of Dangerous Goods Regulations (International Harmonization Update, 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. PHMSA received comments from DGAC and Dow in support of the changes to § 174.50 noting these amendments work to facilitate cross border trade.

Part 175—Carriage by Aircraft

Section 175.10 Exceptions for Passengers, Crewmembers, and Air Operators

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

PHMSA is revising 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 when carried on one's person.

PHMSA is revising 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 is 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 is revising 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

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

than ''electrically powered'' articles. For lithium battery powered devices, quantity limits are 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 are revised to reference the provisions for spare batteries in paragraph (a)(18).

PHMSA is revising paragraph (a)(15) by adding a new paragraph (vi) to separate and clarify the handling requirements applicable to each ''non-spillable'' and ''dry sealed'' battery presently prescribed in paragraph (v). PHMSA is also adding a new paragraph (vii) to authorize passengers with restricted mobility to carry a spare non-spillable or dry sealed battery for their mobility aid. Prior to this rulemaking, spare lithium batteries were permitted for passengers with lithium battery-powered mobility aids; this was deemed acceptable for mobility aids equipped with non-spillable or dry sealed batteries. This action is consistent with the ICAO Technical Instructions.

PHMSA is amending 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, and in these cases the batteries must be removed. Therefore, in this final rule, PHMSA is amending (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 is amending the provisions for carriage of portable electronic devices (PEDs) containing lithium batteries to address safety concerns requiring passengers to carry PEDs in checked baggage. Consistent with the ICAO Technical Instructions, § 175.10(a)(18) is revised to require that when PEDs powered by lithium batteries are in checked baggage, they must be completely powered off and protected to prevent unintentional activation or damage. PHMSA received a comment from Yvonne Keller noting that in an October 18, 2018, final rule [Docket No. PHMSA–2015–0100 (HM–259) [83 FR 52878], PHMSA amended paragraph (a)(18)(i) to authorize passengers and crewmembers to carry on board an aircraft lithium metal battery-powered portable medical electronic devices and two spare batteries for those devices exceeding 2 grams of lithium content per battery, but not exceeding 8 grams of lithium content per battery, with the approval of the operator. We agree that the NPRM did not account for this amendment. Therefore, in this final rule, we are revising this paragraph consistent with the earlier published final rule.

PHMSA is revising 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 (DGP/26–WP/42) submitted by the United States at the ICAO DGP/26 meeting, it was reported that even after the prohibition, 10 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.

In this final rule, PHMSA is aligning 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.

PHMSA is adding a new paragraph (a)(26) that amends 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 is 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 does 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.

PHMSA received a comment from Alaska Airlines requesting that additional text be added to clarify that batteries must be removable without the use of any tool for baggage to be carried on, in the event the bag must subsequently be placed in the cargo compartment. However, in the NPRM, we proposed to align with the text of the ICAO Technical Instructions, which does not include this requirement. The requested language would, therefore, result in unalignment with the ICAO Technical Instructions and additional changes in existing practices in manufacturing and design of these types of bags.

Section 175.33 Shipping Paper and Information to the Pilot-in-Command

Section 175.33 establishes requirements for shipping papers and for the notification of the pilot-in-command when hazardous materials are transported by aircraft. Consistent with revisions to the ICAO Technical Instructions, in paragraph (a)(13)(i), PHMSA is including a requirement to indicate the airport at which the lithium batteries will be unloaded in 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 existing authorization in paragraph (a)(12) to use a summary instead of the default information to the pilot in command for ''UN 1845, Carbon dioxide, solid (dry ice).'' Yevon Keller commented noting that the HM–215O NPRM did not take into account recent changes to this section made in an October 18, 2018, final rule [Docket No. PHMSA–2015–0100 (HM–259); 83 FR 52878]. The NPRM did not fully account for this amendment and, in this final rule, we are revising paragraphs (a)(12) and (13) to make them editorially consistent with the earlier published final rule.

Additionally, in a recent interim final rule (IFR) published March 6, 2019, [HM–224I; 84 FR 8006], PHMSA made revisions to some lithium battery requirements in the HMR.[16] As part of the IFR, we made changes to § 173.185(c) including redesignating paragraph (c)(4)(vi) as paragraph (c)(5). However, in the HM–224I IFR, we did not make a conforming amendment to § 175.33, specifically § 175.33(a)(13)(iii), which continued to incorrectly reference § 173.185(c)(4)(vi). As such, the reference in § 175.33(a)(13)(iii) should be to § 173.185(c)(5), as this will correctly indicate that UN3480, UN3481, UN3090, and UN3091 materials prepared in accordance with § 173.185(c)(5) are still required to appear on the information to the pilot-in-command. This HM–215O final rule makes that necessary editorial correction.

Section 175.78 Stowage Compatibility of Cargo

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 15796], 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 final rule, PHMSA is adding an exception to the segregation requirement by including 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 requiring 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) is reformatted into two paragraphs. A new paragraph (b)(2) is added to prescribe the segregation requirements applicable to lithium cells and batteries. The existing Segregation Table is revised by adding the necessary columns and rows representing hazard classes not presently in the Table. These changes to the Table 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 taking this action to promote consistency with the ICAO Technical Instructions and in response to a NTSB recommendation (A–16–001). The recommendation stemmed from NTSB's investigation of the July 28, 2011, in-flight fire and crash of Asiana Airlines Flight 991, which 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.

PHMSA received two comments from COSTHA and Alaska Airlines in support of the segregation requirements. Alaska Airlines supports the changes to the segregation requirements and COSTHA supports the new Note 3 in § 175.78 exempting ''UN3528'' from Division 5.1 segregation requirements. Alaska Airlines asked if it was an oversight that PHMSA did not propose to amend § 175.310(c)(1)(ii) to include similar prohibitions on shipping lithium metal and lithium ion batteries with flammable liquids, which authorizes transportation of flammable liquid fuel by passenger and cargo aircraft when other means of transportation are impracticable. Shipments made in accordance with § 175.310 may vary from the packaging references and quantity limits listed in Columns 7, 8, and 9 of the HMT. PHMSA did not propose or intend to propose amendments to § 175.310 in the NPRM. As no amendments were proposed to this section or these provisions, we are not amending the requirements in this section in this final rule. The FAA and PHMSA have agreed to look at the issue further and any potential future rulemaking action would afford stakeholders the opportunity to review and provide comments.

Part 176—Carriage by Vessel

Section 176.30 Dangerous Cargo Manifest

Section 176.30 prescribes requirements for DCMs, lists, or stowage plans required to be carried aboard vessels transporting hazardous materials. For consistency with the IMDG Code in this final rule, PHMSA is adding 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 is required to be entered on the DCM, list, or stowage plan carried aboard the vessel.

Section 176.84 Other Requirements for Stowage, Cargo Handling, and Segregation for Cargo Vessels and Passenger Vessels

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 separated 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

[16] *https://www.govinfo.gov/content/pkg/FR-2019-03-06/pdf/2019-03812.pdf.*

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 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 final rule, we are adding new stowage provisions that clarify what segregation requirements apply to shipments of uranium hexafluoride.

PHMSA is adding a new stowage provision 151 and assigning it to the UN 2977 and UN 2978 uranium hexafluoride entries. This new stowage provision requires 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 is adding a new stowage provision 152 and assigning it to UN 3507, Uranium hexafluoride, radioactive material, excepted package. This new stowage provision requires segregation 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 is adding a new stowage provision 153 and assigning it to the UN 2977 and UN 2978 uranium hexafluoride HMT entries. This 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 is adding a new stowage provision 154 and assigning it to the NA 0124, NA 0494, UN 0494, and UN 0124 jet perforating gun HMT entries. This 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—Specifications for Packagings

Section 178.71 Specifications for UN Pressure Receptacles

Section 178.71 prescribes specifications for UN pressure receptacles. Consistent with the UN Model Regulations, PHMSA is amending paragraphs (d)(2), (f), (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 adding a phase out date for ISO 13340:2001, which is authorized for valves manufactured until December 31, 2020, and incorporating 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 requirements have been incorporated into ISO 11118:2015. In paragraph (f), PHMSA is amending the title of the paragraph to include pressure drums and adding 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 Model 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.[17] Therefore, PHMSA is authorizing the same deviation from the ISO standard in paragraph (f).

In addition, in paragraph (i), PHMSA is adding a phase out date for ISO 11118:1999 ''Gas Cylinders for Non-refillable Metallic Gas Cylinders,'' which is authorized until December 31, 2020, and replacing it with the new standard, ISO 11118:2015. In paragraph (j), PHMSA is adding a phase out date for ISO 111120:1999, ''Gas Cylinders for Refillable Seamless Steel Tubes,'' which is authorized until December 31, 2022, and replacing 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.

[17] *https://www.unece.org/fileadmin/DAM/trans/doc/2015/dgac10c3/UN-SCETDG-48-INF49_e_.pdf.*

Section 178.75

Section 178.75 prescribes specifications for multi-element gas containers (MEGCs). In paragraph (d)(3)(v), PHMSA is adding a phase out date for ISO 11120:1999, which is authorized for construction and testing of receptacles of MEGCs until December 31, 2022, and authorizing 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 General Requirements

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 final rule, PHMSA is requiring in paragraph (l)(2)(viii) that the test report for plastic packagings that are subject to the hydraulic pressure test 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. PHMSA received a comment from RIPA supporting the requirement.

Section 178.801 General Requirements

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 final rule, PHMSA is requiring 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. PHMSA received a comment from RIPA supporting the requirement.

Section 178.810 Drop Test

Section 178.810 prescribes the requirements for an IBC drop test. In the NPRM, we proposed to amend paragraph (c)(1), to clarify that the same IBC or a different IBC of the same design type may be utilized for the required drop tests. PHMSA received a comment from Frits Wybenga noting that IBCs exceeding 450 L (0.45 cubic meters) capacity only require one drop test and that our proposed language could confuse users. PHMSA agrees and has determined that (c)(2), addressing IBC design types with a capacity of 0.45 cubic meters or less is the most appropriate paragraph for this provision. As such, we are amending paragraph (c)(2).

Part 180—Continuing Qualification and Maintenance of Packagings

Section 180.207 Requirements for Requalification of UN Pressure Receptacles

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, to reduce the need for special permits, and to facilitate cross-border transportation of these cylinders. Section § 171.12(a)(4) permits 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 provided that a shipper may use either a DOT specification cylinder or a TC cylinder, as appropriate. In this final rule, PHMSA is clarifying the amendments in HM–215N and allowing for the requalification of ''CAN'' marked UN cylinders in the United States.

In the NPRM, PHMSA proposed that 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. PHMSA received a comment from Transport Canada stating that it disagrees that UN cylinders marked with the letters ''CAN'' must comply with the U.S. manufacturing and approval requirements in §§ 178.69, 178.70, and 178.71, as the cylinders are manufactured to comply with the TDG Regulations. Transport Canada recommended that consistent with the reciprocity provisions for TC cylinders added in the HM–215N final rule, UN cylinders marked with the letters ''CAN'' be requalified and marked by a facility registered by Transport Canada in accordance with the Transport Canada TDG Regulations. PHMSA agrees with the commenter that allowing this method of requalification is consistent with previous amendments concerning requalification of Canadian pressure vessels using TDG Regulations, promotes U.S. and Canadian regulatory reciprocity and facilitates international trade. In this final rule, PHMSA is revising paragraph (a)(2) per the recommendation from Transport Canada.

Consistent with changes to the UN Model Regulations, PHMSA is revising paragraph (d)(1) to incorporate ISO 16148:2016, which addresses the requalification of seamless steel cylinders and tubes. This addition allows 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 16148:2016. Non-destructive test methods in this ISO standard have been updated to provide a method for evaluating the significance of acoustic emission examination identifed emission sources. This standard specifies the ultrasonic examination method as a follow-up procedure to evaluate the significance of sources identified through acoustic emissions examinations. Additionally, in paragraph (d)(4), PHMSA is adding a phase out date for 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 is adding new paragraph (d)(6) to incorporate inspection and maintenance requirements for cylinder valves 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 references to additional documents for steel and aluminum-alloy liner materials; and an update of some photographs to provide sharper examples of damage.

Section 180.217 Requalification Requirements for MEGCs

Section 180.217 contains requalification requirements for MEGCs. PHMSA received a comment from Transport Canada that the HM–215N final rule did not extend reciprocity to the requalification of MEGCs performed by facilities registered with Transport Canada. The commenter noted that having mutual recognition for cylinder requalification was one of the main goals of the U.S.-Canada Regulatory Cooperation Council. PHMSA agrees that the ability to requalify MEGC's is consistent with previous amendments concerning pressure vessels and promotes U.S. and Canadian regulatory reciprocity and facilitates international trade. In this final rule PHMSA is revising paragraph (a) by authorizing MEGCs to be requalified by a facility registered by Transport Canada in accordance with the Transport Canada TDG Regulations.

VI. Regulatory Analyses and Notices

A. Statutory/Legal Authority for This Final Rule

This final rule amends the HMR 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. This final rule is published under the statutory authority of Federal hazardous materials transportation law (Federal hazmat 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. Additionally, 49 U.S.C. 5120(b) 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. The Secretary's authority is delegated to PHMSA at 49 CFR 1.97.

B. Executive Order 12866 and DOT Regulatory Policies and Procedures

This final rule is not considered a significant regulatory action under section 3(f) of Executive Order (E.O.) 12866, Regulatory Planning and Review, 58 FR 51735 and, therefore, was not formally reviewed by the Office of Management and Budget. This final rule is not considered a significant rule under the Department of Transportation's Policies and Procedures for Rulemakings (DOT Order 2100.6; Dec. 20, 2018).

E.O. 12866 requires agencies to design regulations ''in the most cost-effective manner,'' to make a ''reasoned determination that the benefits of the intended regulation justify its costs,'' and to develop regulations that ''impose the least burden on society.'' In this final rule, PHMSA accomplishes the directives of E.O. 12866 by harmonizing the HMR with widely used consensus international standards to address specific safety concerns, reduce regulatory burdens, and facilitate international trade. Such alignment promotes international trade through standardization, facilitates domestic transportation and reduces regulatory burden by using a single set of guiding principles worldwide.

Overall, the issues discussed in this final rule promote the continued safe transportation of hazardous materials while producing net cost savings. Cost savings are derived from generalized harmonization effects (such as avoided costs of compliance) and the specific provisions related to corrosivity classification that adds alternative packing group assignment methods to classify corrosive mixtures without conducting physical testing. Details on the estimated cost savings and benefits of this final rule can be found in the rule's Regulatory Impact Analysis (RIA), which is available in the public docket.

Based on the discussions of benefits and costs provided above, PHMSA estimates discounted net cost savings at a 3 percent discount rate of approximately $93,000–$2.2 million per year and at a 7 percent discount rate of approximately $55,000–$2.1 million per year. Please see the complete RIA for a more detailed analysis of the costs and benefits of this final rule.

C. Executive Order 13771

This final rule is considered an E.O. 13771 deregulatory action. Details on the estimated cost savings of this final rule are discussed in the rule's RIA, which has been uploaded to the docket.

D. Executive Order 13132

This final rule was analyzed in accordance with the principles and criteria contained in E.O. 13132, Federalism, 64 FR 43255. E.O. 13132 requires agencies to assure meaningful and timely input by State and local officials in the development of regulatory policies that may have ''substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.'' The regulatory changes in this final rule may preempt State, local, and Indian tribe requirements but do not have 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 hazardous materials transportation law contains an express preemption provision, 49 U.S.C. 5125(b), that preempts State, local, and Indian tribe requirements on certain covered subjects, unless the non-Federal requirements are ''substantively the same'' as the Federal requirements:

(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 final rule addresses covered subject items (1), (2), (3), and (5) above. Therefore, this final rule preempts State, local, or tribal requirements concerning these subjects unless the non-Federal requirements are ''substantively the same'' as the Federal requirements. PHMSA received no comments on the NPRM regarding the effect of the adoption of the specific proposals on State, local or tribal governments.

E. Executive Order 13175

This final rule was analyzed in accordance with the principles and criteria contained in E.O. 13175, Consultation and Coordination with Indian Tribal Governments, 65 FR 67249. E.O. 13175 requires agencies to assure meaningful and timely input from Indian tribal government representatives in the development of rules that significantly or uniquely affect Tribal communities by imposing ''substantial direct compliance costs'' or ''substantial direct effects'' on such communities or the relationship and distribution of power between the Federal government and Indian tribes. This final rule is likely to affect 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. It does not impose substantial direct compliance costs and does not have substantial direct effects on Native American tribal governments. Therefore, the funding and consultation requirements of E.O. 13175 do not apply. Further, PHMSA did not receive comments on the tribal implications of the rulemaking.

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

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires an agency to review regulations to assess its 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. E.O. 13272, ''Proper Consideration of Small Entities in Agency Rulemaking, 68 FR 7990,'' requires agencies to establish procedures and policies to promote compliance with the Regulatory Flexibility Act and to ''thoroughly review draft rules to assess and take appropriate account of the potential impact'' of the rules on small businesses, governmental jurisdictions and small organizations. This rule was developed in accordance with this E.O. and DOT's procedures and policies (DOT Order 2100.6) to promote compliance with the Regulatory Flexibility Act and to ensure that the potential impacts of a regulatory action on small entities were properly considered.

Section 603(b) of the Regulatory Flexibility Act requires an analysis of the possible impact of the rule on small entities, including the need for the rule, the description of the action, the identification of potentially affected small entities, the reporting and recordkeeping requirements, the related Federal rules and regulations, and the alternative proposals considered.

PHMSA expects the amendments in this rule to result in overall net cost savings and ease the regulatory compliance burden for shippers engaged in domestic and international commerce, including trans-border shipments within North America. Additionally, the changes effected by this rule 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 have a significant economic impact on a substantial number of small entities. However, PHMSA solicited comments in the NPRM on the anticipated economic impacts to small entities. Comments from Amazon and NRF to the NPRM indicated that the requirement to prepare a test summary and the subsequent distribution to others in the supply chain for all lithium cells and batteries manufactured would have a disproportionate impact on small businesses. While the commenters provided no quantitative context, PHMSA estimated the burden on manufacturers and subsequent distributors for the lithium cell and battery test summary requirement in the SBA below to address this issue. Such analysis for this final rule is as follows, supplemented by the analysis contained in the RIA, which can be found in the docket for this rulemaking:

1. Need for the Final Rule

This final rule adopts the conditional use of international standards, and where appropriate, harmonizes domestic transportation requirements for hazardous materials with those found in the applicable international standards. This harmonization promotes compliance cost savings, process efficiencies/time savings, reduced potential property, health and environmental damages, and increased trade flows/reduction in barriers to trade.

The benefits from the adoption of the amendments include enhanced transportation safety resulting from the consistency of domestic and international hazard communication and continued access to foreign markets by U.S. manufacturers and other businesses that are transporters of hazardous materials.

2. Description of the Action

This final rule facilitates the transportation of hazardous materials in international commerce by providing consistency with international standards. The rule will align the HMR 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.

3. Identification of Potentially Affected Small Entities

The term ''small entities,'' as described in 5 U.S.C. 601, comprises small businesses and not-for-profit organizations that are independently owned and operated and are not dominant in their fields and governmental jurisdictions with populations of less than 50,000. The amendments considered here are likely to affect 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 noted above, PHMSA expects that these amendments will not have a significant economic impact on a substantial number of small entities. However, to address comments to the NPRM indicating that the requirement to create a test summary for lithium cells and batteries and for subsequent distributors to make this information available to others in the supply chain would have a disproportionate impact on small businesses, PHMSA estimated the burden on manufacturers and subsequent distributors for the lithium cells and batteries test summary requirements. PHMSA identified approximately 3,700 small entities that may be impacted by the lithium cell and battery test summary requirements. PHMSA examined the entities in NAICS codes for battery retailers, wholesalers, and merchants and identified the percentage of entities in each NAICS industry that are involved in distributing batteries based on the sub-NAICS product series information provided in the 2012 Economic Census by Industry. PHMSA assumed that product manufacturers would include 27.9 percent of Electrical Apparatus and Equipment, Wiring Supplies, and Related Equipment Merchant Wholesalers (NAICS 423610), 50 percent of Power-Driven Handtool Manufacturing (NAICS 333991) and 100 percent of Electronic Computer Manufacturing (NAICS 334111) and Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing (NAICS 334220). Finally, PHMSA determined that retailers would need to make the test summary document available to customers. PHMSA assessed that retailers would predominantly fall within the All Other Miscellaneous Store Retailers (NAICS 453998) and that 2.2 percent of all firms in this sector may be affected. Then PHMSA multiplied this percent by the more recent U.S. Census Bureau Statistics of U.S. Businesses (SUSB) 2016 [18] to estimate the total number of potentially impacted respondents. Please see the RIA submitted to the docket for this rulemaking for a more detailed analysis of these small entities. As a result of our analysis on the impacts test summary document requirements will have on small buisnesses, PHMSA believes that although some small businesses will be directly impacted, particular firms and their associated industries are unlikely to experience significant (*i.e.,* greater than 1 percent) impacts.

- Reporting and recordkeeping requirements

Reporting and recordkeeping requirements are discussed in detail in the RIA submitted to the docket for this rulemaking and the ''Paperwork Reduction Act'' section of this rulemaking. These requirements will apply to all regulated entities, including small entities.

4. Related Federal Rules and Regulations

PHMSA is unaware of any Federal rules and regulations that are substantially similar to the requirements in this final rule.

5. Alternative Proposals for Small Business

The Regulatory Flexibility Act directs agencies to establish exceptions and differing compliance standards for small businesses, where it is possible to do so and still meet the objectives of applicable regulatory statutes. PHMSA does not believe there are alternative compliance standards for small businesses that still meet the objectives of these regulatory statutes.

Excepting small entities from the test summary requirements would not fully harmonize the HMR with the UN Model Regulations, IMDG Code, ICAO Technical Instructions, IATA Dangerous Goods Regulations and other related national and international dangerous goods regulations that require

[18] SUSB 2016. Annual Data Tables by Establishment Industry, Data by Enterprise Employment Size, U.S. 6-digit NAICS. *https://www.census.gov/data/tables/2016/econ/susb/2016-susb-annual.html.*

manufacturers and distributors of lithium cells and batteries and equipment powered by cells and batteries to make available a ''test summary'' as specified in the UN Manual of Tests and Criteria, Sixth Revised Edition, Amendment 1, Part III, sub-section 38.3, paragraph 38.3.5. Fully harmonizing the test summary requirements allows traceability and accountability of those involved in the lithium cells and batteries transport chain, including small entities, thereby ensuring that lithium cell and battery designs offered for transport contain specific information on the required UN tests. In addition, it allows those in the distribution chain, including small entities, to more easily identify non-counterfeit products by providing confirmation to users that the battery is from a legitimate and compliant source and that they are receiving, and potentially reoffering for transportation, a battery that is of a tested and approved type. PHMSA believes this may generate safety benefits if counterfeit batteries are more likely to rupture, catch fire or otherwise increase the risk of a dangerous incident.

6. Conclusion

PHMSA conducted a Small Business Analysis (SBA) for this final rule (see RIA in the docket for this rulemaking). Based on this analysis, PHMSA believes that some small businesses will be directly impacted by the lithium cells and batteries test summary requirement; however, PHMSA found particular firms and their associated industries are unlikely to experience significant impacts. In particular, PHMSA demonstrated that the average annual cost of the test summary document is less than one percent of the average annual revenue for each NAICS revenue category for which data was available. Please see the RIA for a more detailed analysis.

Comments from Amazon and NRF to the NPRM indicated that the requirement that subsequent distributors produce a test summary would have disproportionate impact on small businesses. While the commenters provided no quantitative data, PHMSA did review the initial estimation of burden on subsequent distributors in the SBA for the lithium cells and batteries test summary requirement to address this issue. Please see the RIA for this rulemaking in the docket.

Many companies, including small entities, will realize overall economic benefits as a result of the amendments in the final rule. As previously discussed, PHMSA expects the amendments in this rule to result in a net cost savings and ease the regulatory compliance burden for shippers engaged in domestic and international commerce, including trans-border shipments within North America. Additionally, the changes effected by this final rule will relieve U.S. companies, including small entities, competing in foreign markets, from the burden of complying with a dual system of regulations. Consequently, PHMSA certifies that this final rule does not have a significant economic impact on a substantial number of small entities.

G. Paperwork Reduction Act

PHMSA has analyzed this rule in accordance with the Paperwork Reduction Act of 1995 (PRA) (Pub. L. 96–511). PHMSA is revising the approved information collections under the following 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 anticipates that this final rule 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 already required 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 33.33 hours. At a mean hourly wage of $38.77,[19] it is estimated to increase annual salary costs by $1,292.34. PHMSA does not anticipate this requirement will affect out-of-pocket expenses.

Annual Increase in Number of Respondents: 0.

Annual Increase in Number of Responses: 0.

Annual Increase in Burden Hours: 33.33.

Annual Increase in Salary Costs: $1,292.34.

Annual Increase in Burden Costs: $0.

OMB Control Number 2137–0034, ''Hazardous Materials Shipping Papers & Emergency Response Information''

PHMSA estimates that this rulemaking 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 January 1, 2008. Lithium cell or battery manufacturers will need to create a test summary for all 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 final rule accounts for previously manufactured lithium cells and batteries, PHMSA believes that the burden will substantially decrease for subsequent years after a final rule goes into effect.

In the NPRM, PHMSA estimated the requirement to create a test summary for lithium cells and batteries manufactured after June 30, 2003 would result in an overall increase in burden. In response to comments received in the NPRM, discussed in more detail above, PHMSA is adopting a requirement to require a test summary for lithium cells and batteries manufactured after January 1, 2008. This will result in less lithium cells and batteries requiring test summaries than estimated in the NPRM. Cells and batteries that ceased being manufactured between June 30, 2003 and December 31, 2007 would not require a test summary or subsequent distribution to downstream distributors. In addition, PHMSA is changing the implementation date for this provision from year 2020 to year 2022. During the voluntary compliance period of the final rule, lithium cell or battery

[19] 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).

manufacturers will need to create a test summary for all of the previously manufactured lithium cells and batteries; after the final rule goes into effect, lithium cell or battery manufacturers will need to create a test summary for newly manufactured lithium cells and batteries. Therefore, PHMSA is adding two information collections associated with this OMB Control Number—one for lithium cells and batteries manufactured from January 1, 2008 to a final rule implementation date and one accounting for the annual manufacture of new lithium cells and batteries after a final rule compliance date.

In the preliminary RIA, PHMSA identified 73 domestic lithium cell or battery manufacturers per U.S. Census' Annual Survey of Manufactures (NAICS code 335912).[20] PHMSA looked at publicly available company websites for 35 domestic companies known to manufacture lithium cells or batteries.[21] 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 cell and battery design types currently manufactured by these domestic manufacturers is 32. PHMSA estimated in the preliminary RIA 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 × 2.5).[22] Therefore, 5,840 new test summaries must be created for lithium cells or batteries (73 manufacturers × 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 using these test 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 expected 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 estimated in the preliminary RIA that this proposal will increase burden by 2,920 hours (5,840 test reports × 30 minutes).

To determine the projected salary cost for preparing new test summaries, PHMSA estimated in the preliminary RIA a mean hourly wage rate of approximately $67.03 [23] for a total of $195,727.76 in salary cost (2,920 burden hours × $67.03). PHMSA does not estimate any out-of-pocket expenses for the creation of the test summary.

As noted above, comments received to the NPRM indicated that applying the test summary requirements to batteries manufactured after June 30, 2003 is too long of a time frame to include. For the reasons explained above, PHMSA is changing this provision to require a test summary for lithium cells and batteries manufactured after January 1, 2008. Therefore, cells and batteries that ceased being manufactured between June 30, 2003 and December 31, 2007 will not require a test summary or subsequent distribution to downstream distributors. No comments were received regarding our estimation of the number of domestic cell and battery manufacturers, the number of design types they make, or the time it takes to develop a test summary. Therefore, PHMSA is utilizing the preliminary RIA figures for these items and adjusting to account for the final rule applicability date change.

This final rule extends the applicability date for this provision from year 2020 to year 2022. This increases the compliance time from one year to two years, which results in a reduction of the costs estimated with this provision at the NPRM stage. In the preliminary RIA, PHMSA estimated 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 and that 5,840 new test summaries would need to be created for lithium cells or batteries. To account for the change in not requiring the creation and distribution of test summaries from batteries and cells manufactured between June 30, 2003 to January 1, 2008, PHMSA is reducing the uncertainty multiplier utilized to determine the number of test summaries required from 2.5 to 2.0. Based on the uncertainties noted below, PHMSA estimates the number of batteries and cells currently manufactured—that were tested between January 1, 2008 and the estimated compliance date of a final rule—by each domestic lithium cell or battery manufacture to be 64 per manufacturer (32 lithium cells or batteries manufactured × 2). This change results in a reduction in the number of test summaries required from 5,840 to 4,672 (32 lithium cells or batteries per manufacturer × 2 × 73 manufacturers). Therefore, PHMSA estimates that this requirement will increase the total burden by 2,336 hours (4,672 test reports × 30 minutes).

Uncertainties:

—Information on company websites generally only accounts for battery and cells that are currently actively offered for sale by the company. The test summary requirement would be applicable to all batteries and cells manufactured after January 1, 2008. Thus, the information available on 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 batteries on their websites also make their own cells.

—PHMSA identified 14 domestic lithium battery cell and battery manufacturers with usable information on design types on their websites as a representative sample. Companies that did not provide individual product listings on their websites were not included in the above calculations. The companies that were researched constitute a representative sample of lithium cell and battery manufacturers because they make cells and batteries for automobiles, military, medical, and portable electronic devices.

To calculate the total salary cost for preparing new test summaries, PHMSA estimates in this final analysis a mean

[20] 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.

[21] Only 35 of the identified domestic lithium cell and battery manufacturers had websites with usable information containing battery or cell design types.

[22] 2.5 is a multiplier to account for the uncertainties noted in the RIA submitted to the docket for this rulemaking.

[23] 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).

hourly wage rate of approximately $67.0278,[24] for a total of $156,577 in salary cost, reduced from the total salary cost estimated at the NPRM stage of $195,721.23. Because there is a two year compliance date, PHMSA estimates that half of the test summary will be created in the first year. Therefore, to estimate first year burden, PHMSA divided the estimated number of responses by 2, resulting in half of the estimated annual burden hours and costs.

Annual Increase in Number of Respondents: 73.

Annual Increase in Number of Responses: 2,336.

Annual Increase in Burden Hours: 1,168.

Annual Increase in Salary Costs: $78,288.

Annual Increase in Burden Costs: $0.

This test summary requirement is also anticipated to increase the burden for recordkeeping requirements. As detailed in the new requirements, the test summary must be made available for every cell or battery design type, 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 choose the alternative that requires the least amount of recordkeeping burden possible. PHMSA believes the least burdensome method is to make the test summaries available on company websites by utilizing links to battery manufacturer websites where the information is made available. This method presumes that cell and battery manufacturers and distributors maintain infrastructure such as websites that have storage capacity to link to these reports.

To estimate the burden hours and salary costs for this recordkeeping requirement, in the preliminary RIA, 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 estimated 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. PHMSA further estimated that product manufacturers utilize cells and batteries from an average of five different cell or battery manufacturers. Lastly, PHMSA estimated 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.

As noted above, to account for the change in requiring creation and distribution of test summaries from batteries and cells manufactured June 30, 2003 to January 1, 2008, PHMSA is reducing the uncertainty multiplier utilized in the preliminary RIA to determine the number of test summaries required from 2.5 to 2.0. This change results in a reduction in the number of test summaries required from 5,840 to 4,672. See below the breakdown of the lithium cell and battery supply chain, the number of estimated entities, and the number of estimated test summaries required to be made available.

TABLE 5

Supply chain	Number of respondents	Individual recordkeeping responses
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 estimated in the preliminary RIA that ensuring test summaries are available will take 5 minutes per report utilizing the electronic methods noted above.[25] This results in a total recordkeeping requirement of 3,363.33 annual burden hours (40,360 responses × 5 minutes). At an estimated mean hourly annual salary wage of approximately $67.03 [26] PHMSA estimates the salary cost for recordkeeping will increase by $225,444.01. PHMSA does not estimate that this will result in a increase in any out-of-pocket expenses.

Comments to the NPRM from Amazon indicated that the requirement that subsequent distributors produce a test summary would have disproportionate impact on small businesses. While the commenter provided no quantitative information, PHMSA has reviewed our initial estimation of burden on subsequent distributors (both large and small) and revised our estimated impact. The initial review of impacts adequately accounts for the time required to ensure a test summary exists in the least burdensome method of compliance noted above. However, we are amending our estimated impact to account for additional time that may be needed to verify that appropriate information exists, either after initial procurement of the document or link and verification on request of subsequent downstream distributors. This additional time will add another 2 minutes to each test summary increasing the annual burden hours from 5 minutes a response to 7 minutes

[24] 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 $67.0278 = wage rate $45.78/wage % of total compensation 68.3%).

[25] Estimated time to create a link to another website where the information is hosted.

[26] 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).

a response.[27] This results in a total recordkeeping requirement of 4,572.4 hours (39,192 responses × 7 minutes). At an estimated mean hourly wage of $67.03,[28] PHMSA estimates the total cost for recordkeeping increases to $306,478 from the preliminary estimate with recordkeeping requirement of $225,437. To estimate the annual increases in the number of respondents, responses and in the burden hours and costs, PHMSA divides the total estimated burden by 2, the number of years of voluntary compliance with this provision due to the change in the implementation date as noted above.

Annual Increase in Number of Respondents: 5,790.

Annual Increase in Number of Responses: 19,596.

Annual Increase in Burden Hours: 2,286.

Annual Increase in Salary Costs: $153,239.

Annual Increase in Burden Costs: $0.

PHMSA is adding 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 relation to the number of respondents and burden hours currently associated with this information collection. The revisions include: A new requirement to indicate ''TEMPERATURE CONTROLLED'' on a shipping paper if not already indicated in the proper shipping name, when appropriate; removing 1-dodecene to the list of marine pollutants in Appendix B to § 172.101; a new requirement to include the UN identification number for the material being offered, the name and address of the consignor and consignee, and a container packing certificate 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 final rule will increase the overall burden for this information collection request. PHMSA is adding special provision 347 to four explosive Division 1.4S 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 × 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 × 4.75 hours). Please see the RIA submitted to the docket for this rulemaking for more information. At a mean hourly wage of $79.06,[29] 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 adding 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 relation 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 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 from 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.

OMB Control Number 2137–0572, as currently approved by OMB, is divided into five Information Collections (IC), one of which is identified as Testing Requirements for Non-Bulk Packaging. This IC is specific to the requirements in § 178.601 for creating the test report. As mentioned in the approved supporting statement (see *reginfo.gov*), PHMSA has estimated that 5,000 persons will complete this requirement based on historic stakeholder feedback. It's important to note, that this IC is not specific to each packaging type, instead it is for all persons testing non-bulk packaging.

In the approved IC, PHMSA estimated a total of 2 hours for the creation of each test report. Because the change in requirement is only for a small subset of the 5,000 respondents, PHMSA estimated an increase of 1 minute to determine the appropriate water temperature and note in the existing test report. This accounts for a reasonable average increase for all persons completing the test report. At a mean hourly wage of $68.58,[30] it is estimated to increase annual salary costs of $17,145 (5,000 × 3 = 15,000 responses × 1 min/= 15,000 minutes) (15,000 minutes/60 = 250 hours × $68.58 = $17,145). 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.

[27] Additional 2 minutes per record to address additional time that may be needed to verify that appropriate information exists.

[28] 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).

[29] 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).

[30] 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 = wage rate/wage % of total compensation).

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 final rule 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 $68.58,[31] 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: $35,181.54.

Annual Decrease in Burden Costs: $0.

PHMSA will submit the revised information collection and recordkeeping requirements to OMB for approval.

H. Regulation Identifier Number (RIN)

A 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

The Unfunded Mandates Reform Act (UMRA) of 1995, Public Law 104–4, establishes significance thresholds for the direct costs of regulations on state, local, or tribal governments or the private sector that trigger certain agency reporting requirements. The statutory thresholds established in UMRA were $50 million for intergovernmental mandates and $100 million for private-sector mandates in 1996. According to the Congressional Budget Office, the thresholds for 2019, which are adjusted annually for inflation, are $82 million and $164 million, respectively, for intergovernmental and private-sector mandates.[32] This final rule results in cost savings of approximately $55,000 to $2,100,000 per year at a 7 percent discount rate and is the least burdensome alternative that achieves the objective of the rule. It is not significant under UMRA. Therefore, PHMSA is not required to prepare a written statement.

J. Environmental Assessment

The National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S.C. 4321–4375), and implementing regulations by the Council on Environmental Quality (CEQ) (40 CFR part 1500), require that Federal agencies consider the consequences of major Federal actions and prepare a detailed statement on actions that significantly affect quality of the human environment. The CEQ regulations require Federal agencies to conduct an environmental review considering (1) the need for the action, (2) alternatives to the action, (3) probable environmental impacts of the action and alternatives, and (4) the agencies and persons consulted during the consideration process.

1. Need for the Action

This final rule amends the HMR (49 CFR parts 171–180) to maintain alignment with international standards, in part, 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 final rule are not adopted in the HMR, U.S. companies—including numerous small entities competing in foreign markets—would be at an economic disadvantage because they would be required to comply with a dual system of regulations. The changes to the HMR contained in this 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. The rule harmonizes the HMR with international standards 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 in this rule.

2. Alternatives

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

Alternative (1): No Action Alternative

If PHMSA were to take no action, current regulations would remain in place and no new provisions would be added.

Alternative (2): Preferred Alternative

This alternative is the adoption of this final rule. The amendments included in this alternative are more fully addressed in the preamble and regulatory text sections of this final rule.

3. Environmental Impacts

Hazardous materials are substances that may pose a threat to public safety or the environment during transportation because of their physical, chemical, or nuclear properties. Under the HMR, hazardous materials are transported by aircraft, vessel, rail, and highway. The hazardous materials regulatory system is a risk management system that is prevention-oriented and focused on identifying a safety hazard and reducing the probability and quantity of a hazardous material release.

[31] 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).

[32] *https://www.cbo.gov/publication/51335.*

The potential for environmental damage or contamination exists when packages of hazardous materials are involved in accidents or en route incidents resulting from cargo shifts, valve failures, package failures, loading, unloading, collisions, handling problems, or deliberate sabotage. The release of hazardous materials can cause the loss of ecological resources (*e.g.,* wildlife habitats) and the contamination of air, aquatic environments, and soil. Contamination of soil can lead to the contamination of ground water. Compliance with the HMR substantially reduces the possibility of accidental release of hazardous materials.

Alternative (1): No Action Alternative

If PHMSA takes no action, the current regulations would remain in place and no new provisions would be added. With this alternative, 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. Taking no action would mean enhanced and clarified regulatory requirements intended to decrease the risk of environmental and safety incidents would not be adopted. PHMSA believes these amendments will increase standardization and consistency of regulations, which will result in greater protection of human health and the environment. Consistency between United States and international regulations enhances the safety and environmental protection of international hazardous materials transportation through a 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 rule will reduce 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.

Not adopting the proposed environmental and safety requirements in the final rule under the No Action Alternative would result in a lost opportunity for reducing environmental and safety-related incidents.

Alternative (2): Preferred Alternative

PHMSA selected the preferred alternative. Potential environmental impacts of each proposed amendment in the preferred alternative are discussed as follows:

1. *Incorporation by Reference:* PHMSA is updating references to various international hazardous materials transport standards including, in part, 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, PHMSA is adding three new references to standards and updating six other references to standards applicable to the manufacture use and requalification of pressure vessels published by the ISO.

PHMSA believes these amendments will increase standardization and consistency of regulations, which will result in greater protection of human health and the environment. Consistency between United States and international regulations enhances the safety and environmental protection of international hazardous materials transportation through a 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 rule will reduce 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.

2. *Consistent with amendments adopted into the UN Model Regulations, PHMSA is revising the Hazardous Materials Table in § 172.101 to include 12 new n.o.s. entries for articles containing dangerous goods and adding defining criteria, authorized packagings, and safety requirements for transportation of these articles.* Inclusion of the new entries in the HMT allows for identification of appropriate packaging for 12 n.o.s. entries, which is intended to reduce the likelihood of release of hazardous materials that threaten human health and safety and the environment.

3. *PHMSA is making 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 inclusions in the HMT provide a greater level of protection against release and consistency across borders. These provisions are not expected to have a material impact on the environment.

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

This amendment permits additional flexibility for classifying corrosive mixtures and provides 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. The 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 is requiring the creation of a lithium cell or battery test summary.*

PHMSA believes that these 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 contain specific information on the required UN 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 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 hazardous material. The segregation requirements are intended to avoid the cumulative effects of a fire involving both goods simultaneously. PHMSA believes that this amendment will provide for a net increase in environmental protection and safety by potentially lessening the severity of a fire aboard an aircraft, thus preventing 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 changes closely 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 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 changes in this final rule 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 final rule increase protections aimed at avoiding safety and environmental risks.

4. Agencies Consulted

PHMSA has coordinated with the FAA, the FMCSA, the FRA, and the U.S. Coast Guard in the development of this final rule. PHMSA considered the views expressed in comments to the NPRM submitted by members of the public, state and local governments, and industry.

5. Conclusion

PHMSA has determined that no significant environmental impacts will result from this the adoption of this final rule. The provisions of the 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 received no comments specially addressing the environmental impacts of the changes made in this final rule.

K. Privacy Act

In accordance with 5 U.S.C. 553(c), DOT solicits comments from the public to better inform its rulemaking process. DOT posts these comments, without edit, including any personal information the commenter provides, to *www.regulations.gov,* as described in the system of records notice (DOT/ALL–14 FDMS), DOT's complete Privacy Act Statement in the **Federal Register** published on April 11, 2000 (65 FR 19477), and at *http://www.dot.gov/privacy.*

L. International Trade Analysis and Executive Order 13609

The Trade Agreements Act of 1979 (Pub. L. 96–39), as amended by the Uruguay Round Agreements Act (Pub. L. 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. Pursuant to these Acts, the establishment of standards is not considered an unnecessary obstacle to the foreign commerce of the United States, so long as the standards have a legitimate domestic objective, such as the protection of safety, and do not operate in a manner that excludes 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 notes the purpose is to ensure the safety of the American public and has assessed the effects of this final rule to ensure that it does not exclude imports that meet this objective. The final rule will have positive impacts on international trade because it increases the level of harmonization between U.S. regulations and international standards, which is also consistent with the policy in Executive Order 13609, ''Promoting International Regulatory Cooperation,'' 77 FR 26413. As a result, this final rule is not considered as creating an unnecessary obstacle to foreign commerce.

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 final rule involves multiple voluntary consensus standards that are identified and discussed in the section-by-section analysis for § 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, Incorporation by reference, Radioactive materials, Reporting and recordkeeping requirements.

49 CFR Part 176

Hazardous materials transportation, Incorporation by reference, Maritime carriers, 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 amends 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; Pub. L. 104–134, section 31001; Pub. L 114–74 section 4 (28 U.S.C. 2461 note); 49 CFR 1.81 and 1.97.

■ 2. In § 171.7:
■ a. Add paragraph (s)(2);
■ b. Revise paragraphs (t)(1) and (v)(2);
■ c. Redesignate paragraphs (w)(53) through (68) as follows:

Old	New
(w)(53) through (60)	(w)(54) through (61).
(w)(61) through (63)	(w)(63) through (65).
(w)(64) and (65)	(w)((67) and (68).
(w)(66)	(w)(70).
(w)(67) and (68)	(w)(73) and (74).

■ d. Add paragraphs (w)(53), (62), and (66) and paragraphs (w)(71), (72) and (75) through (77);
■ e. Revise paragraphs (aa)(1) through (4);
■ f. Add paragraphs (bb)(1) (xx), (xxi), and (xxii) and (bb)(2); and
■ g. Revise paragraphs (dd)(1) through (3).

The revisions and additions 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), copyright 2004, into § 172.800.

(t) * * *

(1) ICAO Doc 9284, 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; 172.407; 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), Volumes 1 and 2, 2018 Edition, copyright 2018, into §§ 171.22; 171.23; 171.25; 172.101; 172.202; 172.203 172.401; 172.407; 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) * * *

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(53) ISO 11118:2015(E), Gas cylinders—Non-refillable metallic gas cylinders—Specification and test methods, Second edition, 2015–09–15, into §§ 173.301b; 178.71.

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(62) ISO 11120:2015(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.

* * * * *

(66) ISO 11623:2015(E), Gas cylinders—Composite construction—Periodic inspection and testing, Second edition, 2015–12–01, into § 180.207.

* * * * *

(69) ISO 14246:2014(E), Gas cylinders—Cylinder valves—Manufacturing tests and examination, Second Edition, 2014–06–15, into § 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 173.301b.

* * * * *

(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 stem/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, 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, 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, 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, adopted 28 July 2015, into § 173.137.

(bb) * * *

(1) * * *

(xx) SOR/2016–95 June 1, 2016;

(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, ST/SG/AC.10/1/Rev.20(Vol.I) and (Vol.II), (2017), into §§ 171.8; 171.12; 172.202; 172.401; 172.407; 172.502; 172.519; 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; 173.224; 173.225; 173.232; part 173, appendix H; 175.10; 176.905; 178.274:

(i) Sixth Revised Edition (2015);

(ii) Sixth Revised Edition, Amendment 1, ST/SG/AC.10/11/Rev.6/ .Amend.1 (2017).

(3) Globally Harmonized System of Classification and Labelling of Chemicals (GHS), Seventh Revised Edition, ST/SG/AC.10/30/Rev.7 (2017), into § 172.401.

* * * * *

■ 3. In § 171.8,:

■ a. Add the definition for ''UN pressure drum'' in alphabetical order; and

■ b. Revise the definition of ''UN pressure receptacle''.

The addition and revision 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), (a)(3)(v), (a)(4), and (a)(4)(i) 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, pressure drum, 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, pressure drum, 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).

(4) *Cylinders, Pressure Drums, and MEGCs.* When the provisions of this subchapter require that a DOT specification or a UN pressure receptacle must be used for a hazardous material, a packaging authorized by the Transport Canada TDG Regulations may be used only if it corresponds to the DOT specification or UN standard authorized by this subchapter. Unless otherwise excepted in this subchapter, a cylinder (including a UN pressure receptacle) or MEGC may not be transported unless—

(i) The packaging is a UN pressure receptacle or MEGC marked with the letters ''CAN'' for Canada as a country of manufacture or a country of approval or is a cylinder that was manufactured, inspected and tested in accordance with a DOT specification or a UN standard prescribed in part 178 of this subchapter, except that cylinders (including UN pressure receptacles) not conforming to these requirements must meet the requirements in § 171.23. Each cylinder (including UN pressure receptacles) must conform to the applicable requirements in part 173 of this subchapter for the hazardous material involved.

* * * * *

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 (see § 171.7 of this subchapter for availability).

Symbols	Hazardous materials descriptions and proper shipping names	Hazard class or division	Identification No.	PG	Label codes	Special provisions (§ 172.102)	(8) Packaging (§ 173.***) Exceptions	Non-bulk	Bulk	(9) Quantity limitations (see §§ 173.27 and 175.75) Passenger aircraft/rail	Cargo aircraft only	(10) Vessel stowage 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 in contact with water emits flammable gases, 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 *lithium ion batteries or lithium metal batteries.*	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, 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, 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, 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, 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, 148
	*		*	*	*	*		*	*			
Alkyl sulfonic acids, liquid *or* Aryl sulfonic acids, liquid *with more than 5 percent free sulfuric acid.*	8	UN2584	II	8	B2, IB2, T8, TP2, TP13.	154	202	242	1 L	30 L	B	53, 58
Alkyl sulfonic acids, liquid *or* Aryl sulfonic acids, liquid *with not more than 5 percent free sulfuric acid.*	8	UN2586	III	8	IB3, T4, TP1	154	203	241	5 L	60 L	B	53, 58
Alkyl sulfonic acids, solid *or* Aryl sulfonic acids, solid, *with more than 5 percent free sulfuric acid.*	8	UN2583	II	8	IB8, IP2, IP4, T3, TP33.	154	212	240	15 kg	50 kg	A	53, 58
Alkyl sulfonic acids, solid *or* Aryl sulfonic acids, solid *with not more than 5 percent free sulfuric acid.*	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, 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

Symbols	Hazardous materials descriptions and proper shipping names	Hazard class or division	Identification No.	PG	Label codes	Special provisions (§ 172.102)	(8) Packaging (§ 173.***) Excep-tions	Non-bulk	Bulk	(9) Quantity limitations (see §§ 173.27 and 175.75) Passenger aircraft/rail	Cargo aircraft only	(10) Vessel stowage Location	Other
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8A)	(8B)	(8C)	(9A)	(9B)	(10A)	(10B)
		*		*	*	*	*	*		*			
	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, 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, *electric storage*.	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 *unstabilized*	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	B4, N41, T10, TP2, TP13.	None	201	243	Forbidden	2.5 L	D	40, 53, 58
		*		*	*	*	*	*	*				
	Benzyldimethylamine	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			62	None	Forbidden	Forbidden	03	25
	Bombs, photo-flash	1.1D	UN0038		1.1D			62	62	Forbidden	Forbidden	03	25
		*		*	*	*	*	*	*				
	Bombs, *with bursting charge*	1.1F	UN0033		1.1F			62	None	Forbidden	Forbidden	03	25
	Bombs, *with bursting charge*	1.1D	UN0034		1.1D			62	62	Forbidden	Forbidden	03	25
	Bombs, *with bursting charge*	1.2D	UN0035		1.2D			62	62	Forbidden	Forbidden	03	25
	Bombs, *with bursting charge*	1.2F	UN0291		1.2F			62	None	Forbidden	Forbidden	03	25
		*		*	*	*	*	*	*				
	Boosters, *without detonator*	1.1D	UN0042		1.1D	148	None	62	None	Forbidden	Forbidden	03	25
	Boosters, *without detonator*	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
		*		*	*	*	*	*	*				
	Boron trifluoride diethyl etherate	8	UN2604	I	8, 3	A19, T10, TP2, W31	None	201	243	0.5 L	2.5 L	D	40, 53, 58

Symbols	Hazardous materials descriptions and proper shipping names	Hazard class or division	Identification No.	PG	Label codes	Special provisions (§ 172.102)	(8) Packaging (§ 173.***) Exceptions	Non-bulk	Bulk	(9) Quantity limitations (see §§ 173.27 and 175.75) Passenger aircraft/rail	Cargo aircraft only	(10) Vessel stowage Location	Other
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8A)	(8B)	(8C)	(9A)	(9B)	(10A)	(10B)
	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	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 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, *explosive*	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

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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 *with more than 0.1 percent of calcium carbide.*	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.	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 *or* Cartridges, small arms.	1.3C	UN0417		1.3C		None	62	None	Forbidden	Forbidden	03	25
Cartridges for weapons, *with bursting charge.*	1.1F	UN0005		1.1F		None	62	None	Forbidden	Forbidden	03	25
Cartridges for weapons, *with bursting charge.*	1.1E	UN0006		1.1E		None	62	62	Forbidden	Forbidden	03	25
Cartridges for weapons, *with bursting charge.*	1.2F	UN0007		1.2F		None	62	None	Forbidden	Forbidden	03	25
Cartridges for weapons, *with bursting charge.*	1.2E	UN0321		1.2E		None	62	62	Forbidden	Forbidden	03	25
Cartridges for weapons, *with bursting charge.*	1.4F	UN0348		1.4F		None	62	None	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 *or* 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

Symbols	Hazardous materials descriptions and proper shipping names	Hazard class or division	Identification No.	PG	Label codes	Special provisions (§ 172.102)	(8) Packaging (§ 173.***)			(9) Quantity limitations (see §§ 173.27 and 175.75)		(10) 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)
	Charges, depth	1.1D	UN0056		1.1D		None	62	62	Forbidden	Forbidden	03	25
	*	*	*	*	*	*	*						
	Charges, explosive, commercial *without detonator.*	1.1D	UN0442		1.1D		None	62	None	Forbidden	Forbidden	03	25
	Charges, explosive, commercial *without detonator.*	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, *without detonator*	1.1D	UN0059		1.1D		None	62	None	Forbidden	Forbidden	03	25
	Charges, shaped, *without detonator*	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, *with not more than 10 percent chloric acid.*	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 *(with or without sulfur trioxide).*	8	UN1754	I	8, 6.1	2, B9, B10, B14, B32, T20, TP2, TP38, TP45.	None	227	244	Forbidden	Forbidden	C	40, 53, 58
		*		*	*	*	*	*	*				
	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	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	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, *flexible*	1.1D	UN0065		1.1D	102, 148	63(a)	62	None	Forbidden	Forbidden	03	25
		*		*	*	*	*	*	*				
	Cord, detonating *or* Fuze, detonating *metal clad.*	1.2D	UN0102		1.2D		None	62	None	Forbidden	Forbidden	03	25
	Cord, detonating *or* Fuze, detonating *metal clad.*	1.1D	UN0290		1.1D		None	62	None	Forbidden	Forbidden	03	25
		*		*	*	*	*	*	*				
G	Corrosive liquid, acidic, inorganic, n.o.s.	8	UN3264	I	8	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	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

Symbols	Hazardous materials descriptions and proper shipping names	Hazard class or division	Identification No.	PG	Label codes	Special provisions (§ 172.102)	(8) Packaging (§ 173.***) Excep-tions	Non-bulk	Bulk	(9) Quantity limitations (see §§ 173.27 and 175.75) Passenger aircraft/rail	Cargo aircraft only	(10) Vessel stowage Location	Other
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8A)	(8B)	(8C)	(9A)	(9B)	(10A)	(10B)
				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
		*		*	*	*	*	*		*			
	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
		*		*	*	*	*	*		*			
	Dibenzyldichlorosilane	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, A7, B2, IB2, N34, T8, TP2.	154	202	242	1 L	30 L	A	53, 58
		*		*	*	*	*	*		*			
	Dichloroacetyl chloride	8	UN1765	II	8	A3, A7, B2, B6, IB2, N34, T7, TP2.	154	202	242	1 L	30 L	D	40, 53, 58
		*		*	*	*	*	*		*			
	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-Diethyamino-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	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-N-propylamine	3	UN2266	II	3, 8	IB2, T7, TP2, TP13	150	202	243	1 L	5 L	B	40, 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
		*		*	*	*	*		*	*			
	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
		*		*	*	*	*		*	*			
	N,N-Dimethylcyclohexylamine	8	UN2264	II	8, 3	B2, IB2, T7, TP2	154	202	243	1 L	30 L	A	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
		*		*	*	*	*		*	*			
	Ethyldichlorosilane	4.3	UN1183	I	4.3, 8, 3	A2, A7, N34, T14, TP2, TP7, TP13, W31.	None	201	244	Forbidden	1 L	D	21, 40, 49, 53, 58, 100

Symbols	Hazardous materials descriptions and proper shipping names	Hazard class or division	Identification No.	PG	Label codes	Special provisions (§ 172.102)	(8) Packaging (§ 173.***) Exceptions	(8) Packaging (§ 173.***) Non-bulk	(8) Packaging (§ 173.***) Bulk	(9) Quantity limitations (see §§ 173.27 and 175.75) Passenger aircraft/rail	(9) Quantity limitations (see §§ 173.27 and 175.75) Cargo aircraft only	(10) Vessel stowage Location	(10) Vessel stowage Other
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8A)	(8B)	(8C)	(9A)	(9B)	(10A)	(10B)
		*		*	*	*	*		*	*			
	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 *or* Ferrous metal shavings *or* Ferrous metal turnings *or* Ferrous metal cuttings *in a form liable to self-heating.*	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 *or* Fish scrap, stabilized.	9	UN2216	III	None	155, B136, IB8, IP3, T1, TP33.	155	218	218	Forbidden	Forbidden	B	25, 88, 122, 128
		*		*	*	*	*		*	*			
	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	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	A7, B2, IB2, N3, N34, T8, TP2.	None	202	242	1 L	30 L	A	53, 58
		*		*	*	*	*		*	*			
	Fluorosilicic acid	8	UN1778	II	8	A7, B2, B15, IB2, N3, N34, T8, TP2.	None	202	242	1 L	30 L	A	53, 58
	Fluorosulfonic acid	8	UN1777	I	8	A7, A10, B6, B10, N3, N36, T10, TP2.	None	201	243	0.5 L	2.5 L	D	40, 53, 58
		*		*	*	*	*		*	*			
	Formic acid *with not less than 10% but not more than 85% acid by mass.*	8	UN3412	II	8	IB2, T7, TP2	154	202	242	1 L	30 L	A	40, 53, 58
	Formic acid *with not less than 5% but less than 10% acid by mass.*	8	UN3412	III	8	IB3, T4, TP1	154	203	241	5 L	60 L	A	40, 53, 58
	Formic acid *with more than 85% acid by mass.*	8	UN1779	II	8, 3	B2, B28, IB2, T7, TP2	154	202	242	1 L	30 L	A	40, 53, 58
	Fracturing devices, explosive, *without detonators for oil wells.*	1.1D	UN0099		1.1D		None	62	62	Forbidden	Forbidden	03	25
		*		*	*	*	*		*	*			
	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			62	None	Forbidden	Forbidden	03	25

Grenades, *hand or rifle, with bursting charge.*	1.2D	UN0285		1.2D			62	None	Forbidden	Forbidden	03	25
Grenades, *hand or rifle, with bursting charge.*	1.1F	UN0292		1.1F			62	None	Forbidden	Forbidden	03	25
Grenades, *hand or rifle, with bursting charge.*	1.2F	UN0293		1.2F			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	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, 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	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	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	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
	*		*	*	*	*	*	*				
3,3′-Iminodipropylamine	8	UN2269	III	8	IB3, T4, TP2	154	203	241	5 L	60 L	A	52
	*		*	*	*	*	*	*				
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

Symbols	Hazardous materials descriptions and proper shipping names	Hazard class or division	Identification No.	PG	Label codes	Special provisions (§ 172.102)	(8) Packaging (§ 173.***) Excep-tions	Non-bulk	Bulk	(9) Quantity limitations (see §§ 173.27 and 175.75) Passenger aircraft/rail	Cargo aircraft only	(10) Vessel stowage Location	Other
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8A)	(8B)	(8C)	(9A)	(9B)	(10A)	(10B)
	Iodine pentafluoride	5.1	UN2495	I	5.1, 6.1, 8		None	205	243	Forbidden	Forbidden	D	25, 40, 52, 53, 58, 66, 90
		*		*	*	*	*	*		*			
	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, A54, A100	185	185	185	Forbidden	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
	*	*		*	*	*	*		*				
	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, 40, 53, 58, 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, A7, B6, B77, N34, T14, TP2, TP7, TP13, W31.	None	201	243	Forbidden	1 L	D	21, 40, 49, 53, 58, 100

Symbols	Hazardous materials descriptions and proper shipping names	Hazard class or division	Identification No.	PG	Label codes	Special provisions (§ 172.102)	(8) Packaging (§ 173.***) Exceptions	Non-bulk	Bulk	(9) Quantity limitations (see §§ 173.27 and 175.75) Passenger aircraft/rail	Cargo aircraft only	(10) Vessel stowage Location	Other
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8A)	(8B)	(8C)	(9A)	(9B)	(10A)	(10B)
		*		*	*	*	*	*		*			
	Methylphenyldichlorosilane	8	UN2437	II	8	T10, TP2, TP7, TP13	None	206	242	Forbidden	30 L	C	40, 53, 58
		*		*	*	*	*	*		*			
	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			62	None	Forbidden	Forbidden	03	25
	Mines *with bursting charge*	1.1D	UN0137		1.1D			62	62	Forbidden	Forbidden	03	25
	Mines *with bursting charge*	1.2D	UN0138		1.2D			62	62	Forbidden	Forbidden	03	25
	Mines *with bursting charge*	1.2F	UN0294		1.2F			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 *with not more than 50 percent nitric acid.*	8	UN1826	II	8	A7, B2, IB2, T8, TP2	None	158	242	Forbidden	30 L	D	40, 53, 58
	Nitrating acid mixtures *with more than 50 percent nitric acid.*	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 not more than 50 percent nitric acid.*	8	UN1796	II	8	A7, B2, IB2, T8, TP2, TP13.	None	158	242	Forbidden	30 L	D	40, 53, 58
	Nitric acid *other than red fuming, with at least 65 percent, but not more than 70 percent nitric acid.*	8	UN2031	II	8, 5.1	B2, B47, B53, IB2, IP15, T8, TP2.	None	158	242	Forbidden	30 L	D	53, 58, 66, 74, 89, 90
	Nitric acid *other than red fuming, with more than 20 percent and less than 65 percent nitric acid.*	8	UN2031	II	8	A212, B2, B47, B53, IB2, IP15, T8, TP2.	None	158	242	Forbidden	30 L	D	44, 53, 58, 66, 74, 89, 90
	Nitric acid *other than red fuming with not more than 20 percent nitric acid.*	8	UN2031	II	8	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
	Nitric acid *other than red fuming, with more than 70 percent nitric acid.*	8	UN2031	I	8, 5.1	B47, B53, T10, TP2, TP12, TP13.	None	158	243	Forbidden	2.5 L	D	44, 53, 58, 66, 89, 90, 110, 111
		*		*	*	*	*	*		*			
	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 *with not less than 25 percent alcohol by mass, and with not more than 12.6 percent nitrogen, by dry mass.*	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	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, 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

		*		*	*	*	*		*				
	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
		*		*	*	*	*		*				
	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, N41, T10, TP1	None	201	243	Forbidden	2.5 L	D	53, 58, 66
	Perchloric acid *with not more than 50 percent acid by mass.*	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
		*		*	*	*	*		*				
	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

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							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)
	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, 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
	*	*		*	*	*	*	*		*			
	Printing ink, *flammable or* Printing ink related material *(including printing ink thinning or reducing compound), flammable.*	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, *with burster or expelling charge.*	1.2D	UN0346		1.2D			62	62	Forbidden	Forbidden	03	25

*	*		*	*	*	*	*	*	*			
Projectiles, *with burster or expelling charge.*	1.2F	UN0426		1.2F			62	None	Forbidden	Forbidden	03	25
Projectiles, *with burster or expelling charge.*	1.4F	UN0427		1.4F			62	None	Forbidden	Forbidden	03	25
*	*		*	*	*	*	*	*	*			
Projectiles, *with bursting charge*	1.1F	UN0167		1.1F			62	None	Forbidden	Forbidden	03	25
Projectiles, *with bursting charge*	1.1D	UN0168		1.1D			62	62	Forbidden	Forbidden	03	25
Projectiles, *with bursting charge*	1.2D	UN0169		1.2D			62	62	Forbidden	Forbidden	03	25
Projectiles, *with bursting charge*	1.2F	UN0324		1.2F			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, IB2, N34, T7, TP2	None	202	243	1 L	30 L	A	40, 52
*	*		*	*	*	*	*	*	*			
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
*	*		*	*	*	*	*	*	*			
Radioactive material, excepted package-empty packaging.	7	UN2908		Empty	368	422, 428	422, 428	422, 428			A.	
*	*		*	*	*	*	*	*	*			
Radioactive material, low specific activity (LSA–I) *non fissile or fissile-excepted.*	7	UN2912		7	325, A56, T5, TP4, W7.	421, 422, 428.	427	427			A	95, 129
Radioactive material, low specific activity (LSA–II) non fissile or fissile-excepted.	7	UN3321		7	325, A56, T5, TP4, W7.	421, 422, 428.	427	427			A	95, 129
Radioactive material, low specific activity (LSA–III) *non fissile or fissile excepted.*	7	UN3322		7	325, A56, T5, TP4, W7.	421, 422, 428.	427	427			A	95, 150
Radioactive material, surface contaminated objects (SCO–I *or* SCO–II) *non fissile or fissile-excepted.*	7	UN2913		7	325, A56	421, 422, 428.	427	427			A	95
Radioactive material, transported under special arrangement, *non fissile or fissile excepted.*	7	UN2919		7	325, A56, 139						A	95, 105
*	*		*	*	*	*	*	*	*			
Radioactive material, Type A package *non-special form, non fissile or fissile-excepted.*	7	UN2915		7	325, A56, W7, W8	None	415, 418, 419.	415, 418, 419.			A	95, 130
*	*		*	*	*	*	*	*	*			
Radioactive material, Type B(M) package *non fissile or fissile-excepted.*	7	UN2917		7	325, A56		416	416			A	95, 105
*	*		*	*	*	*	*	*	*			
Radioactive material, Type B(U) package *non fissile or fissile-excepted.*	7	UN2916		7	325, A56		416	416			A	95, 105
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, 153

Symbols	Hazardous materials descriptions and proper shipping names	Hazard class or division	Identification No.	PG	Label codes	Special provisions (§ 172.102)	(8) Packaging (§ 173.***) Exceptions	Non-bulk	Bulk	(9) Quantity limitations (see §§ 173.27 and 175.75) Passenger aircraft/rail	Cargo aircraft only	(10) Vessel stowage Location	Other
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8A)	(8B)	(8C)	(9A)	(9B)	(10A)	(10B)
	Radioactive material, uranium hexafluoride, fissile.	7	UN2977		7, 6.1, 8		453	417, 420	417, 420			B	40, 74, 95, 132, 151, 153
	*	*	*	*	*	*	*						
	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	B.	
				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	62	Forbidden	220 kg	03	25
	Rocket motors	1.1C	UN0280		1.1C	109	None	62	62	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	62	Forbidden	Forbidden	03	25
	Rockets, *with bursting charge*	1.2E	UN0182		1.2E		None	62	62	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	62	Forbidden	Forbidden	03	25
	Rockets, *with expelling charge*	1.3C	UN0437		1.3C		None	62	62	Forbidden	Forbidden	03	25
	*	*	*	*	*	*	*						
	Rockets, *with inert head*	1.3C	UN0183		1.3C		None	62	62	Forbidden	Forbidden	03	25
	Rockets, *with inert head*	1.2C	UN0502		1.2C		None	62	62	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, IP7, 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, IP7, 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	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, B2, B6, T10, TP2, TP7, TP13.	None	202	242	Forbidden	30 L	C	40, 53, 58
	*	*	*	*	*	*	*						
	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	62	Forbidden	Forbidden	03	25
	Sounding devices, explosive	1.1F	UN0296		1.1F		None	62	62	Forbidden	Forbidden	03	25
	Sounding devices, explosive	1.1D	UN0374		1.1D		None	62	62	Forbidden	Forbidden	03	25
	Sounding devices, explosive	1.2D	UN0375		1.2D		None	62	62	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	IB8, IP3, T1, TP33	154	213	240	25 kg	100 kg	A	53, 58
		*		*	*	*	*	*	*	*			
	Sulfur chlorides	8	UN1828	I	8	5, 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	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 *with not more than 51% acid.*	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 *with more than 0.05 percent of maleic anhydride.*	8	UN2698	III	8	IB8, IP3, T1, TP33	154	213	240	25 kg	100 kg	A	53, 58

Symbols	Hazardous materials descriptions and proper shipping names	Hazard class or division	Identification No.	PG	Label codes	Special provisions (§ 172.102)	(8) Packaging (§ 173.***) Excep-tions			(9) Quantity limitations (see §§ 173.27 and 175.75) Passenger aircraft/rail		(10) Vessel stowage Location	
							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)
		*		*	*	*	*	*		*			
	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 *with bursting charge*	1.1E	UN0329		1.1E			62	62	Forbidden	Forbidden	03	25
	Torpedoes *with bursting charge*	1.1F	UN0330		1.1F			62	None	Forbidden	Forbidden	03	25
	Torpedoes *with bursting charge*	1.1D	UN0451		1.1D			62	62	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, A7, B2, IB2, N34, T7, TP2.	154	202	242	1 L	30 L	B	53, 58
				III	8	A3, 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	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, A7, B2, IB2, N34, T7, TP2.	154	202	243	1 L	30 L	C	40, 53, 58
	*	*		*	*	*	*	*	*	*			
	Vanadium oxytrichloride	8	UN2443	II	8	A3, A7, B2, B16, IB2, N34, T7, TP2.	154	202	242	Forbidden	30 L	C	40, 53, 58
	*	*		*	*	*	*	*	*	*			
	Vanadium tetrachloride	8	UN2444	I	8	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	62	Forbidden	Forbidden	03	25
	Warheads, rocket *with bursting charge.*	1.2D	UN0287		1.2D		None	62	62	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	62	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, W100.	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

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Appendix B to § 172.101—List of Marine Pollutants

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LIST OF MARINE POLLUTANTS

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

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■ 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 325, 388, 389, and 391 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).

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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} cm^3/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.

* * * * *

325 In the case of non-fissile or fissile-excepted uranium hexafluoride, the material must be classified under UN 2978.

* * * * *

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, 2023, 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 an 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.

*   *   *   *   *

421 This entry will no longer be effective on January 2, 2023, 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 (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:

(i) Battery powered equipment.

(ii) Battery powered vehicle.

(iii) Carbon dioxide, solid.

(iv) Castor bean.

(v) Castor flake.

(vi) Castor meal.

(vii) Castor pomace.

(viii) Consumer commodity.

(ix) Dry ice.

(x) Engine, fuel cell, flammable gas powered.

(xi) Engine, fuel cell, flammable liquid powered.

(xii) Engine, internal combustion.

(xiii) Engine, internal combustion, flammable gas powered.

(xiv) Engine, internal combustion, flammable liquid powered.

(xv) Fish meal, stabilized.

(xvi) Fish scrap, stabilized.

(xvii) Krill Meal, PG III.

(xviii) Machinery, internal combustion.

(xix) Machinery, fuel cell, flammable gas powered.

(xx) Machinery, fuel cell, flammable liquid powered.

(xxi) Machinery, internal combustion, flammable gas powered.

(xxii) Machinery, internal combustion, flammable liquid powered.

(xxiii) Refrigerating machine.

(xxiv) Vehicle, flammable gas powered.

(xxv) Vehicle, flammable liquid powered.

(xxvi) 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 § 173.21, revise paragraph (f) introductory text and paragraph (f)(1) to read as follows:

§ 173.21 Forbidden materials and packages.

* * * * *

(f) A package containing a material which is likely to decompose with a self-accelerated decomposition temperature (SADT) or polymerize with a self-accelerated polymerization temperature (SAPT) of 50 °C (122 °F) or less, with an evolution of a dangerous quantity of heat or gas when decomposing or polymerizing, unless the material is stabilized or inhibited in a manner to preclude such evolution. The SADT and SAPT may be determined by any of the test methods described in Part II of the UN Manual of Tests and Criteria (IBR, see § 171.7 of this subchapter).

(1) A package meeting the criteria of paragraph (f) of this section may be required to be shipped under controlled temperature conditions. The control temperature and emergency temperature for a package shall be as specified in the table in this paragraph (f)(1) based upon the SADT or SAPT of the material. The control temperature is the temperature above which a package of the material may not be offered for transportation or transported. The emergency temperature is the temperature at which, due to imminent danger, emergency measures must be initiated.

TABLE 1 TO PARAGRAPH (f)(1)—DERIVATION OF CONTROL AND EMERGENCY TEMPERATURE

SADT/SAPT [1]	Control temperatures	Emergency temperature
SADT/SAPT ≤20 °C (68 °F)	20 °C (36 °F) below SADT/SAPT	10 °C (18 °F) below SADT/SAPT.
20 °C (68 °F) <SADT/SAPT ≤35 °C (95 °F)	15 °C (27 °F) below SADT/SAPT	10 °C (18 °F) below SADT/SAPT.
35 °C (95 °F) <SADT/SAPT ≤ 50 °C (122 °F)	10 °C (18 °F) below SADT/SAPT	5 °C (9 °F) below SADT/SAPT.
50 °C (122 °F) <SADT/SAPT	(2)	(2)

[1] Self-accelerating decomposition temperature or Self-accelerating polymerization temperature.
[2] Temperature control not required.

(i) The provisions concerning polymerizing substances in paragraph (f) will be effective until January 2, 2023.

(ii) [Reserved]

* * * * *

■ 17. Effective January 2, 2023, in § 173.21, revise paragraph (f) introductory text and paragraph (f)(1) to read as follows:

§ 173.21 Forbidden materials and packages.

* * * * *

(f) A package containing a material which is likely to decompose with a self-accelerated decomposition temperature (SADT) of 50 °C (122 °F) or less, or polymerize at a temperature of 54 °C (130 °F) or less with an evolution of a dangerous quantity of heat or gas when decomposing or polymerizing, unless the material is stabilized or inhibited in a manner to preclude such evolution. The SADT may be determined by any of the test methods described in Part II of the UN Manual of Tests and Criteria (IBR, see § 171.7 of this subchapter).

(1) A package meeting the criteria of paragraph (f) of this section may be required to be shipped under controlled temperature conditions. The control temperature and emergency temperature for a package shall be as specified in the table in this paragraph based upon the SADT of the material. The control temperature is the temperature above which a package of the material may not be offered for transportation or transported. The emergency temperature is the temperature at which, due to imminent danger, emergency measures must be initiated.

TABLE 1 TO PARAGRAPH (f)(1)—METHOD OF DETERMINING CONTROL AND EMERGENCY TEMPERATURE

SADT [1]	Control temperatures	Emergency temperature
SADT ≤20 °C (68 °F)	20 °C (36 °F) below SADT	10 °C (18 °F) below SADT.
20 °C (68 °F) <SADT ≤35 °C (95 °F)	15 °C (27 °F) below SADT	10 °C (18 °F) below SADT.
35 °C (95 °F) <SADT ≤50 °C (122 °F)	10 °C (18 °F) below SADT	5 °C (9 °F) below SADT.
50 °C (122 °F) <SADT	(2)	(2)

[1] Self-accelerating decomposition temperature.
[2] Temperature control not required.

* * * * *

■ 18. In § 173.62:

■ a. Amend paragraph (b) by revising the heading of the Explosives Table; and

■ b. Amend paragraph (c), by revising the heading of the Table of Packing Methods, and Packing Instruction US 1 to read as follows:

§ 173.62 Specific packaging requirements for explosives.

* * * * *

(b) * * *

Table 1 to Paragraph (b): Explosives Table

* * * * *

(c) * * *

TABLE 2 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;

TABLE 2 TO PARAGRAPH (c): TABLE OF PACKING METHODS—Continued

Packing instruction	Inner packagings	Intermediate packagings	Outer packagings
(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.			

■ 19. 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 packaging is not more than 30 L (7.9 gallons) and for transportation by cargo aircraft, the capacity of the packaging is not more than 100 L (26.3 gallons); and

* * * * *

■ 20. 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, 2023.

* * * * *

■ 21. 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 (a)(3) of this section), 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.

* * * * *

■ 22. 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).

* * * * *

■ 23. 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.

* * * * *

■ 24. 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.

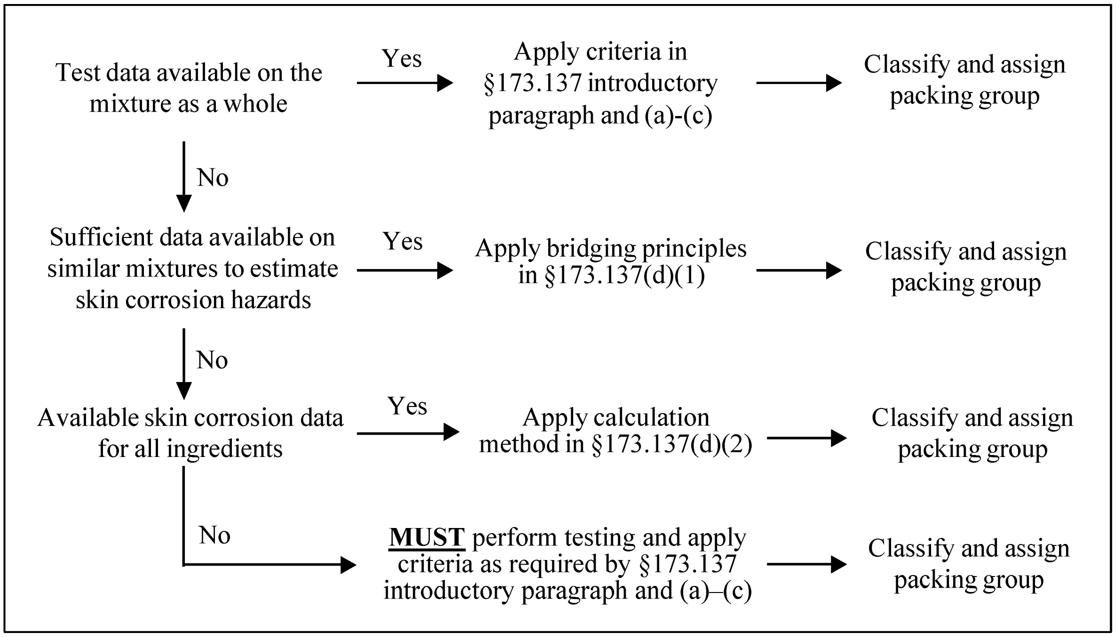
(c) *Packing Group III.* Materials, other than those meeting Packing Group I or II criteria—

(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.* 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.

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

(ii) To determine whether a mixture containing corrosive substances must be considered a corrosive mixture and to assign a packing group, the calculation method in the flow chart in Appendix I must be applied. For this calculation method, generic concentration limits apply 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.

(iii) 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).

(iv) 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:

$$\frac{PGx_1}{GCL} + \frac{PGx_2}{SCL_2} + \ldots + \frac{PGx_i}{SCL_i} \geq 1$$

PG x_i = concentration of substance 1, 2 . . . *i* in the mixture, assigned to packing group x (I, II or III)
GCL = generic concentration limit
SCL_i = 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.

■ 25. 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.

* * * * *

■ 26. Revise § 173.185 to read as follows:

§ 173.185 Lithium cells and batteries.

As used in this section, *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. *Equipment* means the device or apparatus for which the lithium cells or batteries will provide electrical power for its operation. *Lithium cell(s)* or *battery(ies)* includes both lithium metal and lithium ion chemistries. *Medical device* means an instrument, apparatus, implement, machine, contrivance, implant, or in vitro reagent, including any component, part, or accessory thereof, which is intended for use in the diagnosis of disease or other conditions, or in the cure, mitigation, treatment, or prevention of disease, of a person.

(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 (IBR; see § 171.7 of this subchapter). Lithium cells and batteries are subject to these tests regardless of whether the cells used to construct the battery are of a tested type. A single cell battery as defined in part III, sub-section 38.3 of the UN Manual of Tests and Criteria is considered a ''cell'' and must be offered for transportation in accordance with the requirements for cells.

(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) Beginning January 1, 2022 each manufacturer and subsequent distributor of lithium cells or batteries manufactured on or after January 1, 2008, must make available 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, email address, and website for more information;

(iii) Name of the test laboratory, to include address, telephone number, email 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 to prevent damage caused by 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) 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 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 a single item of equipment containing batteries, 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 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 cells or batteries are packed with or contained in equipment in quantities not exceeding 5 kg net weight, the outer package that contains lithium cells or batteries must be appropriately marked: ''PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT'', ''LITHIUM METAL BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT'', ''LITHIUM ION 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.

Figure 1 to paragraph (c)(3)(i)

(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 1 g	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) Not more than one package prepared in accordance with this paragraph (c)(4) may be placed into an overpack. When a package is required to display the ''CARGO AIRCRAFT ONLY'' label, the paragraph (c)(1)(iii) mark, or the paragraph (c)(3)(i) lithium battery mark and the package is placed in an overpack, the appropriate label or mark must either be clearly visible through the overpack, or the label or 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) A shipper is not permitted to offer for transport more than one package prepared in accordance with the provisions of this paragraph in any single consignment.

(iv) Each shipment with packages required to display the paragraph (c)(3)(i) 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.

(v) Packages and overpacks of lithium batteries prepared in accordance with this paragraph (c)(4) must be offered to the operator separately from cargo which is not subject to the requirements of this subchapter and must not be loaded into a unit load device before being offered to the operator.

(vi) 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, and the total net quantity (mass) of the lithium cells or batteries in the completed package must not exceed 5 kg. A ''set'' of cells or batteries is the number of individual cells or batteries that are required to power each piece of equipment.

(vii) 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 of this paragraph (c)(4), must receive instruction on these conditions and limitations, corresponding to their functions.

(viii) 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).

(5) For transportation by aircraft, a package that exceeds the number or quantity (mass) limits in the table shown in paragraph (c)(4)(i) of this section, the overpack limit described in paragraph (c)(4)(ii) of this section, or the consignment limit described in paragraph (c)(4)(iii) of this section 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 paragraph (b)(3)(ii) of this section when the package displays both the lithium battery mark in paragraph (c)(3)(i) and the Class 9 Lithium Battery label specified in § 172.447 of this subchapter. 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 UN performance packaging requirements in paragraphs (b)(3)(ii), (b)(3)(iii) and (b)(6) of this section, when packed in a strong outer packaging conforming to the applicable requirements of subpart B of this part. A lithium cell or battery that meets the size, packaging, and hazard communication conditions in paragraph (c)(1)–(3) of this section is excepted from subparts C through H of part 172 of this subchapter.

(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 a single item of equipment containing cells or batteries, 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 a single item of equipment containing cells or batteries, 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) *Limited exceptions to restrictions on air transportation of medical device batteries.* Irrespective of the quantity limitations described in column 9A of the § 172.101 Hazardous Materials Table of this subchapter, up to two replacement lithium cells or batteries specifically used for a medical device as defined in this section may be transported as cargo on a passenger aircraft. Packages containing these cells or batteries are not subject to the marking requirement in paragraph (c)(1)(iii) of this section or the ''CARGO AIRCRAFT ONLY'' label required by § 172.402(c) of this subchapter and may be transported as cargo on a passenger aircraft when approved by the Associate Administrator and provided the following conditions are met:

(1) The intended destination of the cells or batteries is not serviced daily by cargo aircraft if a cell or battery is required for medically necessary care; and

(2) Lithium ion cells or batteries for medical devices are excepted from the state of charge limitations in § 172.102, special provision A100, of this subchapter, provided each cell or battery is:

(i) Individually packed in an inner packaging that completely encloses the cell or battery;

(ii) Placed in a rigid outer packaging; and

(iii) Protected to prevent short circuits.

(h) *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.

■ 27. 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.

■ 28. 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.

* * * * *

■ 29. 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.

■ 30. In § 173.224, revise paragraph (b)(4), the table to paragraph (b), and paragraph (c) 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.

* * * * *

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(hexahydrobenzonitrile)	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

SELF-REACTIVE MATERIALS TABLE—Continued

Self-reactive substance (1)	Identification No. (2)	Concentration (%) (3)	Packing method (4)	Control temperature (°C) (5)	Emergency temperature (6)	Notes (7)
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 chloride	3236	67 − 100	OP7	+35	+40	
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-methylphenylsulphony)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′-dimethyl-terephthalamide, 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 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 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 percent, by mass, if assigned to Packing Group I or II; or

(B) Less than 30 percent, 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 fiberboard 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.

■ 31. In § 173.225, revise the table to paragraph (c), the heading of the table to paragraph (d), paragraph (e), paragraph (g) introductory text, and the heading to the table to paragraph (g) 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 No.	Concentration (mass %)	Diluent (mass %)			Water (mass %)	Packing 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

TABLE TO PARAGRAPH (c): ORGANIC PEROXIDE TABLE—Continued

Technical name	ID No.	Concentration (mass %)	Diluent (mass %)			Water (mass %)	Packing method	Temperature (°C)		Notes
			A	B	I			Control	Emergency	
(1)	(2)	(3)	(4a)	(4b)	(4c)	(5)	(6)	(7a)	(7b)	(8)
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 peroxypivalate	UN3113	≤77		≥23			OP5	10	15	
tert-Amyl peroxypivalate	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 monoperoxymaleate	UN3102	>52 – 100					OP5			
tert-Butyl monoperoxymaleate	UN3103	≤52	≥48				OP6			
tert-Butyl monoperoxymaleate	UN3108	≤52			≥48		OP8			
tert-Butyl monoperoxymaleate [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 peroxycrotonate	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 peroxypivalate	UN3113	>67 – 77	≥23				OP5	0	10	
tert-Butyl peroxypivalate	UN3115	>27 – 67		≥33			OP7	0	10	
tert-Butyl peroxypivalate	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-trimethlyhexanoate.	UN3106	≤42			≥58		OP7			
tert-Butyl peroxy-3,5,5-trimethylhexanoate.	UN3109	≤37		≥63			OP8			
3-Chloroperoxybenzoic acid	UN3102	>57 – 86			≥14		OP1			

TABLE TO PARAGRAPH (c): ORGANIC PEROXIDE TABLE—Continued

Technical name	ID No.	Concentration (mass %)	Diluent (mass %)			Water (mass %)	Packing method	Temperature (°C)		Notes
			A	B	I			Control	Emergency	
(1)	(2)	(3)	(4a)	(4b)	(4c)	(5)	(6)	(7a)	(7b)	(8)
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 peroxypivalate	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 peroxyazelate	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			

TABLE TO PARAGRAPH (c): ORGANIC PEROXIDE TABLE—Continued

Technical name	ID No.	Concentration (mass %)	Diluent (mass %)			Water (mass %)	Packing method	Temperature (°C)		Notes
			A	B	I			Control	Emergency	
(1)	(2)	(3)	(4a)	(4b)	(4c)	(5)	(6)	(7a)	(7b)	(8)
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-trimethylcyclohexane.	UN3107	≤32	≥26	≥42			OP8			
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			
Diisobutyryl peroxide	UN3111	>32 – 52		≥48			OP5	−20	−10	
Diisobutyryl peroxide [as a stable dispersion in water].	UN3119	≤42					OP8	−20	−10	
Diisobutyryl 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			

TABLE TO PARAGRAPH (c): ORGANIC PEROXIDE TABLE—Continued

Technical name	ID No.	Concentration (mass %)	Diluent (mass %)			Water (mass %)	Packing method	Temperature (°C)		Notes
			A	B	I			Control	Emergency	
(1)	(2)	(3)	(4a)	(4b)	(4c)	(5)	(6)	(7a)	(7b)	(8)
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-butylperoxy)hexyne-3.	UN3103	>52 − 86	≥14				OP5			
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-neodecanoyl-peroxyisopropyl) 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 peroxypivalate.	UN3115	≤52	≥45	≥10			OP7	− 20	− 10	
tert-Hexyl peroxyneodecanoate	UN3115	≤71	≥29				OP7	0	10	
tert-Hexyl peroxypivalate	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			

TABLE TO PARAGRAPH (c): ORGANIC PEROXIDE TABLE—Continued

Technical name	ID No.	Concentration (mass %)	Diluent (mass %)			Water (mass %)	Packing method	Temperature (°C)		Notes
			A	B	I			Control	Emergency	
(1)	(2)	(3)	(4a)	(4b)	(4c)	(5)	(6)	(7a)	(7b)	(8)
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
Peroxylauric 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 peroxypivalate	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

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 ≥36% diluent type A by mass, and in addition ethylbenzene.
23. With ≥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 ≤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 ≤6.7%.

(d) * * *

(4) * * *

Table to Paragraph (d): Maximum Quantity per Packaging/Package

* * * * *

(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		
	Isopropyl cumyl 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-1,4,7-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 peroxypivalate, 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 peroxypivalate, 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
	Diisobutyryl peroxide, not more than 28% as a stable dispersion in water	31HA1	1000	−20 °C	−10 °C
		31A	1250	−20 °C	−10 °C
	Diisobutyryl 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

TABLE TO PARAGRAPH (e): ORGANIC PEROXIDE IBC TABLE—Continued

UN No.	Organic peroxide	Type of IBC	Maximum quantity (liters)	Control temperature	Emergency temperature
	3-Hydroxy-1,1-dimethylbutyl peroxy-neodecanoate, not more than 52%, stable dispersion, in water.	31A	1250	−15 °C	−5 °C
	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) of this section. Organic peroxides listed in this table, provided they meet the specific packaging requirements found in paragraph (h) of this section, 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

* * * * *

■ 32. 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.

■ 33. 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;

* * * * *

■ 34. 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.

* * * * *

■ 35. 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:

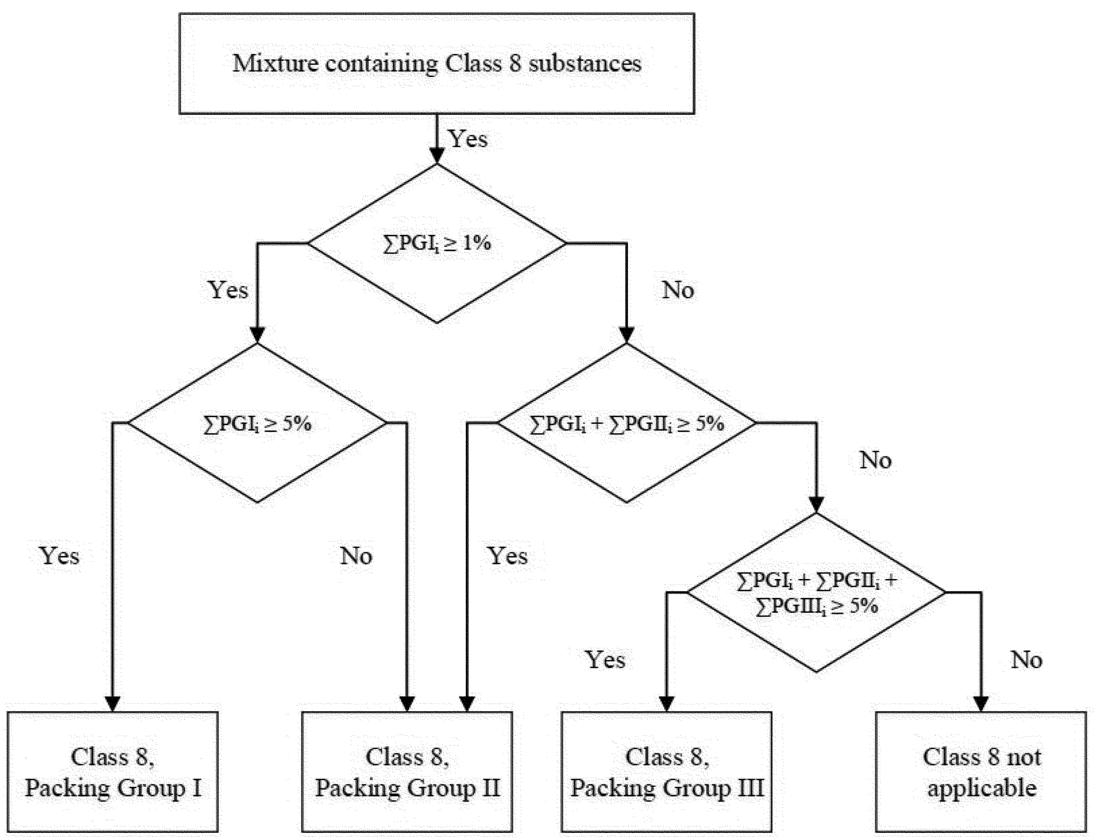
(i) The UN identification number for the material preceded by the letters ''UN'', as shown in column (4) of the Hazardous Materials Table in § 172.101 of this subchapter; and

(ii) The name and address of the consignor and the consignee.

(2) The certificate requirements in § 176.27 must be met.

■ 36. Add appendix I to part 173 to read as follows:

Appendix I to Part 173—Calculation Method



PART 174—CARRIAGE BY RAIL

■ 37. The authority citation for part 174 continues to read as follows:

Authority: 49 U.S.C. 5101–5128; 33 U.S.C. 1321; 49 CFR 1.81 and 1.97.

■ 38. 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

■ 39. 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.

■ 40. In § 175.10, revise paragraphs (a)(2), (3), (14), (15), (a)(17)(v) introductory text, paragraphs (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 (IBR, *see* § 171.7 of this subchapter). The lighters must be equipped with a safety cap or similar means of protection 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) Medical devices that contain radioactive materials (*e.g.,* cardiac pacemaker) implanted or externally fitted in humans or animals and radiopharmaceuticals that have been injected or ingested as the result of medical treatment.

* * * * *

(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

(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. With the approval of the operator, portable medical electronic devices (*e.g.,* automated external defibrillators (AED), nebulizer, continuous positive airway pressure (CPAP), etc.) may contain lithium metal batteries exceeding 2 grams, but not exceeding 8 grams. With the approval of the operator, no more than two lithium metal batteries each exceeding 2 grams, but not exceeding 8 grams, may be carried as spare batteries for portable medical electronic devices in carry-on baggage and must be carried with the portable medical electronic device the spare batteries are intended to operate;

(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.

* * * * *

■ 41. In § 175.33, paragraphs (a)(13)(i) and (iii) are revised to read as follows:

§ 175.33 Shipping paper and notification of pilot-in-command.

(a) * * *

(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, hazard 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-only aircraft.

* * * * *

(iii) For UN3480, UN3481, UN3090, and UN3091 prepared in accordance with § 173.185(c), except those prepared in accordance with § 173.185(c)(5), are not required to appear on the information to the pilot-in-command.

* * * * *

■ 42. 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

■ 43. 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.

■ 44. 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.

* * * * *

■ 45. In § 176.84, add provisions 151, 152, 153, and 154 to the table in paragraph (b) 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

■ 46. 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.

■ 47. In § 178.71:

■ a. Revise paragraph (d)(2);

■ b. Revise parargah (f) introductory text,

■ c. Add paragraph (f)(4); and

■ d. Revise paragraphs (i), (j), and (q)(12).

The addition and revisions 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).

* * * * *

■ 48. In § 178.75, paragraph (d)(3)(v) is revised to read as follows:

§ 178.75 Specifications for MEGCs.

* * * * *

(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, 2022, 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).

* * * * *

■ 49. In § 178.601, paragraph (l)(2)(viii) is revised to read as follows:

§ 178.601 General requirements.

* * * * *

(l) * * *

(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;

* * * * *

■ 50. In § 178.801, paragraph (l)(2)(viii) is revised to read as follows:

§ 178.801 General Requirements.

* * * * *

(l) * * *

(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;

* * * * *

■ 51. In § 178.810, paragraph (c)(2) is revised to read as follows:

§ 178.810 Drop test.

* * * * *

(c) * * *

(2) IBC design types with a capacity of 0.45 cubic meters (15.9 cubic feet) or less must be subject to an additional drop test. 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

■ 52. 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.

■ 53. 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 or requalified and marked by a facility registered by Transport Canada in accordance with the Transport Canada TDG Regulations (IBR, *see* § 171.7 of this subchapter). 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 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).

■ 54. In § 180.217, paragraph (a) is revised to read as follows:

§ 180.217 Requalification requirements for MEGCs.

(a) *Periodic inspections.* Each MEGC must be given an initial visual inspection and test in accordance with § 178.75(i) of this subchapter before being put into service for the first time. After the initial inspection, a MEGC must be inspected at least once every five years in accordance with this subpart or by a facility registered by Transport Canada in accordance with the Transport Canada TDG Regulations (IBR, *see* § 171.7 of this subchapter).

* * * * *

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Howard R. Elliott,

Administrator, Pipeline and Hazardous Materials Safety Administration.

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