DEPARTMENT OF TRANSPORTATION

Pipeline and Hazardous Materials Safety Administration

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

[Docket No. PHMSA–2021–0092 (HM–215Q)]

RIN 2137–AF57

Hazardous Materials: Harmonization With International Standards

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

ACTION: Final rule.

SUMMARY: PHMSA is amending the Hazardous Materials Regulations (HMR) to maintain alignment with international regulations and standards by adopting various amendments, including changes to proper shipping names, hazard classes, packing groups, special provisions, packaging authorizations, air transport quantity limitations, and vessel stowage requirements. PHMSA is also withdrawing the unpublished November 28, 2022, Notice of Enforcement Policy Regarding International Standards on the use of select updated international standards in complying with the HMR during the pendency of this rulemaking.

DATES:

Effective date: This rule is effective May 10, 2024.

Voluntary compliance date: January 1, 2023.

Delayed compliance date: April 10, 2025.

Incorporation by reference date: The incorporation by reference of certain publications listed in this rule is approved by the Director of the Federal Register on May 10, 2024.

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SUPPLEMENTARY INFORMATION:

Table of Contents

I. Executive Summary
II. Background
III. Incorporation by Reference Discussion Under 1 CFR Part 51
IV. Comment Discussion
V. Section-by-Section Review of Amendments
VI. Regulatory Analyses and Notices
A. Statutory/Legal Authority for This Rulemaking
B. Executive Orders 12866 and 14094, and DOT Regulatory Policies and Procedures
C. Executive Order 13132
D. Executive Order 13175
E. Regulatory Flexibility Act, Executive Order 13272, and DOT Policies and Procedures
F. Paperwork Reduction Act
G. Unfunded Mandates Reform Act of 1995
H. Environment Assessment
I. Privacy Act
J. Executive Order 13609 and International Trade Analysis
K. National Technology Transfer and Advancement Act
L. Executive Order 13211
M. Cybersecurity and Executive Order 14028
N. Severability

I. Executive Summary

As discussed in further detail in this final rule (*see* V. Section-by-Section Review of Amendments), the Pipeline and Hazardous Materials Safety Administration (PHMSA) amends certain sections of the Hazardous Materials Regulations (HMR; 49 CFR parts 171 through 180) to maintain alignment with international regulations and standards by adopting various amendments, including changes to proper shipping names, hazard classes, packing groups, special provisions, packaging authorizations, air transport quantity limitations, and vessel stowage requirements. Furthermore, this final rule addresses the 21 sets of comments received in response to the Notice of Proposed Rulemaking (NPRM) [1] published in May 2023. Overall, the comments to the NPRM were generally supportive of the proposals made; however, PHMSA did receive a few comments seeking further clarification or revisions to the NPRM, which PHMSA also addresses in this final rule. PHMSA expects that the adoption of the regulatory amendments in this final rule will facilitate transportation efficiency while maintaining the high safety standard currently achieved under the HMR. For example, the final rule will update several International Organization for Standards (ISO) standards; revise requirements for the shipping of lithium batteries; and set specification for the construction of Intermediate Bulk Containers (IBCs) constructed from recycled resins. This final rule will also align HMR requirements with anticipated increases in the volume of lithium batteries transported in interstate commerce from electrification of the transportation and other economic sectors. PHMSA also notes that the harmonization of the HMR with international consensus standards could reduce delays and interruptions of hazardous materials during transportation. The amendments may also lower greenhouse gas (GHG) emissions and safety risks, including risks to minority, low income, underserved, and other disadvantaged populations, and communities in the vicinity of interim storage sites and transportation arteries and hubs. The following list summarizes the more noteworthy amendments set forth in this final rule:

- *Incorporation by Reference:* PHMSA is incorporating by reference updated versions of the following international hazardous materials regulations and standards: the 2023–2024 edition of the International Civil Aviation Organization Technical Instructions for the Safe Transport of Dangerous Goods by Air (ICAO Technical Instructions); Amendment 41–22 to the International Maritime Dangerous Goods Code (IMDG Code); and the 22nd revised edition of the United Nations Recommendations on the Transport of Dangerous Goods—Model Regulations (UN Model Regulations).
- *Hazardous Materials Table:* PHMSA is amending the Hazardous Materials Table (HMT; 49 CFR 172.101) to add, revise, or remove certain proper shipping names (PSNs), hazard classes, packing groups (PGs), special provisions (SPs), packaging authorizations, bulk packaging requirements, and passenger and cargo-only aircraft maximum quantity limits.
- *Polymerizing Substances:* In 2017—as part of the HM–215N final rule [2]—PHMSA added four new Division 4.1 (flammable solid) 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. These changes remained in effect until January 2, 2019, while PHMSA used the interim period to review and research the implications of the polymerizing substance amendments. In 2020—as part of the HM–215O [3] final rule—PHMSA extended the date the provisions remained in effect from January 2, 2019, to January 2, 2023, to allow for the additional research to be completed on the topic. In this final rule, PHMSA is removing the phaseout date (January 2, 2023) from the transport provisions for

[1] 88 FR 34568 (May 30, 2023).

[2] 82 FR 15796 (Mar. 30, 2017).

[3] 85 FR 27810 (May 11, 2020).

polymerizing substances to allow for continued use of the provisions.

• *Cobalt dihydroxide powder containing not less than 10 percent respirable particles:* PHMSA is adding a new entry to HMT, ''UN3550 Cobalt dihydroxide powder, *containing not less than 10% respirable particles,*'' and corresponding packaging provisions. Cobalt is a key strategic mineral used in various advanced medical and technical applications around the world, including various types of batteries. Historically, this hazardous material has been classified and transported as a Class 9 material under ''UN3077, Environmentally hazardous substance, solid, n.o.s.;'' however, testing required under Registration, Evaluation, Authorisations and Restriction of Chemicals (REACH) regulations [4] for comprehensive GHS testing determined that this material poses an inhalation toxicity hazard. Following this determination, the 22nd revised edition of the UN Model Regulations developed a new entry on the Dangerous Goods List (DGL) and packaging authorizations specifically for this hazardous material to facilitate continued global transport of this material. In this final rule, PHMSA is adding a new entry for cobalt dihydroxide containing not less than 10 percent respirable particles and assigning it UN3550 in the HMT, in addition to adding packaging provisions, including the authorization to transport this material in flexible IBCs. PHMSA expects these provisions will facilitate the continued transport of this material and keep global supply chains open. *See* 172.101 of the V. Section-by-Section Review of Amendments for additional discussion of these amendments.

• *Lithium Battery Exceptions:* PHMSA is removing the exceptions provided for small lithium cells and batteries for transportation by aircraft. This is consistent with the elimination of similar provisions in the ICAO Technical Instructions. *See* 173.185 of the V. Section-by-Section Review of Amendments for additional discussion of these amendments.

All the amendments are expected to maintain the HMR's high safety standard for the public and the environment. Additionally, PHMSA anticipates that there are safety benefits to be derived from improved compliance related to consistency amongst domestic and international regulations. As further explained in the final regulatory impact analysis (RIA), PHMSA expects that the benefits of each of the amendments (both separately and in the aggregate) in this final rule justify any associated compliance costs. PHMSA estimates that the annualized quantified net cost savings of this rulemaking, using a two percent discount rate, are approximately $6.3 to $14.7 million per year.

II. Background

The Federal Hazardous Materials Transportation Law (49 U.S.C. 5101, *et seq.*) directs PHMSA to participate in relevant international standard-setting bodies and encourages alignment of the HMR with international transport standards, as consistent with promotion of safety and the public interest. *See* 49 U.S.C. 5120. This statutory mandate reflects the importance of international standard-setting activity, in light of the globalization of commercial transportation of hazardous materials. Harmonization of the HMR with those efforts can reduce the costs and other burdens of complying with multiple or inconsistent safety requirements among nations. Consistency between the HMR and current international standards can also enhance safety by:

• Ensuring that the HMR are informed by the latest best practices and lessons learned.

• Improving understanding of, and compliance with, pertinent requirements.

• Facilitating the flow of hazardous materials from their points of origin to their points of destination, thereby avoiding risks to the public and the environment from release of hazardous materials due to delays or interruptions in the transportation of those materials.

• Enabling consistent emergency response procedures in the event of a hazardous materials incident.

PHMSA participates in the development of international regulations and standards for the transportation of hazardous materials. It also adopts within the HMR international consensus standards and regulations consistent with PHMSA's safety mission. PHMSA reviews and evaluates each international standard it considers for incorporation within the HMR on its own merits, including the effects on transportation safety, the environmental impacts, and any economic impact. PHMSA's goal is to harmonize with international standards without diminishing the level of safety currently provided by the HMR or imposing undue burdens on the regulated community.

In final rule HM–181,[5] PHMSA's predecessor—the Research and Special Programs Administration (RSPA)—comprehensively revised the HMR for greater consistency with the UN Model Regulations. The UN Model Regulations constitute a set of recommendations issued by the United Nations Sub-Committee of Experts (UNSCOE) on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals (GHS). The UN Model Regulations are amended and updated biennially by the UNSCOE and serve as the basis for national, regional, and international modal regulations, including the ICAO Technical Instructions and IMDG Code.

PHMSA has evaluated recent updates to the international standards, including review of numerous updated standards for the design, manufacture, testing, and use of packagings, and is revising the HMR to adopt changes consistent with revisions to the 2023–2024 edition of the ICAO Technical Instructions, Amendment 41–22 to the IMDG Code, and the 22nd revised edition of the UN Model Regulations, all of which were published by or in effect on January 1, 2023,[6] while also ensuring the changes are consistent with PHMSA's safety mission. Consequently, PHMSA is incorporating by reference these revised international regulations, several new or updated ISO standards, and a new Organization for Economic Co-operation and Development (OECD) standard. The regulations and standards incorporated by reference are authorized for use for domestic transportation, under specific conditions, in part 171, subpart C of the HMR.

Lastly, PHMSA issued a Notice of Enforcement Policy Regarding International Standards [7] on November 28, 2022, stating that while PHMSA was considering the 2023–2024 Edition of the ICAO Technical Instructions and Amendment 41–22 to the IMDG Code for potential adoption into the HMR, PHMSA and other federal agencies that enforce the HMR—*e.g.,* the Federal Railroad Administration, the Federal Aviation Administration (FAA), the Federal Motor Carrier Safety Administration, and the United States Coast Guard—would not take enforcement action against any offeror or carrier who uses these standards as an alternative to complying with current HMR requirements when all or part of

[4] Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006.

[5] 55 FR 52401 (Dec. 21, 1990).

[6] Amendment 41–22 of the IMDG Code became mandatory on January 1, 2024. Voluntary compliance began on January 1, 2023.

[7] PHMSA, Notice of Enforcement Policy Regarding International Standards (Nov. 28, 2022), *https://www.phmsa.dot.gov/regulatory-compliance/phmsa-guidance/phmsa-notice-enforcement-policy-regarding-international.*

the transportation is by air with respect to the ICAO Technical Instructions, or by vessel with respect to the IMDG Code. In addition, that Notice stated PHMSA, and its modal partners, would not take enforcement action against any offeror or carrier who offers or accepts for domestic or international transportation by any mode packages marked or labeled in accordance with those updated standards. PHMSA now withdraws its November 28, 2022, Notice of Enforcement Policy Regarding International Standards as of the effective date of this final rule.

III. Incorporation by Reference Discussion Under 1 CFR Part 51

According to the Office of Management and Budget (OMB), Circular A–119, ''*Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities,*'' government agencies must use voluntary consensus standards wherever practical in the development of regulations.

PHMSA currently incorporates by reference into the HMR all or parts of numerous standards and specifications developed and published by standard development organizations (SDO). In general, SDOs update and revise their published standards every two to five years to reflect modern technology and best technical practices. The National Technology Transfer and Advancement Act of 1995 (NTTAA; Pub. L. 104–113) directs federal agencies to use standards developed by voluntary consensus standards bodies in lieu of government-written standards whenever possible. Voluntary consensus standards bodies develop, establish, or coordinate technical standards using agreed-upon procedures. OMB issued Circular A–119 to implement section 12(d) of the NTTAA relative to the utilization of consensus technical standards by federal agencies. This circular provides guidance for agencies participating in voluntary consensus standards bodies and describes procedures for satisfying the reporting requirements in the NTTAA. Accordingly, PHMSA is responsible for determining which standards currently referenced in the HMR should be updated, revised, or removed, and which standards should be added to the HMR. Revisions to materials incorporated by reference in the HMR are handled via the rulemaking process, which allows for the public and regulated entities to provide input. During the rulemaking process, PHMSA must also obtain approval from the Office of the Federal Register to incorporate by reference any new materials. The Office of the Federal Register issued a rulemaking [8] that revised 1 CFR 51.5 to require that an agency detail in the preamble of an NPRM the ways the materials it proposes to incorporate by reference are reasonably available to interested parties, or how the agency worked to make those materials reasonably available to interested parties. Changes to the materials incorporated by reference in the HMR are discussed in detail in the § 171.7 discussion in ''V. Section-by-Section Review of Amendments'' section of this document.''

IV. Comment Discussion

In response to the NPRM, PHMSA received 21 sets of comments from the following organizations and other interested parties:

American Association for Laboratory Accreditation (A2LA)	*https://www.regulations.gov/comment/PHMSA-2021-0092-0011.*
Anonymous	*https://www.regulations.gov/comment/PHMSA-2021-0092-0004.*
Airline Pilots Association International (ALPA)	*https://www.regulations.gov/comment/PHMSA-2021-0092-0019.*
Compressed Gas Association (CGA)	*https://www.regulations.gov/comment/PHMSA-2021-0092-0010.*
Council on Safe Transportation of Hazardous Articles (COSTHA)	*https://www.regulations.gov/comment/PHMSA-2021-0092-0015.*
Dangerous Goods Advisor	*https://www.regulations.gov/comment/PHMSA-2021-0092-0024.*
Dangerous Goods Advisory Council (DGAC)	*https://www.regulations.gov/comment/PHMSA-2021-0092-0009.*
Dow Chemical Company	*https://www.regulations.gov/comment/PHMSA-2021-0092-0014.*
Entegris	*https://www.regulations.gov/comment/PHMSA-2021-0092-0006.*
Entegris	*https://www.regulations.gov/comment/PHMSA-2021-0092-0005.*
Entegris	*https://www.regulations.gov/comment/PHMSA-2021-0092-0007.*
Entegris	*https://www.regulations.gov/comment/PHMSA-2021-0092-0021.*
Entegris	*https://www.regulations.gov/comment/PHMSA-2021-0092-0018.*
Hexagon Digital Wave, LLC	*https://www.regulations.gov/comment/PHMSA-2021-0092-0022.*
Household Commercial Products Association (HCPA)	*https://www.regulations.gov/comment/PHMSA-2021-0092-0017.*
Institute of Hazardous Materials Management (IHMM)	*https://www.regulations.gov/comment/PHMSA-2021-0092-0012.*
Medical Device Transport Council (MDTC)	*https://www.regulations.gov/comment/PHMSA-2021-0092-0016.*
Nordco Inspection Technologies	*https://www.regulations.gov/comment/PHMSA-2021-0092-0022.*
PRBA—The Rechargeable Battery Association	*https://www.regulations.gov/comment/PHMSA-2021-0092-0016.*
Reusable Industrial Packaging Association (RIPA)	*https://www.regulations.gov/comment/PHMSA-2021-0092-0008.*
The Rigid Intermediate Bulk Container Association, Inc. (RIBCA)	*https://www.regulations.gov/comment/PHMSA-2021-0092-0016.*

PHMSA received comments from the A2LA, ALPA, COSTHA, DGAC, HCPA, MDTC, and PRBA, all providing general support for harmonization with international standards with additional support from Entegris, and Hexagon Digital Wave for the incorporation by reference of the ISO standards applicable to cylinders.

Comments concerning the compliance date for the phaseout dates for ISO standards, gas mixtures containing fluorine, IBCs manufactured from recycled plastics, and comments outside the scope of this rulemaking are discussed below. All other comments specific to proposed changes to HMR sections are addressed in the ''V. Section-by-Section Review of Amendments'' of this document.

A. Comments Outside the Scope of This Rulemaking

PHMSA received comments from HCPA and MDTC to reconsider the definition of an aerosol in § 171.8 in order to maintain alignment with international regulations and standards. The commenters note that the United Nations (UN) Model Regulations define an aerosol as an article consisting of a non-refillable receptacle containing a gas, compressed, liquefied or dissolved under pressure, with or without a liquid, paste or powder, and fitted with a release device allowing the contents to be ejected as solid or liquid particles in suspension in a gas, as a foam, paste or powder, or in a liquid or gaseous state. The HMR defines an aerosol in § 171.8 as an article consisting of any non-refillable receptacle containing a gas

[8] 79 FR 66278 (Nov. 7, 2014).

compressed, liquefied, or dissolved under pressure, the sole purpose of which is to expel a nonpoisonous (other than a Division 6.1 Packing Group III material) liquid, paste, or powder, and fitted with a self-closing release device allowing the contents to be ejected by the gas.

PHMSA acknowledges the commenter's concerns over the HMR definition of an aerosol not being harmonized with the UN Model Regulations. However, PHMSA did not propose changes in the NPRM and, therefore, declines to make such revisions in this final rule without further evaluation by PHMSA subject matter experts and an opportunity for stakeholders to comment on the issue. PHMSA will continue to evaluate the potential harmonization of the aerosol definition with the international regulations in conjunction with a petition request from the Consumer Specialty Product Association (CSPA).[9]

PHMSA received comments from Entegris, Hexagon Digital Wave, and Nordco Inspection Technologies suggesting that ISO 18119:2018, ''Gas Cylinders—Seamless Steel And Seamless Aluminum-Alloy Gas Cylinders And Tubes—Periodic Inspection and Testing,'' be incorporated by reference into § 171.7(w), and that § 180.207(d)(1) and (d)(2) be revised to reference ISO 18119:2018. The commenters note that ISO 6406:2005(E), ''Gas cylinders—Seamless steel gas cylinders—Periodic inspection and testing,'' and ISO 10461:2005(E), ''Gas cylinders—Seamless aluminum-alloy gas cylinders—Periodic inspection and testing,'' have now been superseded by ISO 18119:2018 in the ISO catalogue. Further, the commenters note that at the end of 2024, the UN Model Regulations will no longer acknowledge ISO 6406:2005(E) and 10461:2005(E).

PHMSA acknowledges the comments for PHMSA to incorporate by reference ISO 18119:2018 into § 171.7(w), and revise § 180.207 (d)(1) and (d)(2) to reference ISO 18119:2018. However, PHMSA did not propose changes in the NPRM and, therefore, declines to make such revisions in this final rule without further evaluation by PHMSA subject matter experts and an opportunity for stakeholders to comment on the issue. PHMSA has received petitions from both FIBA technologies [10] and Hazmat Safety Consulting [11] proposing to incorporate by reference ISO 18119:2018 into § 171.1, and PHMSA plans to propose this revision in an upcoming rulemaking.

IHMM submitted comments highlighting three accredited professional certifications—the Certified Hazardous Materials Manager (CHMM), the Certified Hazardous Materials Practitioner (CHMP), and the Certified Dangerous Goods Professional (CDGP)—that demonstrate expertise in managing hazardous materials, and recommends that PHMSA require companies transporting hazardous materials to appoint certified professionals responsible for regulatory compliance, similar to the dangerous goods safety advisor required by the Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) within the European Union (EU). IHMM believes that in addition to harmonizing standards, governments should harmonize responsibility for the safe transportation of hazardous materials and dangerous goods. IHMM recommends that PHMSA use its authority to require certified professionals oversee compliance at companies engaged in hazardous materials transportation.

PHMSA acknowledges the IHMM's comment concerning certified professionals. However, PHMSA did not propose such changes in the NPRM and, therefore, declines to make such revisions in this final rule without further evaluation by PHMSA subject matter experts and an opportunity for stakeholders to comment on the issue. If the commenter has a specific proposal, PHMSA encourages the commenter to submit a petition for rulemaking in accordance with § 106.100 of the HMR.

A2LA supports the proposed amendments and actions that are being considered in this rulemaking to be consistent with international standards to harmonize activities and promote greater safety and efficiencies. A2LA also encourages PHMSA to take this a step further by recommending that when testing is required, that laboratories approved under ISO/IEC 17025, ''Testing and calibration laboratories,'' be relied upon for testing activities. A2LA asserts that this will help ensure data generated for HMR compliance is developed by accredited bodies. A2LA adds that this revision would provide and establish a framework for the harmonization of accreditation activities globally.

PHMSA acknowledges A2LA's comment concerning laboratories approved under ISO/IEC 17025. However, PHMSA did not propose such changes in the NPRM and, therefore, declines to make such revisions in this final rule without further evaluation by PHMSA subject matter experts and an opportunity for stakeholders to comment on the issue. If the commenter has a specific proposal, PHMSA encourages the commenter to submit a petition for rulemaking in accordance with § 106.100 of the HMR.

B. Phaseout Dates for ISO Standards

CGA and Entegris submitted comments regarding the proposed incorporation of ISO 11117:2019, ''Gas cylinders—Valve protection caps and guards—Design, construction and tests,'' into § 173.301b(c)(2)(ii). CGA and Entegris note that the language proposed in § 173.301b(c)(2)(ii) of the NPRM removes ISO 11117:2008 and creates a phaseout date of December 31, 2026, for its use. To ensure the continued use of existing caps made to previous editions of ISO 11117, CGA and Entegris suggest a revision to § 173.301b(c)(2)(ii) that more closely aligns with sub-paragraph 4.1.6.1.8 of the 22nd edition of the UN Model Regulations. The revision proposed by CGA and Entegris would make it clear that valve caps manufactured up until December 31, 2026, under ISO 11117:2008 could continue to be used under the HMR. CGA and Entegris add that the proposed text in the NPRM would result in an unnecessary economic burden by mandating the replacement of valve protection caps under the HMR that would remain authorized by the UN Model Regulations. Entegris adds that consideration should be given to permit the use of these older valve caps that adhere to ISO 11117:2008.

PHMSA concurs with CGA and Entegris that the intent of the language in the UN Model Regulations was to allow the continued use of the valve protection caps under ISO 11117:2008 provided they are manufactured prior to December 31, 2026. As such, PHMSA is revising the text in § 173.301b(c)(2)(ii) to more closely align with the intent of the UN Model Regulations and allow for the continued use of valve caps manufactured prior to December 31, 2026, under ISO 11117:2008.

CGA also provided comments suggesting that PHMSA modify the regulatory text for all the IBR ISO standards in §§ 178.71 and 178.75 to permit the manufacturing of UN cylinders conforming to the ISO standards being replaced until December 31, 2026, to better align the HMR with the intent of the 22nd edition of the UN Model Regulations. PHMSA concurs with CGA's comment that the intent of this proposal was to closely align with the phaseout language in the

[9] *https://www.regulations.gov/docket/PHMSA-2017-0131/document.*

[10] *https://www.regulations.gov/docket/PHMSA-2020-0168/document.*

[11] *https://www.regulations.gov/document/PHMSA-2023-0088-0001.*

UN Model Regulations. As such, PHMSA has revised the text for the ISO publications in §§ 178.71 and 178.75 to better reflect the phaseout dates as intended and represented in the UN Model Regulations.

C. Gas Mixtures Containing Fluorine

In the NPRM, PHMSA proposed a new special provision for UN pressure receptacles containing fluorine mixed with inert gases. This proposal was intended to provide flexibility for the maximum allowable working pressure for cylinders containing fluorine gas when fluorine is part of a less reactive gas mixture. This revision was supported due to pure fluorine gas being highly reactive and restrictive, while gas mixtures with small amounts of fluorine are less hazardous. The 22nd edition of the UN Model Regulations allows for higher working pressures for cylinders containing gas mixtures of fluorine with inert gases based on the application of partial pressure calculations.

In the NPRM, PHMSA proposed to add special provision 441 to § 172.102 to align with revisions made to the UN Model Regulations for gas mixtures containing fluorine. The NPRM assigned special provision 441 to the proper shipping name ''UN1045, Fluorine, compressed'' in the HMT. CGA and Entegris provided comments stating that the proposed special provision 441 in the NPRM should not be applied to ''UN1045, Fluorine, compressed,'' as mixtures of fluorine with inert gases and a fluorine concentration <35% are no longer Hazard Zone A gases. The commenters add that there is no scenario where a gas classified as ''UN1045, Fluorine compressed'' would be able to qualify for the exception as proposed in special provision 441 of the NPRM. The commenters add that special provision 441 should have been applied to the n.o.s. entries: ''UN3306, Compressed gas, poisonous, oxidizing, corrosive, n.o.s.;'' ''UN3156, Compressed gas, oxidizing, n.o.s.;'' and ''UN1956, Compressed gas, n.o.s.,'' as was done in the 22nd edition of the UN Model Regulations. Entegris and CGA also note that the equations in the NPRM for new special provision 441 have several editorial errors. The amendments made to the UN Model Regulations provide two calculations to calculate the MAWP for mixtures of fluorine and inert gases with a fluorine concentration <35%, both of which contain editorial errors.

PHMSA agrees with the commenters, and in this final rule PHMSA has determined that special provision 441 as proposed in the NPRM would not be appropriate to apply to ''UN1045, Fluorine, compressed.'' Additionally, PHMSA asserts that instead of applying a special provision to all of the applicable UN numbers, it is more appropriate to revise § 173.302b by adding a paragraph (g) for gas mixtures containing fluorine gases as was generally suggested by CGA.[12] This new paragraph in § 173.302b(g)(5) that appears in this final rule has the same wording as was proposed in special provision 441 of the NPRM, with the additional editorial corrections for the partial pressure calculations as suggested by Entegris. PHMSA asserts that by placing these flexibilities in § 173.302b(g), gas mixtures containing fluorine gas will be permitted to take the flexibilities as allowed under the UN Model Regulations.

D. IBCs Manufactured From Recycled Plastics

In the NPRM, PHMSA proposed to revise §§ 178.706(c)(3) and 178.707(c)(3) to allow for the manufacturing of rigid and composite IBCs manufactured from recycled plastics. The NPRM proposed to allow the construction of IBCs from recycled plastics with the approval of the Associate Administrator, consistent with a change adopted in the 22nd revised edition of the UN Model Regulations. In the NPRM, PHMSA proposed including a slight variation from the international provision by requiring prior approval by the Associate Administrator for use of recycled plastics in the construction of IBCs manufactured from recycled plastics.

RIBCA submitted comments expressing disagreement with the proposed requirement for manufacturers to obtain case-by-case approval from PHMSA's Associate Administrator prior to using recycled plastic in the manufacturing of rigid and composite IBCs. RIBCA argued the PHMSA proposal is inconsistent with the UN Model Regulations, which allow the use of recycled plastics meeting a specified definition without any competent authority approval. RIBCA also questioned PHMSA's rationale that approvals are needed due to lack of HMR requirements for manufacturer quality assurance programs, noting these are already integral to ensuring IBC integrity. Further, RIBCA stated that the performance-oriented packaging requirements in the HMR should sufficiently address any safety issues with recycled plastics, as demonstrated by the millions of UN plastic drums and jerricans successfully produced with recycled plastics. RIBCA mentioned that due to constraints under the Administrative Procedure Act, the changes they recommend may fall outside the scope of revisions PHMSA could make in a final rule. Overall, RIBCA recommended that PHMSA align the HMR with the UN Model Regulations and authorize recycled plastic in the manufacturing of IBCs without additional competent authority approvals.

PHMSA acknowledges RIBCAs comments and notes that, in the NPRM, PHMSA stated that the UN Model Regulations incorporate quality assurance program requirements that require recognition by a governing body. By requiring approval of the Associate Administrator, PHMSA is able to maintain oversight of procedures, such as batch testing, that manufacturers will use to ensure the quality of recycled plastics used in the construction of recycled plastic IBCs. PHMSA asserts that the proposals in the NPRM are consistent with the intent of the UN Model Regulations.

Additionally, PHMSA is currently conducting research to develop an Agency-wide policy on packages manufactured from recycled plastics. On April 14, 2023,[13] PHMSA published a request for information (RFI) pertaining to how the potential use of recycled plastic resins in the manufacturing of specification packagings may affect hazardous materials transportation safety. In response to the RFI, PHMSA received nine comments and is currently evaluating those comments in order to determine an Agency-wide policy on recycled plastics in packagings. Until this analysis is complete and PHMSA is ready to deploy an Agency-wide policy, PHMSA asserts it is prudent for now to leave in the requirement to obtain a competent authority approval prior to the manufacturing of IBCs made from recycled plastics. PHMSA also notes that RIPA, DGAC, and Dow Chemical provided comments to the NPRM in support of these revisions as written.

V. Section-by-Section Review of Amendments

The following is a section-by-section review of amendments to harmonize the HMR with international regulations and standards.

[12] PHMSA notes that in a separate rulemaking (HM–219D, ''Adoption of Miscellaneous Petitions and Updating Regulatory Requirements'') that will be published and codified before this final rule, it is adopting a new paragraph (f) within § 173.302b.

[13] *https://www.federalregister.gov/documents/2023/04/14/2023-07869/hazardous-materials-request-for-feedback-on-recycled-plastics-policy.*

A. Part 171

Section 171.7

Section 171.7 provides a listing of all voluntary consensus standards incorporated by reference into the HMR, as directed by the NTTAA. PHMSA evaluated updated international consensus standards pertaining to PSNs, hazard classes, PGs, special provisions, packaging authorizations, air transport quantity limitations, and vessel stowage requirements. PHMSA contributed to the development of those standards—each of which build on the well-established and documented safety histories of earlier editions—as it participated in the discussions and working group activities associated with their proposal, revision, and approval. Those activities, in turn, have informed PHMSA's evaluation of the effect the updated consensus standards will have on safety, when incorporated by reference and with provisions adopted into the HMR. Further, PHMSA notes that some of the consensus standards incorporated by reference within the HMR in this final rule have already been adopted into the regulatory schemes of other countries. Additionally, as noted above, PHMSA has issued past enforcement discretions authorizing the use of the consensus standards as an interim strategy for complying with current HMR requirements. PHMSA is not aware of adverse safety impacts from that operational experience. For these reasons, PHMSA expects their incorporation by reference will maintain the high safety standard currently achieved under the HMR. PHMSA received comments from ALPA, CGA, COSTHA, DGAC, Entegris, and Hexagon Digital Wave that were generally supportive of the proposals to incorporate by reference the latest versions of the international standards. Therefore, PHMSA is adding or revising the following incorporation by reference materials.[14]

• In paragraph (t)(1), incorporate by reference the 2023–2024 edition of the ICAO Technical Instructions, to replace the 2021–2022 edition, which is currently referenced in §§ 171.8; 171.22 through 171.24; 172.101; 172.202; 172.401; 172.407; 172.512; 172.519; 172.602; 173.56; 173.320; 175.10, 175.33; and 178.3. The ICAO Technical Instructions specify detailed instructions for the international safe transport of dangerous goods by air. The requirements in the 2023–2024 edition have been amended to align better with the 22nd revised edition of the UN Model Regulations and the International Atomic Energy Agency (IAEA) Regulations for the Safe Transport of Radioactive Material. Notable changes in the 2023–2024 edition of the ICAO Technical Instructions include new packing and stowage provisions, new and revised entries on its Dangerous Goods List, and editorial corrections. The 2023–2024 edition of the ICAO Technical Instructions is available for purchase on the ICAO website at *https://store.icao.int/en/shop-by-areas/safety/dangerous-goods.*

• In paragraph (v)(2), incorporate by reference the 2022 edition of the IMDG Code, Incorporating Amendment 41–22 (English Edition), to replace Incorporating Amendment 40–20, 2020 Edition, which is currently referenced in §§ 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; and 178.274. The IMDG Code is a unified international code that outlines standards and requirements for the transport of dangerous goods by sea (*i.e.,* by vessel). Notable changes in Amendment 41–22 of the IMDG Code include new packing and stowage provisions, new and revised entries on its Dangerous Goods List, and editorial corrections. Distributors of the IMDG Code can be found on the International Maritime Organization (IMO) website at: *https://www.imo.org/en/publications/Pages/Distributors-default.aspx.*

• In paragraph (w), incorporate by reference or remove the following ISO documents to include new and updated standards for the specification, design, construction, testing, and use of gas cylinders:

• ISO 9809, Parts 1 through 3. ISO 9809 is comprised of four parts (ISO 9809–1 through 9809–4) and specifies minimum requirements for the material, design, construction, and workmanship; manufacturing processes; and examination and testing at time of manufacture for various types of refillable seamless steel gas cylinders and tubes. PHMSA is incorporating by reference the most recent versions of Parts 1 through 3.

• Incorporate by reference the third edition of ISO 9809–1:2019(E), ''*Gas cylinders—Design, construction and testing of refillable seamless steel gas cylinders and tubes—Part 1: Quenched and tempered steel cylinders and tubes with tensile strength less than 1100 Mpa,*'' in paragraph (w)(32). Additionally, PHMSA is allowing a sunset date of December 31, 2026, for continued use and phase out of the second edition of ISO 9809–1:2010, which is currently referenced in § 178.37, § 178.71, and § 178.75. PHMSA clarified in the ''IV: Comment Discussion'' section of this final rule that the phaseout date of December 31, 2026, applies to the manufacturing of cylinders and tubes with tensile strength below 1100 Mpa under ISO 9809–1:2010. Cylinders manufactured before December 31, 2026, under ISO 9809–1:2010 are authorized under the HMR. Part 1 of ISO 9809 is applicable to cylinders and tubes for compressed, liquefied, and dissolved gases, and for quenched and tempered steel cylinders and tubes with a maximum actual tensile strength of less than 1100 MPa, which is equivalent to U.S. customary unit of about 160,000 psi. As part of its periodic review of all standards, ISO reviewed ISO 9809–1:2010(E) and published an updated version, ISO 9809–1:2019(E), which was published in 2019 and adopted in the 22nd revised edition of the UN Model Regulations. The updated standard has technical revisions including limiting the bend test only for prototype tests. Updating references to this document aligns the HMR with changes adopted in the 22nd revised edition of the UN Model Regulations pertaining to the design and construction of UN cylinders. PHMSA has reviewed this edition as part of its regular participation in the review of amendments for the UN Model Regulations and concludes incorporation of the revised third edition will maintain or improve the safety standards associated with its use.

• Incorporate by reference the third edition of ISO 9809–2:2019(E), ''*Gas cylinders—Design, construction and testing of refillable seamless steel gas cylinders and tubes—Part 2: Quenched and tempered steel cylinders and tubes with tensile strength greater than or equal to 1100 MPa,*'' in paragraph (w)(35). ISO 9809–2:2019 is the third edition of ISO 9809–2. Additionally, PHMSA is adding a sunset date of December 31, 2026, for continued use and phaseout of the second edition of ISO 9809–2:2010, which is currently referenced in § 178.71 and § 178.75. PHMSA clarified in the ''Section IV: Comment Discussion'' section of this final rule that the phaseout date of December 31, 2026, applies to the manufacturing of cylinder under ISO 9809–2:2010. Cylinders manufactured before December 31, 2026, under ISO 9809–2:2010 are authorized under the HMR. ISO 9809–2:2019 specifies minimum requirements for the material, design, construction and workmanship;

[14] All other standards that are set out as part of the regulatory text of § 171.7(w) were previously approved for incorporation by reference.

manufacturing processes; and examination and testing at time of manufacture for refillable seamless steel gas cylinders and tubes with water capacities up to and including 450 L. Part 2 of ISO 9809 is applicable to cylinders and tubes for compressed, liquefied, and dissolved gases, and for quenched and tempered steel cylinders and tubes with an actual tensile strength greater than or equal to 1100 MPa. As part of its periodic review of all standards, ISO reviewed ISO 9809–2:2010 and published an updated version, ISO 9809–2:2019, in 2019; this updated version was adopted in the 22nd revised edition of the UN Model Regulations. The updated standard has technical revisions including expanded cylinder size (*i.e.,* allowed water capacity is extended from below 0.5 L up to and including 450 L); the introduction of specific batch sizes for tubes; limiting the bend test only for prototype tests; the addition of test requirements for check analysis (tolerances modified); and the addition of new test requirements for threads. Updating references to this document aligns the HMR with changes adopted in the 22nd revised edition of the UN Model Regulations pertaining to the design and construction of UN cylinders. PHMSA has reviewed this edition as part of its regular participation in the review of amendments for the UN Model Regulations and concludes incorporation of the revised third edition will maintain or improve the safety standards associated with its use.

• Incorporate by reference the third edition of ISO 9809–3:2019(E), ''*Gas cylinders—Design, construction and testing of refillable seamless steel gas cylinders and tubes—Part 3: Normalized steel cylinders and tubes*'' in paragraph (w)(38). Additionally, PHMSA is allowing a sunset date of December 31, 2026, for continued use phaseout of the second edition of ISO 9809–3:2010, which is currently referenced in § 178.71 and § 178.75. PHMSA clarified in the ''Section IV: Comment Discussion'' section of this final rule that the phaseout date of December 31, 2026, applies to the manufacturing of cylinders under ISO 9809–3:2010. Cylinders manufactured before December 31, 2026, under ISO 9808–3:2010 would still be authorized under the HMR. ISO 9809–3 is applicable to cylinders and tubes for compressed, liquefied, and dissolved gases, and for normalized, or normalized and tempered, steel cylinders and tubes. As part of its periodic review of all standards, ISO reviewed ISO 9809–3:2010 and published an updated version, ISO 9809–3:2019. The updated standard has technical revisions including: a wider scope of cylinders (*i.e.,* allowed water capacity is extended from below 0.5 L up to and including 450 L); the introduction of specific batch sizes for tubes; limiting the bend test only for prototype tests; the addition of test requirements for check analysis (tolerances modified); and the addition of new test requirements for threads. Updating references to the 2019 edition aligns the HMR with changes adopted in the 22nd revised edition of the UN Model Regulations, which added this version pertaining to the design and construction of UN cylinders. PHMSA has reviewed this edition as part of its regular participation in the review of amendments for the UN Model Regulations and concludes incorporation of the revised third edition will maintain or improve the safety standards associated with its use.

• Incorporate by reference supplemental amendment ISO 10462:2013/Amd 1:2019(E), ''*Gas cylinders—Acetylene cylinders—Periodic inspection and maintenance—Amendment 1,*'' in paragraph (w)(48). This amendment adds a reference to ISO 10462:2013/Amd 1:2019(E) in § 180.207(d)(3), where ISO 10462:2013 is currently required, and adds a sunset date of December 31, 2024, for continued use and phaseout of ISO 10462:2013 without the supplemental amendment. ISO 10462:2013 specifies requirements for the periodic inspection of acetylene cylinders as required for the transport of dangerous goods and for maintenance in connection with periodic inspection. It applies to acetylene cylinders with and without solvent, and with a maximum nominal water capacity of 150 L. As part of a periodic review of its standards, ISO reviewed ISO 10462:2013, and in June 2019 published a short supplemental amendment, ISO 10462:2013/Amd 1:2019. The supplemental document includes updates such as simplified marking requirements for rejected cylinders. Updating references to this document aligns the HMR with documents referenced in the 22nd revised edition of the UN Model Regulations pertaining to the requalification procedures for acetylene UN cylinders. PHMSA has reviewed this edition as part of its regular participation in the review of amendments for the UN Model Regulations and concludes the incorporation of the supplemental document maintains the HMR safety standards for use of acetylene cylinders.

• Incorporate by reference the third edition of ISO 11117:2019(E), ''*Gas cylinders—Valve protection caps and guards—Design, construction and tests,*'' in paragraph (w)(56). This amendment authorizes the use of the third edition until further notice, and adds an end date of December 31st, 2026, to the authorization for use of the second edition—ISO 11117:2008—and the associated corrigendum, which are currently referenced in § 173.301b. ISO 11117 specifies the requirements for valve protection caps and valve guards used on cylinders for liquefied, dissolved, or compressed gases. The changes in this revised standard pertain to the improvement of the interoperability of both the valve protection caps and the valve guards, with the cylinders and the cylinder valves. To that end, the drop test, the marking, and test report requirements have been revised and clarified. Updating references to this document aligns the HMR with changes adopted in the 22nd revised edition of the UN Model Regulations pertaining to valve protection on UN pressure receptacles. PHMSA has reviewed this edition as part of its regular participation in the review of amendments for the UN Model Regulations and does not expect any degradation of safety standards in association with its use.

• Incorporate by reference ISO 11118:2015/Amd 1:2019(E), ''*Gas cylinders—Non-refillable metallic gas cylinders—Specification and test methods—Amendment 1,*'' in paragraph (w)(59). ISO 11118:2015/Amd 1:2019(E) is a short supplemental amendment that is intended to be used in conjunction with ISO 11118:2015, which is currently referenced in § 178.71. This amendment authorizes the use of this supplemental amendment in conjunction with ISO 11118:2015 until further notice, and adds an end date of December 31, 2026, until which ISO 11118:2015 may continue to be used without this supplemental amendment. ISO 11118:2015, which specifies minimum requirements for the material, design, inspections, construction and workmanship; manufacturing processes; and tests at manufacture of non-refillable metallic gas cylinders of welded, brazed, or seamless construction for compressed and liquefied gases, including the requirements for their non-refillable sealing devices and their methods of testing. ISO 11118:2015/Amd 1:2019 corrects the identity of referenced clauses and corrects numerous typographical errors. The amendment

also includes updates to the marking requirements in the normative Annex A, which includes clarifications, corrections, and new testing requirements. Updating references to this document aligns the HMR with documents referenced in the 22nd revised edition of the UN Model Regulations pertaining to non-refillable UN cylinders. PHMSA has reviewed this amended document as part of its regular participation in the review of amendments for the UN Model Regulations and determined the added corrections and clarifications provide important additional utility for users of ISO 11118:2015(E). PHMSA does not expect any degradation of safety standards in association with its use and expects updates to these safety standards may provide an additional level of safety.

• Incorporate by reference ISO 11513:2019, ''*Gas cylinders—Refillable welded steel cylinders containing materials for sub-atmospheric gas packaging (excluding acetylene)—Design, construction, testing, use and periodic inspection,*'' in paragraph (w)(71). ISO 11513:2019 is the second edition of ISO 11513. This amendment authorizes the use of the second edition and adds an end date to the authorization for use of the first edition, ISO 11513:2011 (including Annex A), which is currently referenced in § 173.302c, § 178.71, and § 180.207. ISO 11513 specifies minimum requirements for the material, design, construction, workmanship, examination, and testing at manufacture of refillable welded steel cylinders for the sub-atmospheric pressure storage of liquefied and compressed gases. The second edition has been updated to amend packing instructions and remove a prohibition on the use of ultrasonic testing during periodic inspection. Updating references to this document aligns the HMR with documents referenced in the 22nd revised edition of the UN Model Regulations pertaining to the shipment of adsorbed gases in UN pressure receptacles. PHMSA has reviewed this edition as part of its regular participation in the review of amendments for the UN Model Regulations and does not expect any degradation of safety standards in association with its use and expects updates to these safety standards may provide an additional level of safety.

• Incorporate by reference ISO 16111:2018, ''*Transportable gas storage devices—Hydrogen absorbed in reversible metal hydride,*'' in paragraph (w)(80). ISO 16111:2018 is the second edition of ISO 16111. This amendment authorizes the use of the second edition until further notice, and adds an end date of December 31, 2026, on the authorization to use the first edition, ISO 16111:2008, which is referenced in §§ 173.301b, 173.311, and 178.71. PHMSA clarified in the ''Section IV: Comment Discussion'' section of this final rule that the phaseout date of December 31, 2026, applies to the manufacturing of metal hydride storage devices under ISO 16111:2008. Metal hydride storage systems manufactured before December 31, 2016, under ISO 16111:2009 are still authorized under the HMR. ISO 16111 defines the requirements applicable to the material, design, construction, and testing of transportable hydrogen gas storage systems, which utilize shells not exceeding 150 L internal volume and having a maximum developed pressure not exceeding 25 MPa. This updated standard includes additional information pertaining to service temperature conditions that have been described in detail; new references related to shell design; modified drop test conditions; modified acceptance criteria for leak testing; modified hydrogen cycling conditions; new warning labelling; and updated information on safety data sheets. Updating references to this document aligns the HMR with documents referenced in the 22nd revised edition of the UN Model Regulations pertaining to metal hydride storage systems. PHMSA has reviewed this edition as part of its regular participation in the review of amendments for the UN Model Regulations and expects updates to these safety standards may provide an additional level of safety.

• Incorporate by reference ISO 17871:2020(E), ''*Gas cylinders—Quick-release cylinder valves—Specification and type testing,*'' in paragraph (w)(83). ISO 17871:2020 is the second edition of ISO 17871. This amendment authorizes the use of the second edition and adds an end date of December 31, 2026, to the authorization for use of the first edition, ISO 17871:2015(E), which is currently referenced in 173.301b. This document, in conjunction with ISO 10297 and ISO 14246, specifies design, type testing, marking, manufacturing tests, and examination requirements for quick-release cylinder valves intended to be fitted to refillable transportable gas cylinders, pressure drums, and tubes that convey certain gases, such as compressed or liquefied gases, or extinguishing agents charged with compressed gases to be used for fire-extinguishing, explosion protection, and rescue applications. As part of its regular review of its standards, ISO updated and published the second edition of ISO 17871 as ISO 17871:2020. The 2020 edition of this standard broadens the scope to include quick release valves for pressure drums and tubes, and specifically excludes the use of quick release valves with flammable gases. Other notable changes include the addition of the valve burst test pressure; the deletion of the flame impingement test; and the deletion of internal leak tightness test at −40 °C for quick release cylinder valves used only for fixed fire-fighting systems installed in buildings. Updating references to this document aligns the HMR with changes adopted in the 22nd revised edition of the UN Model Regulations pertaining to the shipment of gases in UN pressure receptacles. PHMSA has reviewed this edition as part of its regular participation in the review of amendments for the UN Model Regulations and does not expect any degradation of safety standards in association with its use.

• Incorporate by reference ISO 21172–1:2015/Amd 1:2018, ''*Gas cylinders—Welded steel pressure drums up to 3000 litres capacity for the transport of gases—Design and construction—Part 1: Capacities up to 1000 litres—Amendment 1,*'' in paragraph (w)(89). ISO 21172–1:2015/Amd1:2018 is a short supplemental amendment intended to be used in conjunction with ISO 21172–1:2015, which is currently referenced in § 178.71. This amendment authorizes the use of this supplemental document in conjunction with the first edition, ISO 21172–1:2015. It also adds an end date of December 31, 2026, until which ISO 21172–1:2015 may continue to be used without this supplemental amendment. ISO 21172–1:2015 specifies the minimum requirements for the material, design, fabrication, construction, workmanship, inspection, and testing at manufacture of refillable welded steel gas pressure drums of volumes 150 L to 1,000 L, and up to 300 bar (30 MPa) test pressure for compressed and liquefied gases. This supplemental amendment includes updated references and removes the restriction on corrosive substances. Updating references to this document aligns the HMR with documents referenced in the 22nd revised edition of the UN Model Regulations pertaining to the design and construction of UN pressure drums. PHMSA has reviewed this edition as part of its regular participation in the review of amendments for the UN Model Regulations and does not expect any

degradation of safety standards in association with its use.

• Incorporate by reference ISO 23088:2020, ''*Gas cylinders—Periodic inspection and testing of welded steel pressure drums—Capacities up to 1000 l,*'' in paragraph (w)(91). This amendment incorporates by reference the first edition of ISO 23088, which specifies the requirements for periodic inspection and testing of welded steel transportable pressure drums of water capacity from 150 L up to 1,000 L, and up to 300 bar (30 MPa) test pressure intended for compressed and liquefied gases in § 180.207. This new standard was adopted in the 22nd revised edition of the UN Model Regulations because it fulfills the need for specific periodic inspection instructions for pressure drums constructed in accordance with ISO 21172–1. Incorporating by reference this document aligns the HMR with standards adopted in the 22nd revised edition of the UN Model Regulations pertaining to the design, construction, and inspection of UN pressure drums. PHMSA has reviewed this document as part of its regular participation in the review of amendments for the UN Model Regulations and expects that its addition will facilitate the continued use of UN pressure drums with no degradation of safety.

• In paragraph (aa)(3), incorporate by reference the OECD Guidelines for the Testing of Chemicals, ''Test No. 439: *In Vitro* Skin Irritation: Reconstructed Human Epidermis Test Method'' (2015). This Test Guideline (TG) provides an *in vitro* procedure that may be used for the hazard identification of irritant chemicals. PHMSA is amending the HMR to reference this test in § 173.137, and to authorize the use of this test method in addition to those already referenced in that section. This test method is used to specifically exclude a material from classification as corrosive, and to maintain alignment with the 22nd revised edition of the UN Model Regulations. This test method provides an *in vitro* procedure that may be used for the hazard identification of irritant chemicals (substances and mixtures). OECD test methods can be found in the OECD iLibrary available at *https://www.oecd-ilibrary.org.*

• In paragraph (dd), incorporate by reference United Nations standards including:

→ ''The Recommendations on the Transport of Dangerous Goods—Model Regulations,'' 22nd revised edition (2021), Volumes I and II, in paragraph (dd)(1), which are referenced in §§ 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; and 178.274. The Model Regulations provide framework provisions promoting uniform development of national and international regulations governing the transportation of hazardous materials by various modes of transport. At its tenth session on December 11, 2020, the UNSCOE on the Transport of Dangerous Goods adopted amendments to the UN Model Regulations on the Transport of Dangerous Goods concerning, inter alia, electric storage systems (including modification of the lithium battery mark and provisions for transport of assembled batteries not equipped with overcharge protection); requirements for the design, construction, inspection, and testing of portable tanks with shells made of fiber reinforced plastics (FRP) materials; modified listings of dangerous goods; and additional harmonization with the IAEA Regulations for the Safe Transport of Radioactive Material. PHMSA participates in the development of the UN Model Regulations and has determined that the amendments adopted in the 22nd revised edition support the safe transport of hazardous materials and as such are appropriate for incorporation in the HMR. The 22nd revised edition of the UN Model Regulations is available online at *https://unece.org/transport/dangerous-goods/un-model-regulations-rev-22.*

→ ''The Manual of Tests and Criteria, Amendment 1 to the Seventh revised edition'' (Rev.7/Amend.1) (2021), in paragraph (dd)(2)(ii), which is referenced in §§ 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; and 178.274. The Manual of Tests and Criteria contains instruction for the classification of hazardous materials for purposes of transportation according to the UN Model Regulations. At its tenth session, the Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals adopted a set of amendments to the seventh revised edition of the Manual, which were circulated and collected in amendment 1 to the seventh revised edition. The new amendments adopted in December 2020 pertain to the transport of explosives, including alignment with revised Chapter 2.1 of the GHS, classification of self-reactive substances and polymerizing substances, and the assessment of the thermal stability of samples and temperature control assessment for transport of self-reactive substances and organic peroxides. PHMSA has reviewed and approved the amendments adopted in this document and further expects that their incorporation in the HMR will provide an additional level of safety. PHMSA is incorporating by reference this document as a supplement, to be used in conjunction with the seventh revised edition (2019). The amendments to the manual can be accessed at *https://unece.org/transport/dangerous-goods/rev7-files.*

→ ''Globally Harmonized System of Classification and Labelling of Chemicals (GHS),'' ninth revised edition (2021) in paragraph (dd)(3), which is referenced in § 172.401. The GHS standard provides a basic scheme to identify and communicate the hazards of substances and mixtures. At its tenth session on December 11, 2020, the Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals adopted a set of amendments to the eighth revised edition of the GHS which include, inter alia: revisions to Chapter 2.1 (explosives) to better address their explosion hazard when they are not in their transport configuration; revisions to decision logics; revisions to classification and labelling summary tables in Annex 1; revisions and additional rationalization of precautionary statements; and updates of references to OECD test guidelines for the testing of chemicals in Annexes 9 and 10. PHMSA has reviewed and approved the amendments incorporated in this document and further expects that its incorporation in the HMR will provide an additional level of safety. The ninth revised edition of the GHS can be accessed at *https://unece.org/transport/standards/transport/dangerous-goods/ghs-rev9-2021.*

Section 171.12

Section 171.12 prescribes requirements for shipments of hazardous materials in North America, including use of the Transport Canada (TC) Transportation of Dangerous Goods (TDG) Regulations. In rule HM–215N,[15] PHMSA amended the HMR to expand recognition of cylinders and pressure receptacles, and certificates of equivalency—Transport Canada's equivalent of a special permit—approved in accordance with the TDG Regulations. The goal of these amendments was to promote flexibility; permit the use of modern technology for

[15] 82 FR 15796 (Mar. 30, 2017).

the requalification and use of pressure receptacles; expand the universe of pressure receptacles authorized for use in hazardous material transport; reduce the need for special permits; and facilitate cross-border transportation of these pressure receptacles. In accordance with § 171.12(a)(4), when the provisions of the HMR require the use of either a DOT specification or a UN pressure receptacle for transport of a hazardous material, a packaging authorized by Transport Canada's TDG Regulations may be used only if it corresponds to the DOT specification or UN standard. HM–215N revised paragraph (a)(4)(iii) to include a table listing Canadian Railway Commission (CRC), Board of Transport Commissioners for Canada (BTC), Canadian Transport Commission (CTC), or Transport Canada (TC) specification cylinders, in accordance and full conformance with the TDG Regulations, that correspond with a DOT specification cylinder.

However, currently there are no TC specification cylinders corresponding to DOT specification cylinders listed in the table for DOT–8 and DOT–8AL cylinders used to transport acetylene. During the development of HM–215N, PHMSA conducted a comparative analysis of DOT and TC cylinder specifications, and only those TC cylinder specifications that corresponded directly to DOT cylinder specifications were included. As a result, PHMSA did not include TC–8WM and TC–8WAM specifications for the transport of acetylene in the table of corresponding cylinders at § 171.12(a)(4)(iii). This omission was primarily due to concerns over differing solvent authorizations, calculations, and methods of construction for the design associated with the TC–8WM and TC–8WAM specifications. PHMSA conducted a second comparative analysis of DOT and TC cylinder specifications for transport of acetylene and concluded that the initial concerns were unwarranted. Therefore, PHMSA is adding TC–8WM and TC–8WAM specifications to the table of corresponding DOT specifications in § 171.12(a)(4)(iii) as comparable cylinders to DOT–8 and DOT–8AL, respectively. PHMSA's supplemental review indicates the differences between the TC and DOT specifications for transport of acetylene are minor, and the standard for safety of transportation of acetylene in cylinders under the HMR is maintained. This amendment allows for TC acetylene cylinders manufactured in Canada to be filled, used, and requalified (including rebuild, repair, and reheat-treatment) in the United States, facilitating cross border movement of acetylene and eliminating the need for a special permit to allow transport of acetylene in these TC–8WM and TC–8AWM cylinders while maintaining an equivalent level of safety. Additionally, this amendment provides reciprocity to TC's authorized use of DOT–8 and DOT–8AL cylinders for acetylene transport. DGAC and CGA provided comments in support of this revision. Additionally, DGAC urges TC and PHMSA to work to mutually recognize competent authority approvals and special permits. DGAC adds that mutual recognition of these authorities will further enable companies to move hazardous material in a safe and expeditious manner, eliminating unnecessary applications to both regulatory authorities, while maintaining safe transportation for hazardous materials. PHMSA acknowledges DGAC's comment and will continue to work with TC on efforts to harmonize the TDG with the HMR in the future.

Section 171.23

Section 171.23 outlines the requirements for specific materials and packagings transported under the ICAO Technical Instructions, IMDG Code, TC TDG Regulations, or the IAEA Regulations. It also includes authorized use, under specific conditions, of pi-marked pressure receptacles that comply with the Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR), and the EU Directive 2010/35/EU,[16] and marked with a pi (π) symbol to denote such compliance for transport of hazardous materials. PHMSA is amending the language in the provisions for pi-marked pressure receptacles in paragraph (a)(3) to clarify the scope of pressure receptacles authorized by this section. ''Pressure receptacles'' is a collective term that may be used to refer to many types of pressurized containers of various sizes, such as cylinders, tubes, pressure drums, closed cryogenic receptacles, metal hydride storage systems, bundles of cylinders, or salvage pressure receptacles. When PHMSA adopted the provisions for pi-marked pressure receptacles,[17] it did not intend to broadly apply the scope to all pressure receptacle types. Instead, PHMSA's intent was to apply the authorized use of pi-marked pressure receptacles domestically only to cylinders, as indicated in current paragraph (a)(3)(iii), which specifically references cylinders. Some of the pressure receptacles authorized in accordance with the ADR standard do not have an equivalent packaging authorized in the HMR, and some have large capacities, both of which give pause to PHMSA with respect to the hazardous materials authorized in these packagings. Therefore, PHMSA is replacing the words ''pressure receptacles'' in paragraph (a)(3) with ''cylinders with a water capacity not exceeding 150 L,'' as defined in § 171.8, to specify the scope of pi-marked pressure receptacles authorized under § 171.23. PHMSA expects that this amendment will improve safety by providing additional clarity with regard to the scope of authorized use of pi-marked pressure receptacles for transport of hazardous material in the United States. PHMSA is aware of growing interest in the authorization for use of other pi-marked pressure receptacles and PHMSA plans to address that issue in a future rulemaking. CGA and DGAC provided a comment in support of this revision.

Section 171.25

Section 171.25 outlines additional requirements for the use of the IMDG Code in addition to those found in § 171.22 and § 171.23. As discussed in the NPRM, PHMSA is not adopting provisions for UN FRP portable tanks in the HMR. However, to facilitate limited import and export of these tanks in international commerce, and to gain additional experience with their transport, PHMSA is adding a new paragraph—§ 171.25(c)(5)—that prohibits the general transportation of UN FRP portable tanks designed and constructed in accordance with Chapter 6.10 of the IMDG Code within the United States, yet allows for the tanks to be transported within a single port area in the United States in accordance with the provisions of § 171.25(d) covering the use of the IMDG Code in port areas. This action will maintain the safe transportation of hazardous material under the HMR while facilitating international commerce by permitting the import or export of hazardous materials in UN FRP portable tanks, and limiting their use and movement within the confines of a single port area. DGAC provided comments in support of this revision.

[16] U.N. Econ. Comm'n for Europe, Transportation Division, Agreement Concerning the Int'l Carriage of Dangerous Goods by Road, 110th Sess., ECE/TRANS/300, U.N. Sales No. E. 21. VIII. 1 (2020).

[17] 85 FR 75680 (Nov. 25, 2020).

B. Part 172

Section 172.101 Hazardous Materials Table (HMT)

The HMT summarizes terms and conditions governing transportation of listed hazardous materials under the HMR. For each entry, the HMT identifies information such as the PSN, UN identification number, and hazard class. The HMT specifies additional information or reference requirements in the HMR such as hazard communication, packaging, quantity limits aboard aircraft, and stowage of hazardous materials aboard vessels. PHMSA is making several changes to the HMT as discussed below. For purposes of the Government Publishing Office's typesetting procedures, changes to the HMT appear under three sections of the HMT: ''remove,'' ''add,'' and ''revise.'' Certain entries in the HMT, such as those with revisions to the PSNs, appear as a ''remove'' and ''add.'' Amendments to the HMT include the following:

New HMT Entry

PHMSA is adding a new entry, ''UN3550, Cobalt dihydroxide powder, *containing not less than 10% respirable particles,* Division 6.1, PG I,'' to the HMT. Cobalt is a key strategic mineral used in various advanced medical and technical applications around the world, and it is essential to keep the global supply chains for this material open. This material has a 40-year history of safe global transport as ''UN3077, Environmentally hazardous substance, solid, n.o.s., Class 9'' in different forms, including as crude material directly from mines, high moisture content paste, and very fine refined powders in flexible IBCs rated for PG III. However, recent testing required for compliance with the REACH Regulation in the European Union, and subsequent evaluation against the hazard classification criteria of the EU Classification, Labelling, and Packaging (CLP) Regulation, resulted in a classification of Acute toxicity by inhalation Category 1, which is equivalent to the Division 6.1 hazard classification. As a result of this testing, it was determined that when this material is in fine powder form, it must no longer be transported as Class 9 miscellaneous hazard material. In powder form, cobalt dihydroxide powder must now be classified as a Division 6.1 toxic-by-inhalation solid material, for which a unique UN identification number and associated classification, hazard communication, and packing instructions do not currently exist in the HMT. This change in classification led to the development of the new UN identification number UN3550 and associated transportation requirements by the UNSCOE. To that end, the UNSCOE developed appropriate packaging provisions, including a special packaging condition, which permits the continued use of certain flexible IBCs. PHMSA notes that other forms of cobalt dihydroxide powder may continue to be classified and described as ''UN3077, Environmentally hazardous, solid, n.o.s., 9, PG III.'' Specifically, the UNSCOE addressed shipper concerns that flexible IBCs are not otherwise permitted for transport of Division 6.1 toxic solids, yet there is a 40-year record of safe transport of the refined material as UN3077 material in flexible IBCs, with no recorded accidents, incidents, or health issues. PHMSA is also adding a corresponding special provision (IP22) to indicate that the use of certain flexible IBCs is permitted for UN3550, which is discussed further in § 172.102 of this Section-by-Section Review. The other packaging provisions for this cobalt dihydroxide powder are consistent with those for other Division 6.1 solid materials assigned PG I, such as ''UN3467, Organometallic compound, solid, toxic, n.o.s.'' An entry for UN3550 was also added in the 2023–2024 ICAO Technical Instructions and aligns with the packaging requirements in this final rule. PHMSA agrees with the UN provision to allow for the continued transport of this hazardous material in flexible IBCs, or in accordance with other special provisions and packaging requirements outlined in Part 173. The addition of this new HMT entry will maintain the HMR's safety standard for transportation of Division 6.1 solid materials.

HMT Corrections

PHMSA is making corrections to multiple HMT entries that were inadvertently modified in previous rulemakings. Specifically, for the PGII and PGIII entries for ''UN3129, Water-reactive liquid, corrosive, n.o.s.'' and ''UN3148, Water-reactive liquid, n.o.s.,'' the references to exceptions in § 173.151 in Column 8A were removed and replaced with the word ''None.'' While there are no exceptions for these materials when assigned to PGI, PHMSA did not intend to remove the exceptions for PGII and III materials. Additionally, for the PGIII entry for ''UN3148, Water-reactive liquid, n.o.s.,'' the ''G'' in Column 1, which indicates that a technical name must be provided in association with the proper shipping name, was also inadvertently deleted. PHMSA expects that making these editorial corrections will prevent frustrations in shipping due to the inadvertent removal of the reference to authorized shipping exceptions and prevent confusion regarding the required shipping description. PHMSA also is making a correction to the entry ''UN0512, Detonators, electronic programmable for blasting.'' In HM–215P, PHMSA added three new entries for electronic detonators to distinguish them from electric detonators, which have different functioning characteristics but similar regulatory provisions for their transport. PHMSA incorrectly assigned an obsolete special provision, Special Provision 103, which was removed from the HMR by final rule HM–219C.[18] UN0512 is comparable to the entry UN0255 and therefore should reflect the same special provision, Special Provision 148. Therefore, PHMSA is removing the reference to Special Provision 103 in Column 7 for UN0512 and replacing it with Special Provision 148 consistent with the entry of UN0255. PHMSA expects this correction will remove confusion surrounding additional provisions for these detonators. Lastly, PHMSA is making a correction to the proper shipping name for UN3380, which should read ''Desensitized explosive, solid, n.o.s.'' In the previous HM–215 rulemaking, the word ''explosive'' was inadvertently made plural. This spelling is in conflict with a similar material on the HMT, ''UN3379, Desensitized explosive, liquid, n.o.s.,'' and international regulations. Therefore, PHMSA expects that this correction will remove confusion surrounding the proper shipping name for these materials.

PHMSA is also making a correction to the HMT entry for ''UN1791, Hypochlorite Solutions.'' In HM–215O, PHMSA added stowage codes 53 and 58—which require stowage ''separated from alkaline compounds'' and ''separated from cyanides,'' respectively—to Column 10B of the HMT for several hazardous materials for consistency with changes included in Amendment 39–18 of the IMDG Code. These stowage codes were intended to be applied to several HMT entries to ensure proper segregation between acids and both amines and cyanides, but should not have included UN1791. Therefore, PHMSA is removing stowage codes 53 and 58 from Column 10B for this entry. PHMSA expects that this correction will remove the burden faced by shippers who have had to segregate hypochlorite solutions for compliance with the HMR, which is inconsistent

[18] 85 FR 75680 (Nov. 25, 2020).

with the requirements of the IMDG Code.

Lastly, PHMSA is making a correction to the HMT entry for ''UN3021, Pesticides, liquid, flammable, toxic, *flash point less than 23 degrees C.*'' On December 27, 2022, PHMSA published the HM–260B [19] final rule titled ''Hazardous Materials: Editorial Corrections and Clarifications,'' which intended to only revise the hazardous materials description in Column 2 to italicize ''flash point less than 23 degrees C'' so that it is understood it is not part of the required PSN as it is now reflected in the HMT—''UN3021, Pesticides, liquid, flammable, toxic, *flash point less than 23 degrees C.*'' However, this revision unintentionally left out the PG II line for the ''UN3021, Pesticides, liquid, flammable, toxic, *flash point less than 23 degrees C*'' entry, and thus it was inadvertently revised in the HMT to only show the PG I line of the table entry for this hazardous material description. Therefore, in this final rule, PHMSA is revising the entry under ''UN3021, Pesticides, liquid, flammable, toxic, *flash point less than 23 degrees C*'' to again include the PG II line as it was never intended to be removed, and to avoid confusion by stakeholders whether there is no longer a PG II line with associated references for authorized packaging and transportation conditions for this table entry.

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 PSNs. PHMSA is consolidating two entries in the HMT that are currently listed under ''UN1169, Extracts, aromatic, liquid'' (PGII and PGIII) and ''UN1197, Extracts, flavoring, liquid'' (PGII and PGIII). Specifically, PHMSA is removing the table entry for ''UN1169, Extracts, aromatic, liquid'' and modifying the PSN associated with the table entry for UN1197 to reflect materials that have been historically transported separately under UN1169 and UN1197. The 22nd revised edition of the UN Model Regulations made these same changes, deleting UN1169 from the Dangerous Goods List and changing the PSN for UN1197 to ''Extracts, liquid, for flavor or aroma'' to remove confusion associated with selection of the appropriate PSNs across the various languages of nations engaged in international shipments of the material. It became apparent that, whether for a flavor extract or aroma extract, the PSNs were often used interchangeably as there is no difference between the two with regard to classification, hazard communication, and packaging for transport. PHMSA agrees that the existence of two interchangeable UN numbers does not provide any additional value and, therefore, is removing the table entry for UN1169 and modifying the PSN for UN1197 to read ''Extracts, liquid, *for flavor or aroma.*'' Additionally, PHMSA is amending the text of paragraph (c)(12)(ii), which outlines requirements for generic or n.o.s. descriptions. The text of this paragraph provides an example using ''Extracts, flavoring, liquid.'' Therefore, PHMSA is amending the wording of that example by replacing ''Extracts, flavoring, liquid'' with ''Extracts, liquid, for flavor or aroma'' to correspond to the amended PSN for UN1197. This action maintains the current level of safety for transportation of liquid extracts.

Column (3) Hazard Class or Division

Section 172.101(d) describes column (3) of the HMT, which designates the hazard class or division corresponding to the PSN of that entry. Consistent with changes adopted in the 22nd revised edition of the UN Model Regulations, PHMSA is changing the primary hazard classification for the entry ''UN1891, Ethyl Bromide,'' from a toxic liquid of Division 6.1 to a Class 3 flammable liquid. This change in classification is consistent with the change adopted in the 2023–2024 ICAO Technical Instructions, as well as the UN Model Regulations, and is based on new test data indicating that the flash point and boiling point of ethyl bromide has a core flammability hazard according to the Class 3 classification criteria of the ICAO Technical Instructions. More specifically, different data sources showed that its flash point of −20 °C (−4 °F) and its boiling point of 38 °C (100.4 °F) meet the criteria for assignment as a Class 3 at the PG II level—the criteria of which is having a flash point <23 °C and boiling point >35 °C. Additionally, rather than classifying ethyl bromide solely as a Class 3 flammable liquid, it was determined that the Division 6.1 hazard still applies and should remain assigned as a subsidiary hazard. This is consistent with the HMR precedence of hazard table in § 173.2a, which states that a material that meets criteria for classification as both Class 3 and Division 6.1 (except for when a material meets the PG I poison-by-inhalation criteria), the flammability hazard takes precedence and is the primary hazard. These changes in hazard class and associated packaging requirements were adopted to ensure that the hazards of ethyl bromide are accurately communicated and appropriately packaged. PHMSA reviewed these findings and agrees it is appropriate to classify ethyl bromide as a flammable liquid, with a subsidiary Division 6.1 hazard. Because of this change in hazard class, additional conforming changes to the HMT entry for ethyl bromide are required in column (6), as discussed below. Additionally, PHMSA expects that clearly identifying the flammability hazard posed by this material will improve safety by ensuring that the material is handled appropriately before and during transport.

Column (6) Label Codes

Section 172.101(g) describes column (6) of the HMT, which contains label codes representing the hazard warning labels required for a package filled with a material conforming to the associated hazard class and proper shipping name, unless the package is otherwise excepted from labeling. The first code is indicative of the primary hazard of the material. Additional label codes are indicative of subsidiary hazards. As discussed above, PHMSA is modifying the primary hazard class for ''UN1891, Ethyl bromide'' to Class 3. Consistent with this change, PHMSA is assigning Class 3 as the primary hazard label and Division 6.1 as a subsidiary hazard label. Consequently, PHMSA is amending column (6) of the HMT for this entry to reflect the warning labels required for the transport of this hazardous material. PHMSA expects that this change will improve safety by clearly communicating the transportation hazards of this material.

Column (7) Special Provisions

Section 172.101(h) describes column (7) of the HMT, which assigns special provisions for each HMT entry. Section 172.102 provides for the meaning and requirements of the special provisions assigned to entries in the HMT. The revisions to column (7) of certain entries in the HMT are discussed below.

Special Provision 396

PHMSA is adding a new special provision, Special Provision 396, and assigning it to ''UN3538, Articles containing non-flammable, non-toxic gas, n.o.s.'' DGAC noted that PHMSA had inadvertently left out Special Provision 396 in column 7 for ''UN3538, Articles containing non-flammable, non-toxic gas, n.o.s.'' PHMSA has revised that editorial error in this final rule. For

[19] 87 FR 79752 (Dec. 27, 2022).

additional information, *see* § 172.102 of the Section-by-Section Review.

Special Provision 398

PHMSA is assigning a newly added special provision, Special Provision 398, which pertains to the potential classification of butylene and butylene mixtures as UN1012. This special provision clarifies that butylene mixtures and certain butylene isomers may be assigned to UN1012, while specifically excluding isobutylene from this UN classification. For additional information, *see* § 172.102 of the Section-by-Section Review.

Special Provisions A4 and A5

PHMSA is assigning Special Provision A4 to the entry ''UN2922, Corrosive liquid, toxic, n.o.s.'' and Special Provision A5 to the entry ''UN2923, Corrosive solid, toxic, n.o.s.'' Special Provisions A4 and A5 address liquids and solids in PG I that also pose an inhalation toxicity hazard by limiting or prohibiting their transportation on aircraft. In principle, all liquids or solids that have an inhalation toxicity hazard, and assigned PG I, should be subject to one of the two special provisions, as appropriate. However, UN2922 and UN2923 are assigned Class 8 as the primary hazard and Division 6.1 as a subsidiary hazard because of classification guidelines that require hazardous materials that meet the criteria of Class 8, and have an inhalation toxicity of dusts and mists (LC50) in the range of PG I, but toxicity through oral ingestion or dermal contact only in the range of PG III or less, must be assigned to Class 8 as the primary hazard rather than Division 6.1. In reviewing these provisions, the ICAO Dangerous Goods Panel (DGP) determined that additional restrictions should be implemented for these hazardous materials as the corrosive classification assigned to UN2922 and UN2923 does not negate the inhalation toxicity hazard. Because of the inhalation hazard posed by these materials, the 2023–2024 ICAO Technical Instructions included an amendment to impose quantity limits for transportation of these materials by air. PHMSA agrees with this determination and therefore is assigning Special Provision A4 to UN2922, which prohibits this material from transport on passenger and cargo-only aircraft. PHMSA also is assigning Special Provision A5 to UN2923, which prohibits this material on passenger aircraft and limits the amount that may be transported on cargo-only aircraft. PHMSA expects that correcting this conflict will improve safety by prohibiting corrosive materials that also pose inhalation hazards on passenger aircraft and limiting their transport on cargo-only aircraft.

Special Provisions A224 and A225

PHMSA is adding two new air special provisions, A224 and A225, and assigning them to HMT entries ''UN3548, Articles containing miscellaneous dangerous goods, n.o.s.'' and ''UN3538, Articles containing non-flammable, non-toxic gas, n.o.s.,'' respectively. These special provisions allow for the transport on both passenger aircraft and cargo-only aircraft under certain conditions. For additional information, *see* 172.102 of the Section-by-Section Review. Also, *see* § 172.102 of the Section-By-Section Review below for a detailed discussion of the special provision amendments addressed in this final rule. DGAC and MDTC provided comments in support of this revision.

Column (8) Packaging

Section 172.101(i) explains the purpose of column (8) in the HMT. Columns (8A), (8B), and (8C) specify the applicable sections for exceptions, non-bulk packaging requirements, and bulk packaging requirements, respectively. Columns (8A), (8B), and (8C) are completed in a manner which indicates that ''§ 173.'' precedes the designated numerical entry. Column (8A) contains exceptions from some of the requirements of this subchapter. The referenced exceptions are in addition to those specified in subpart A of part 173 and elsewhere in subchapter C. The word ''None'' in this column means no packaging exceptions are authorized, except as may be provided by special provisions in column (7). For example, the entry ''151'' in column (8A), associated with the proper shipping name ''Nitrocellulose with water,'' indicates that, for this material, packaging exceptions are provided in § 173.151 of this subchapter.

PHMSA is removing references to § 173.151, which provides exceptions for Class 4 hazardous materials, in column (8A), and adding the word ''None'' for three solid desensitized explosive entries: ''UN2555, Nitrocellulose with water *with not less than 25 percent water by mass;*'' ''UN2556, Nitrocellulose with alcohol *with not less than 25 percent alcohol by mass, and with not more than 12.6 percent nitrogen, by dry mass;*'' and ''UN2557, Nitrocellulose, *with not more than 12.6 percent nitrogen, by dry mass* mixture with *or* without plasticizer, with or without pigment.'' These changes remove the applicability of the limited quantity exceptions for these hazardous materials to correct an inconsistency regarding solid desensitized explosives. Consistent with the UN Model Regulations, PHMSA has not authorized limited quantity packaging exceptions for 30 other solid desensitized explosives.[20] Solid desensitized explosives are explosive substances that are wetted with water or alcohols, or are diluted with other substances, to form a homogeneous solid mixture to suppress their explosive properties. Like PG I materials, solid desensitized explosives in PG II are specifically prohibited from transport under the limited quantity provisions in the UN Model Regulations. However, this inconsistency was identified with respect to air transport by the ICAO DGP, resulting in a similar amendment in the 2023–2024 ICAO Technical Instructions. In this final rule, PHMSA is also making related editorial amendments in § 173.27, general requirements for transportation by aircraft. (See additional discussion in § 173.27 of Section-by-Section Review.) PHMSA expects that correcting this oversight to require these nitrocellulose mixtures be transported in accordance with all requirements of the HMR, rather than permitting the use of the limited quantity exceptions in § 173.151, will not only add an additional level of safety, but also facilitate the transport of these materials by streamlining packaging and hazard communication requirements to be consistent with requirements for similar materials and with international regulations.

Column (9) Quantity Limitations

Section 172.101(j) explains the purpose of column (9) in the HMT. Column (9) specifies quantity limitations for packages transported by air and rail. Column (9) is divided into two columns: column (9A) provides quantity limits for passenger aircraft/rail, and column (9B) provides quantity limits for cargo-only aircraft.

Consistent with changes adopted in the 2023–2024 edition of the ICAO Technical Instructions, PHMSA is amending the quantity limitations for UN 1891, Ethyl bromide, when

[20] UN1310, UN1320, UN1321, UN1322, UN1336, UN1337, UN1344, UN1347, UN1348, UN1349, UN1354, UN1355, UN1356, UN1357, UN1517, UN1571, UN2555, UN2556, UN2557, UN2852, UN2907, UN3317, UN3319, UN3344, UN3364, UN3365, UN3366, UN3367, UN3368, UN3369, UN3370, UN3376, UN3380, and UN3474.UN1517, UN1571, UN2555, UN2556, UN2557, UN2852, UN2907, UN3317, UN3319, UN3344, UN3364, UN3365, UN3366, UN3367, UN3368, UN3369, UN3370, UN3376, UN3380, and UN3474.

transported by passenger aircraft. Previously, the maximum net quantity per package for passenger aircraft was 5 L on the Dangerous Goods List of the ICAO Technical Instructions; this same quantity limit is currently in place for passenger aircraft, as indicated in column (9A) of the HMT. As a result of the reclassification of UN1891 as a Class 3 flammable liquid, the permitted quantity was reduced in the ICAO Technical Instructions to 1L per packaging. This change is in line with the quantity limits for many other Class 3 materials. PHMSA is making a corresponding change for passenger aircraft limits in column (9A). With regard to cargo-only aircraft, no changes to the 60 L maximum net quantity were made in the ICAO Technical Instructions, as that limit is the same for Class 3 and Division 6.1 materials. PHMSA expects that this change will provide an additional level of safety commensurate to the newly recognized flammability hazard posed by this material.

PHMSA is modifying the packaging limits aboard cargo-only aircraft for three battery entries: ''UN2794, Batteries, wet, filled with acid, electric storage;'' ''UN2795, Batteries, wet, filled with alkali, electric storage;'' and ''UN3292, Batteries, containing sodium.'' Specifically, these changes limit the quantity per packaging to 400 kg, as there is currently no limit for these items. Typically, these articles must be packed in UN specification packagings, and 400 kg is the maximum quantity permitted in such packagings. These changes are consistent with changes made in the 2023–2024 ICAO Technical Instructions, which were made as a correction to an inconsistency between the ICAO Technical Instructions and the UN Model Regulations. Therefore, in column (9B) of the HMT, the words ''no limit'' will be replaced by 400 kg. PHMSA expects that this change will streamline packaging requirements by providing packaging limits for similar items in similar packagings, consistent with analogous international regulations. This streamlining will also increase safety by increasing clarity on the packaging limits for these similar items.

Section 172.102 Special Provisions

Section 172.102 lists special provisions applicable to the transportation of specific hazardous materials. Special provisions include packaging requirements, prohibitions, and exceptions applicable to particular quantities or forms of hazardous materials. PHMSA is making the following revisions to the special provisions in this section:

Special Provision 78

Special Provision 78 currently states that ''UN1002, Air, compressed'' may not be used to describe compressed air that contains more than 23.5% oxygen. It also stipulates that compressed air containing more than 23.5% oxygen must be shipped using the description ''UN3156, Compressed gas, oxidizing, n.o.s.,'' which has a Class 5 subsidiary hazard classification. PHMSA is amending Special Provision 78 to provide additional clarity with regard to the permitted use of the proper shipping description UN1002. In an effort to address specific mixtures of nitrogen and oxygen that are commercially called ''synthetic air,'' the 22nd revised edition of the UN Model Regulations includes a new special provision that was intended to clarify that ''synthetic air'' may be transported under UN1002, provided that it does not contain more than 23.5% oxygen. ''Synthetic air'' is typically a mixture containing up to 23.5% oxygen with the balance being nitrogen. This mixture is used in a variety of applications, including medical and non-medical, and may be used when ambient air is not sufficient due to the presence of contaminants. This new special provision specifies that mixtures of nitrogen and oxygen containing not less than 19.5% and not more than 23.5% oxygen by volume may be transported under UN1002 when no other oxidizing gases are present. It also states that a Division 5.1 subsidiary hazard label is not required for any concentrations within this limit. While this language is not drastically different than the current language in the HMR, PHMSA expects that rewording Special Provision 78 to include the 19.5% lower bound for oxygen and the note regarding the use of the Division 5.1 subsidiary hazard label will improve safety by providing clearer and more useful instructions for shippers of compressed synthetic air.

Special Provision 156

PHMSA is amending Special Provision 156 to require that, when transported by air, a shipping paper, such as an air waybill, accompanying the shipment must indicate that the package containing asbestos is not restricted for shipment. Currently, this special provision excepts asbestos from the requirements of 49 CFR Subchapter C when it is immersed or fixed in a natural or artificial binder—such as cement, plastics, asphalt, resins, or mineral ore—in such a way that no escape of hazardous quantities of respirable asbestos fibers can occur. It was noted that confusion over whether a shipment was or was not excepted from the regulations had led to delays and frustrated shipments. The 2023–2024 ICAO Technical Instructions amended a similar special provision to assist in providing evidence of compliance with its requirements. PHMSA's revision to Special Provision 156 requires that, when transported by air, packages or shipping documentation be marked to indicate that the package containing asbestos is not restricted for shipment. PHMSA expects that this requirement will facilitate the safe shipment of asbestos by preventing them from being mistaken as fully regulated hazardous materials.

Special Provision 387

Special Provision 387 provides shippers of polymerizing substances with information regarding stabilization requirements for their shipments. As discussed below, in an earlier rulemaking, PHMSA placed sunset dates on the HMR provisions concerning transport provisions for polymerizing substances to allow time for the completion of research on various topics concerning their transport, and to gather and review empirical evidence concerning the appropriate transport provisions for polymerizing substances. In line with other amendments in this final rule for the transport of polymerizing substances, PHMSA is amending Special Provision 387 to remove the sunset date of January 2, 2023. The result of this amendment is that the existing stabilization requirements noted in this special provision remain and the sunset date is removed. DGAC and Dow Chemical provided comments in support of this revision. See 173.21 of the Section-by-Section Review for the full discussion of changes pertaining to polymerizing substances.

Special Provision 396

PHMSA is adding a new special provision, Special Provision 396, and assigning it to ''UN3538, Articles containing non-flammable, non-toxic gas, n.o.s,'' to authorize the transport of large and robust articles (*e.g.,* transformers) that include cylinders containing UN1066 ''Nitrogen,'' UN1956 ''Compressed gas N.O.S.,'' or UN1002 ''Air, compressed'' with the valves open to allow low quantities of gas to be constantly supplied through a pressure regulator from a gas cylinder connected to the transformer. Similar provisions were added in the 22nd revised edition of the UN Model Regulations and Amendment 41–22 of the IMDG Code to

address shipments of transformers, which are typically pressurized with nitrogen or air but are not gas tight. Prior to 2020, transformers were transported as ''UN 3363, Dangerous Goods in Machinery/Apparatus;'' however, the packing provisions for UN3363 imposed quantity limits requiring multiple approvals from competent authorities as specified in Special Provision 136 in the HMR (SP 301 in the UN Model Regulations). Following more recent amendments to the UN Model Regulations, these transformers were eligible for transport under UN 3538. The provisions that allow these transformers to be transported unpackaged do not explicitly require the transformer to be gas-tight but instead require the valves to be closed during transport. To obviate the need for an approval each time such transformers are transported, a new special provision was added to the 22nd revised edition of UN Model Regulations because these transformers only emit small quantities of nitrogen or synthetic air, which are not flammable, toxic, corrosive, or oxidizing. PHMSA is making several safety controls in shipments of this type that are largely consistent with the provisions adopted in the UN Model Regulations and the IMDG Code. These controls include requiring the following: cylinders must be connected to the article through pressure regulators and have fixed piping to keep the pressure below 35 kPa (0.35) bar; cylinders must be secured to prevent shifting; cylinders and other components must be protected from damage and impacts during transport; the shipping paper must include a reference to shipping under this special provision; and if placed inside a cargo transport unit (CTU), the CTU must be well ventilated. PHMSA notes that these international regulations require marking the CTU with the asphyxiation warning mark for CTUs. The HMR has not adopted this mark and is not doing so at this time. PHMSA is not revising this mark because it views the additional controls—specifically, the indication on the shipping paper, as well as other operational controls noted in the special provision—as providing sufficient warning to those in the transport chain of the dangers present and mitigation of potential hazards. PHMSA expects that the addition of this special provision will facilitate the transport of this specialized machinery without imposing excessive manufacturing requirements to ensure gas tightness to prevent the release of relatively innocuous gases during transport.

Special Provision 398

PHMSA is adding Special Provision 398, pertaining to the classification of hazardous materials under UN1012, Butylene. This new special provision clarifies that butylene mixtures and certain butylene isomers may be assigned to UN1012, while specifically excluding UN1055, Isobutylene, from this UN classification. Butylene, also known as butene, includes four different isomers, corresponding to one general chemical formula, C4H8. One of these isomers is isobutylene, which, while similar to the other three isomers, has been assigned a separate UN number, UN1055, which has its own set of packaging provisions. To avoid ''UN1055, Isobutylene'' being classified and transported under UN1012, this amendment facilitates the consistent and proper classification of this group of hazardous materials. This clarification for UN1012, Butylene, was added in the 22nd revised edition of the UN Model Regulations for consistency with European regulations, which made similar changes to avoid ''UN1055, Isobutylene'' being classified and transported under UN1012. PHMSA is adding this clarifying special provision with the expectation that it will facilitate consistent and proper classification of this group of hazardous materials.

Special Provision 421

Special Provision 421 is currently assigned to the four polymerizing substance entries in the HMT.[21] Currently, this special provision notes that these entries will no longer be effective on January 2, 2023, unless extended or terminated prior to this date. As discussed in ''Section I. Executive Summary'' section of this rulemaking, PHMSA had placed sunset dates on the HMR provisions concerning transport provisions for polymerizing substances to allow time for the completion of research on various topics concerning their transport, and to gather and review empirical evidence concerning the appropriate transport provisions for polymerizing substances. As we have completed this review, we are deleting Special Provision 421 and maintaining the existing polymerizing substance HMT entries. DGAC provided comments in support of this revision.

Special Provision A54

Special Provision A54 specifies that, irrespective of the quantity limits in column (9B) of the § 172.101 table, a lithium battery, including a lithium battery packed with, or contained in, equipment that otherwise meets the applicable requirements of § 173.185, may have a mass exceeding 35 kg, if approved by the Associate Administrator prior to shipment. PHMSA is amending this special provision to require that, when this special provision is used, the special provision number must be indicated on the shipping paper. PHMSA expects that this amendment will enhance safety by improving the communication of potential hazards, as without such indication, the need for shipment acceptance staff to check and ensure a copy of the approval accompanying the shipment can potentially be missed.

Special Provisions A224 and A225

The 2023–2024 ICAO Technical Instructions added two new special provisions permitting the transport of articles containing hazardous materials aboard passenger and cargo-only aircraft. Currently these articles are forbidden from transport on passenger and cargo-only aircraft, as specified in column (9) of the HMT. However, the ICAO DGP developed these packaging provisions, which include provisions that ensure appropriate gas containment during transport. The aim of these special provisions was to facilitate the transport of large articles containing environmentally hazardous substances (such as aircraft landing gear struts filled with hydraulic fluid) and large articles containing a non-flammable, non-toxic gas (such as new types of magnetic resonance imaging (MRI) scanners, which often contain compressed helium as well as lithium cells or batteries). These amendments were adopted in the 2022–2023 ICAO Technical Instructions, and PHMSA is mirroring these provisions by adding two new air-specific special provisions, A224 and A225, and assigning them to HMT entries ''UN3548, Articles containing miscellaneous dangerous goods, n.o.s.'' and ''UN 3538, Articles containing non-flammable, non-toxic gas, n.o.s.,'' respectively.

These special provisions allow for the transport of large articles containing a non-flammable, non-toxic gas or environmentally hazardous substances on both passenger aircraft and cargo aircraft only under certain conditions. Specifically, under Special Provision A224, ''UN3548, Articles containing miscellaneous dangerous goods, n.o.s.'' are permitted on passenger and cargo-only aircraft, provided that the only dangerous goods in the article are environmentally hazardous substances, except for lithium cells or batteries that comply with § 173.185(c) (*e.g.,* the

[21] UN3531, UN3532, UN3533, and UN3534.

article may contain an environmentally hazardous substance and lithium cell or battery that complies with § 173.185(c)).

Similarly, under Special Provision A225, ''UN3538, Articles containing non-flammable, non-toxic gas, n.o.s.'' are permitted aboard passenger and cargo-only aircraft, provided that the article contains only a Division 2.2 gas that does not have a subsidiary hazard excluding refrigerated liquefied gases and other gases forbidden for transport on passenger aircraft, except for lithium cells or batteries that comply with § 173.185(c) (*e.g.,* the article may contain a non-refrigerated liquefied gas or otherwise forbidden Division 2.2 gas without a subsidiary hazard and a lithium cell or battery that complies with § 173.185(c)). In addition to containing only the permitted hazardous materials, the special provision also requires that shippers comply with additional packaging requirements specified in § 173.232, and that the special provision be indicated on shipping documentation.

The ICAO DGP agreed that these provisions were appropriate given that environmentally hazardous substances pose a very low hazard in air, and that non-flammable, non-toxic gases without subsidiary hazard are already allowed on both passenger and cargo-only aircraft as well as certain other articles containing similar gases. PHMSA agrees and expects that, in addition to aligning the HMR with recent changes added to the 2023–2024 ICAO Technical Instructions, the addition of these provisions will facilitate the transport of these materials by air while maintaining the current level of safety for air transport of certain hazardous materials. MDTC provided a comment in support of these revisions.

IP Codes

IP Codes are special provisions that are assigned to specific commodities and applicable when that commodity is transported in IBCs. Table 2 in § 172.102 specifies the requirements corresponding to the IP Code indicated in column (7) of the HMT. In this final rule, PHMSA is amending the text of IP15 and adding a new IP Code, IP22.

IP15

PHMSA is amending the text of IP15 to clarify language pertaining to the authorized period of use of composite IBCs. Currently, IP15 states that for IBCs containing UN2031 with more than 55% nitric acid, rigid plastic IBCs and composite IBCs that have a rigid plastic inner receptacle are authorized for two years from the date of IBC manufacture. A change to a corresponding special provision was adopted in the 22nd revised edition of the UN Model Regulations to make clear that the authorized two-year period of use specifically refers to the duration of use of the inner receptacle of composite IBCs and not to the outer framework. The intent of this requirement is to limit the inner receptacle for composite IBCs to the two-year period of use when used for this specific corrosive material, rather than requiring that the outer framework be inspected as often. The entire composite IBC remains subject to the five-year inspection interval, prescribed in § 180.352. This change in the UN Model Regulations was in response to mistranslations of the UN Model Regulations, which led to inconsistent maintenance of composite IBCs. While PHMSA is not aware of any issues surrounding the language in IP15, PHMSA expects that making this editorial change will ensure international users are not confused by the text of the HMR, and this clarification will enhance safe transport of hazardous materials in such IBCs.

IP22

As discussed earlier, PHMSA is adding a new IP code, IP22, for the new entry, ''UN 3550, Cobalt dihydroxide powder, *containing not less than 10% respirable particles.*'' This special provision authorizes the transport of Cobalt dihydroxide powder, a Division 6.1 solid, in flexible IBCs that are equipped with siftproof liners that prevent any egress of dust during transport. This hazardous material was recently classified as a solid with a toxic-by-inhalation hazard. Prior to this Division 6.1 classification, cobalt dihydroxide had been transported as ''UN3077, Environmentally hazardous substance, solid, n.o.s., Class 9'' in unlined flexible IBCs. However, this reclassification posed a problem for shippers because flexible IBCs are not authorized for Division 6.1 toxic solids. In response to the recent EU GHS changes, many shippers stopped using unlined flexible IBCs and began using lined 13H3 or 13H4 flexible IBCs to prevent the release of dust.[22] Additionally, the industry also developed a new design type flexible IBC with an improved liner to prevent egress of dust. This new design type, 13H3 flexible IBC, has been tested and approved to PG I by international competent authorities. Consequently, to address the packaging problem shippers faced as a result of new classification criteria, the UNSCOE created a special provision that allows this material to be transported in lined siftproof packagings. This decision was based on the 40-year record of safe transport in this material in PG III packagings, as well as the additional level of sift-proofness provided by the new design track record of the new siftproof packagings. PHMSA agrees with the UNSCOE's determination that siftproof flexible IBCs are appropriate packagings for this material and expects that this special provision will avoid unnecessary disruptions in the transport of this essential raw material while still ensuring safe transport of this material. The lack of a UN entry for this specific combination of physical and hazardous attributes—solid and toxic-by-inhalation—led to the development of this new UN entry by the UNSCOE. More specifically, UN3550 was created for cobalt dihydroxide to resolve the packaging and transport problem faced by shippers because of the new Division 6.1 classification. Consequently, based on the record of safe transport by multi-modal means in flexible IBCs, with no recorded accidents, incidents, or health issues as UN3077, the UNSCOE's resolution of this packaging conflict was to develop a new UN number, assigning appropriate packing provisions and creating a special packaging condition which permits the use of flexible IBCs.

C. Part 173

Section 173.4b

Section 173.4b specifies the hazard criteria and packaging requirements to qualify for the de minimis exception—*i.e.,* exceptions from certain HMR requirements for very minor amounts of hazardous material. For non-infectious biological specimens that contain minor amounts of preservatives that are a hazardous material, PHMSA is adding a reference to formaldehyde solution in paragraphs (b)(1)(i) and (b)(1)(ii) to clarify that the conditions for packing of the specimens applies to formaldehyde solution too. Currently, paragraph (b) excepts non-infectious biological specimens, such as those of mammals, birds, amphibians, reptiles, fish, insects, and other invertebrates, containing small quantities of chemical preservatives like ethanol or formaldehyde solution from the HMR, provided certain conditions are met. For example, paragraph (b)(1) provides instruction for when alcohol or an alcohol solution is used, such as when a specimen is placed in a plastic bag, that any free liquid in the bag must not exceed 30 mL. The ICAO Technical Instructions include a similar instruction, yet during a review of the

[22] *https://unece.org/DAM/trans/doc/2019/dgac10c3/UN-SCETDG-56-INF19e.pdf.*

ICAO Technical Instructions, the ICAO DGP noted that the exception does not address when formaldehyde solutions are used as preservatives for specimens; thus, there was no specified limit on the amount of free liquid formaldehyde solution that may be in a packaging. Consequently, the 2023–2024 ICAO Technical Instructions include an amendment to the de minimis provisions to specify limits for formaldehyde solutions. PHMSA agrees with this clarifying amendment and expects that adopting a similar change will enhance safety by removing uncertainty about whether the quantity limits also apply to formaldehyde solutions. PHMSA received a comment from the MDTC in support of this revision.

Section 173.21

Section 173.21 describes situations in which offering for transport or transportation of certain materials or packages is forbidden. Examples of such forbidden shipments include materials designated as ''Forbidden'' in Column (3) of the HMT; electrical devices that are likely to generate sparks and/or a dangerous amount of heat; and materials that are likely to decompose or polymerize and generate dangerous quantities of heat or gas during decomposition or polymerization. This last group of materials is addressed in paragraph (f) of this section, which outlines the conditions under which materials that are likely to decompose or polymerize unless stabilized or inhibited in some manner (*e.g.,* with temperature controls or chemical stabilization) are authorized for transport.

PHMSA is lowering the temperature threshold for certain materials transported in portable tanks that require temperature control. Specifically, this amendment lowers this threshold temperature for a material that is likely to decompose with a self-accelerated decomposition temperature (SADT), or polymerize with a self-accelerated polymerization temperature (SAPT) from 50 °C (122 °F) to 45 °C (113 °F) when transported in portable tanks. This means that portable tanks containing materials likely to decompose or polymerize at temperatures greater than 45 °C are not required to be stabilized or inhibited by temperature control. In an earlier rulemaking, HM–215N, PHMSA gave notice that at that time, it would not adopt reductions in temperature thresholds for shipments in portable tanks, and maintained a 50 °C (122 °F) threshold for requiring temperature control to allow for additional time to conduct research on the impacts of such a change and to allow additional time to fully consider the issue. However, PHMSA-sponsored research, which was completed in February 2021 by APT Research, Inc. (APT),[23] has informed our revisions in this final rule. That research aimed to gather more information concerning temperature control of polymerizing substances in portable tanks, and testing requirements for these substances intended to be transported in portable tanks or intermediate bulk containers (IBCs), as these two areas of safety controls in the HMR differed from those adopted in the international consensus standards and regulations. The report following research conducted by APT noted that ''relaxing the temperature control requirements as proposed by HM–215N is assessed to be an appropriate approach since it will harmonize U.S. regulations with international requirements and no additional hazards were identified for any common polymers during transport. Polymers in industry with SAPTs approaching 45 °C or 50 °C were found to be uncommon.'' PHMSA agrees with this assessment and is lowering this temperature threshold at which temperature control is required for portable tanks containing a material that is likely to decompose with a SADT, or polymerize with a SAPT from 50 °C (122 °F) or less to 45 °C (113 °F) or less. Although the APT research focused on polymerizing materials, PHMSA believes decomposing materials behave similarly and has opted to apply the change to both material types. PHMSA believes this amendment will help facilitate international transportation of these goods while maintaining the high standard of safety in the HMR for transportation of decomposing and polymerizing materials. To that end, PHMSA also is amending the table in paragraph (f)(1) to accommodate the specific temperature controls applicable to decomposing and polymerizing substances transported in portable tanks. This amendment aligns the HMR with temperature thresholds for substances with SADTs and SAPTs transported in portable tanks with those found in the UN Model Regulations and the IMDG Code. Further, based on this change specific to use of portable tanks, PHMSA is revising the table in paragraph (f)(1) to include packaging type as a factor in determining the criteria for control temperatures and emergency temperatures. Lastly, PHMSA is amending paragraph (f) to provide a reference to the lower threshold of 45 °C (113 °F) for portable tanks and include a reference to language concerning organic peroxides that require temperature control. Paragraph (f)(2) is revised to (f)(2)(i)–(iii) to indicate general temperature control requirements for organic peroxides by type. These requirements are consistent with the UN Model Regulations and ensure that appropriate temperature control provisions are applied to organic peroxides not specifically listed in the Organic Peroxide Table in § 173.225. DGAC and Dow Chemical provided comments in support of this revision.

Additionally, to fully adopt these changes, PHMSA is removing the phaseout language currently found in (f)(1)(i), which states that the provisions concerning polymerizing substances in paragraph (f) will be effective until January 2, 2023. Finally, based on results of the research, PHMSA is maintaining the current defining criteria for polymerizing substances in § 173.124, that a polymerizing substance must successfully pass the UN Test Series E at the ''None'' or ''Low'' level, or achieve equivalent criteria using an alternative test method with the approval of the Associate Administrator, prior to selection of an appropriate portable tank or IBC. Dow chemical and DGAC provided comments in support of this proposal.

Section 173.27

Section 173.27 outlines general requirements for transportation by aircraft, including requirements and limitations for hazardous materials transported in limited quantities. Currently, the provisions for combination packagings in paragraph (f)(2) specify that materials or articles not authorized as a limited quantity for transportation by aircraft include all PG I materials; self-reactive flammable solids in Division 4.1; spontaneously combustible materials in Division 4.2; and liquids that are dangerous when wet in Division 4.3. The ICAO Technical Instructions included similar language for Division 4.1 materials by allowing non-self-reactive Division 4.1 materials assigned to PG II or PG III to be transported as limited quantities. However, the ICAO DGP identified a conflict with limited quantity provisions in the ICAO Technical Instructions and the limited quantity provisions in the UN Model Regulations pertaining to four Division 4.1 material, assigned PG II: ''UN 2555, Nitrocellulose with water with not less than 25 percent water by mass;'' ''UN 2556, Nitrocellulose with alcohol with not less than 25 percent alcohol by mass, and with not more than 12.6

[23] Report can be accessed in Docket No. PHMSA–2021–0092 on *www.regulations.gov.*

percent nitrogen, by dry mass;'' ''UN 2557, Nitrocellulose, with not more than 12.6 percent nitrogen, by dry mass mixture with or without plasticizer, with or without pigment;'' and ''UN 2907, Isosorbide dinitrate mixture with not less than 60 percent lactose, mannose, starch or calcium hydrogen phosphate.'' Despite not being defined as self-reactive, the UN Model Regulations have never included these specific Division 4.1 flammable solid materials for transport as limited quantities. The ICAO Technical Instructions were amended for consistency with the UN Model Regulations to clearly indicate that the transport of these four PG II materials in Division 4.1 are not authorized for transportation by aircraft as limited quantities. PHMSA received a comment from Dangerous Goods Advisor noting that the inclusion of UN 2555, UN 2556, UN 2557, and UN 2907 in § 173.27(f)(2)(i)(D) seems unnecessary and could downplay the additional inapplicability to the other 30 desensitized explosives listed in the HMT. After reviewing the list of the other desensitized explosives, PHMSA determined that all 30 other desensitized explosives entries are PG I materials in the HMT. PG I materials are already excluded from the limited quantities section in § 173.27(f)(2)(i)(A). While PHMSA understands that listing the UN numbers in § 173.27(f)(2)(i)(D) is somewhat redundant with removing the reference to § 173.151 for the relevant UN number in the HMT, PHMSA asserts that listing the UN number in § 173.27 provides reinforcing information that these PG II desensitized explosives are not eligible to be shipped as limited quantities. PHMSA is adding language in § 173.27(f)(2)(i)(D) to explicitly include the UN identification numbers for these materials, indicating that these materials may not be transported as limited quantities by aircraft. PHMSA expects this change will add an additional level of safety by correcting this packaging provision, which has been inconsistent with those in place for materials that pose similar hazards.

Section 173.124

Section 173.124 outlines defining criteria for Divisions 4.1 (Flammable solid), 4.2 (Spontaneously combustible), and 4.3 (Dangerous when wet material). In an earlier rulemaking, PHMSA placed phaseout dates on the HMR provisions concerning transport provisions for polymerizing substances to allow time for the completion of research on various topics concerning their transport, and to gather and review empirical evidence concerning the appropriate transport provisions for polymerizing substances. In line with other amendments in this final rule for the transport of polymerizing substances, PHMSA is removing paragraph (a)(4)(iv), which has the phaseout date of January 2, 2023. The result of this amendment will be to remove the phaseout date and keep the existing requirements—as outlined in paragraph (a)(4)—effective beyond the January 2, 2023, date.

Section 173.137

Section 173.137 prescribes the requirements for assigning a packing group to Class 8 (corrosive) materials. PHMSA is authorizing the use of an additional test method, Test No. 439, ''*In Vitro* Skin Irritation: Reconstructed Human Epidermis Test Method,'' as well as editorial changes to this section to provide clarity regarding the use of the authorized OECD Guidelines for the Testing of Chemicals.

Currently, the HMR requires offerors to classify Class 8 materials and assign a packing group based on tests performed in accordance with various OECD Guidelines for the Testing of Chemicals (TG), including a skin corrosion test (*in vivo*) and various *in vitro* testing guidelines that do not involve animal testing. Data obtained from the currently authorized test guidelines is the only data acceptable for classification and assignment of a packing group. Specifically for PG I, II, or III determinations, the HMR authorizes the use of OECD Guidelines for the Testing of Chemicals, Test No. 435, ''*In Vitro* Membrane Barrier Test Method for Skin Corrosion,'' and Test No. 404, ''Acute Dermal Irritation/Corrosion'' (an *in vivo* test method). The HMR also authorizes the use of OECD Test No. 430, ''*In Vitro* Skin Corrosion: Transcutaneous Electrical Resistance Test (TER),'' and Test No. 431, ''*In Vitro* Skin Corrosion: Reconstructed Human Epidermis (RHE) Test Method;'' however, the scope of what these tests can determine is limited. For that reason, Test No. 430 is authorized for use only to determine whether a material is corrosive or not; materials that are determined to be corrosive using this test require additional testing using Test Nos. 435 or 404 or assignment to the most conservative packing group, PG I. Similarly, Test No. 431 may also be used to determine whether or not a material is corrosive; however; while this can identify when a corrosive must be assigned PG I, it cannot differentiate between PG II and III materials. Consistent with the UN Model Regulations, when this method does not clearly distinguish between PG II or PG III, the HMR allows the material to be transported as PGII without further *in vivo* testing. Consistent with changes made to the 22nd revised edition of the UN Model Regulations, PHMSA is authorizing an additional TG, OECD Test No. 439, ''*In Vitro* Skin Irritation: Reconstructed Human Epidermis Test Method,'' as an authorized test, which may be used to exclude a material from classification as a corrosive material. Test No. 439 was adopted in the UN Model Regulations because it provides another means of testing, without the use of live animals, that can easily identify materials as non-corrosive. However, while Test No. 439 may be used for the hazard identification of irritant chemicals, it is limited in that it simply allows materials to be identified as either corrosive or non-corrosive to skin. Because this test method only identifies the material as corrosive or not, the UN Model Regulations added an additional provision requiring that materials, which are tested using Test No. 439 and indicate corrosivity, must be assigned to the most conservative PG (*i.e.,* PG I), unless additional tests are performed to provide more specific data that can be used to assign a less conservative PG. The addition of Test No. 439 as an authorized test method will provide greater flexibility for shippers to classify, package, and transport corrosive material, while maintaining the HMR safety standard for transport of corrosive materials.

With regard to the editorial changes in this section, PHMSA is amending the text of this section to provide clarity regarding the authorized OECD Testing of Chemicals. Additionally, PHMSA is amending the last paragraph of the introductory text, which currently states that assignment to packing groups I through III must be made based on data obtained from tests conducted in accordance with OECD Guideline Number 404 or Number 435 in order to remove the reference to Test No. 435. Since its update in 2015, the criteria for packing group assignments in Test No. 435 are no longer the same as the criteria for Test Guideline 404. PHMSA expects that these amendments will enhance safety by providing clarity regarding the proper testing and assignment of packing groups, and promote efficiency by streamlining the assignment of packing groups.

Section 173.151

Section 173.151 contains exceptions for Class 4 hazardous materials. In the NPRM, PHMSA proposed to add ''151'' to column 8a of the HMT for ''UN 3148, Water-reactive liquid, n.o.s.'' However, § 173.151(d) currently only refers to

Division 4.3 ''solid'' dangerous when wet materials, which is contradictory to the liquid state of UN 3148. In this final rule, PHMSA is making an editorial revision to § 173.151(d), which currently contains only the words ''solids'' to describe Division 4.3 (self-reactive) materials. PHMSA is revising this paragraph to include ''solids'' and ''liquids'' to accurately reflect that Division 4.3 materials could be either in a solid or liquid state.

Section 173.167

Section 173.167 contains the packaging instructions and exceptions for ''ID8000, Consumer commodities.'' The ID8000 entry was added to the HMR in final rule HM–215K,[24] with the intent of aligning the HMR with the ICAO Technical Instructions for the air transportation of limited quantities of a consumer commodity material. Based on inquiries from shippers and carriers, PHMSA understands that confusion exists regarding the requirements for hazard communication and the ability to withstand pressure differential for packages of a ''ID8000, Consumer commodity'' material when moved by modes other than air. In 2012 and 2017, PHMSA issued letters of interpretation regarding the applicability and hazard communication requirements for ID8000 shipments.[25] Both of these letters of interpretation recognized that ID8000 shipments are inherently ''limited quantity'' and provided the opinion that for transportation by highway, rail, and vessel, ID8000 packages could be marked with the standard marking found in § 172.315(a)(1) (*i.e.,* limited quantity mark without the ''Y''). In 2022, PHMSA received a petition for rulemaking, designated P–1762,[26] from the Council on the Safe Transportation of Hazardous Articles (COSTHA) relating to ID8000. In its petition, COSTHA requested that PHMSA revise § 173.167 to make it clear that packages prepared under this section may be offered for transportation and transported by all modes.

In consideration of P–1762 and consistent with these letters of interpretation regarding the requirements for ID8000 shipments, PHMSA is revising the requirements in § 173.167 for ''ID8000, Consumer commodity'' materials. The intent of this revision is to clearly address requirements for all modes of transportation, while continuing to recognize that the history and intent of the ''ID8000, Consumer commodity'' entry is closely tied to the ICAO Technical Instructions and air transportation.

First, PHMSA is making editorial revisions to the title of the section and introductory language in paragraph (a). PHMSA is renaming the section ''ID8000 Consumer commodity'' to distinguish this section from the historical ''ORM–D, Consumer commodity'' HMT entry and an exception that ceased to be effective on December 31, 2020. PHMSA purposely phased out the ''ORM–D, Consumer commodity'' classification and description to remove the dual system of shipping certain limited quantities domestically and internationally, as it was a source of confusion.

PHMSA acknowledges that there may be circumstances where persons need to transport ID8000 packages between locations—*e.g.,* to a warehouse for consolidation, etc.—without needing or using air transportation. Therefore, PHMSA recognizes the need to not only accommodate that portion of transport but also provide assurances that any ID8000 package is appropriately prepared for air transportation, regardless of whether air transportation is actually used. PHMSA is clarifying that ID8000 material is inherently a limited quantity by adding the phrase ''limited quantity'' to the § 173.167(a) introductory text. Finally, PHMSA is removing the phrase ''when offered for transportation by aircraft'' from the introductory language in paragraph (a) and restructuring the existing first sentence of the section into two separate statements. This revision is intended to clarify that the materials and quantities listed in this section may be transported by all modes, and to clarify that only the materials listed in paragraph (a) are eligible to be transported as ''ID8000, Consumer commodity.''

More significantly, PHMSA is revising the structure of the section by moving the two requirements in the currently effective language of paragraph (b)—applicable only to air transportation—to new subparagraphs (6) and (7) of paragraph (a). This will require all ID8000 packages to be subject to the limited quantity marking requirements of § 172.315(b) (*i.e.,* require use of the ''Y'' limited quantity marking) and other markings required by part 172 subpart D, including marking of the ID number and PSN. This revision will also require compliance with the § 173.27(c) pressure differential requirement for transportation by all modes. The intent of this revision is two-fold:

1. Provide clarity to shippers on the hazard communication and pressure differential requirements for all shipments of ''ID8000, Consumer commodity'' packages.

2. Ensure that ''ID8000, Consumer commodity'' packages—wherever they are in the transportation stream—meet the requirements for air transportation.

However, while required in paragraph (a), PHMSA is adding a new paragraph (b) to provide exceptions to ID8000 packages for shipping papers and labels when transported by highway and rail. These exceptions were previously in the introductory language to paragraph (a). PHMSA is also providing a new labeling exception for ID8000 packages transported by vessel, which aligns with the labeling exception provided to limited quantity packages transported by vessel. PHMSA reminds shippers that packages shipped under this section are still subject to the marking requirement (*i.e.,* require the limited quantity marking). PHMSA received comments from COSTHA and the MDTC in support of this revision.

In addition to the revisions to § 173.167 requested in P–1762 discussed above, COSTHA submitted petition P–1761 [27] with additional requests. Specifically, in P–1761, COSTHA requested that PHMSA add a reference to § 173.167 in the sections that outline limited quantity exceptions for Class 3, PG II and III (§ 173.150), UN3175 (§ 173.151), Division 6.1 PG III (§ 173.153), UN3077, UN3082, UN3334 and UN3335 (§ 173.155), and Class 2 non-toxic aerosols (§ 173.306). PHMSA did not propose these revisions in the NPRM. PHMSA received comments from COSTHA reiterating their petition that PHMSA modify the limited quantity sections listed above to reference § 173.167. PHMSA asserts that ID8000 is a specialized exception, designed only for a small subset of materials, and the materials are subject to stringent packaging requirements. PHMSA reiterates that adding a reference to § 173.167 to the limited quantity exception sections listed above will create confusion for shippers by referencing an exception that most may not be able to adequately meet. All the materials and quantities authorized in § 173.167 may be transported as limited quantities by all modes. For the vast majority of hazardous material shippers who offer these materials in these small quantities, utilizing the limited quantity exception specific to the commodity (*e.g.,* not utilizing § 173.167) is the most appropriate and simplest option.

[24] 76 FR 3307 (Jan. 19, 2011).

[25] Ref. No. 11–0090 (May 3. 2012); Ref. No. 16–0075 (Jan. 9, 2016).

[26] *https://www.regulations.gov/document/PHMSA-2022-0007-0001.*

[27] *https://www.regulations.gov/document/PHMSA-2022-0006-0001.*

PHMSA reiterates that if shippers, carriers, or other entities involved in the transportation of hazardous materials are uncertain what marking requirements apply to a limited quantity shipment, it could mean that their training programs are inadequate and may need to be reviewed.

Section 173.185

Section 173.185 prescribes requirements for the transportation of lithium cells and batteries. PHMSA is making numerous changes to this section as follows.

Paragraph (a) classification revisions: Paragraph (a) provides general classification provisions, which include requirements for manufacturers and subsequent distributers of lithium cells and batteries to provide others in the supply chain a test summary of the battery, which contains information regarding the cells and batteries. PHMSA received a comment from PRBA and MDTC noting that a small, but important amendment to the UN38.3 Test Summary is included in the UN Manual of Tests and Criteria, Seventh Revised Edition, Amendment 1, which was adopted in December 2020. PRBA notes that this amendment was based on a proposal filed with the UN Sub-Committee of Experts on the Transport of Dangerous Goods by PRBA and their counterpart in Europe. The amendment removes the signature requirement in the test summary document, which is currently found in § 173.185(a)(3)(x). This provision currently states: ''Signature with name and title of signatory as an indication of the validity of information provided.''

PRBA notes that PHMSA proposed to incorporate by reference in § 171.7 the UN Manual of Tests and Criteria, Seventh Revised Edition, Amendment 1, but did not include this proposed change to the Test Summary document in § 173.185 of the HMR. In its comments, PRBA and MDTC requested that PHMSA amend § 173.185(a)(3)(x) to make it clear that a signature is not required on the test summary document. PHMSA concurs with the MDTC and PRBA comments that the revision was inadvertently left out of the NPRM, and as such PHMSA is revising § 173.185(a)(3)(x) to require the test summary indicate the name and title of a responsible person. A signature would no longer be required.

Additionally, PHMSA is amending paragraph (a)(3) to except button cell batteries installed in equipment (including circuit boards) from these test summary requirements. This amendment will give shippers of traditionally less regulated products, such as wrist watches and key fobs, an exception from the need to maintain a test summary document.

PHMSA received a comment from ALPA opposing the amendment to except button cells installed in equipment from the test summary document requirement. ALPA stated in its comments that experimental data was presented at the ICAO DGP working group showing that button cells installed in electronic devices initiated fires when short circuiting. PHMSA appreciates ALPA's perspective on this issue; however, button cell batteries have inherent limitations on their energy capacity and content. This self-limiting design helps mitigate potential risks if the batteries are misused or damaged. PHMSA asserts that the HMR appropriately addresses the hazards associated with these types of batteries. PHMSA also notes that this revision in no way relieves button cells from the design testing requirements; it merely excepts the button cells from the requirement to create and distribute a test summary document. Additionally, COSTHA, DGAC, MDTC, and PRBA all provided comments in support of this proposal as written. Therefore, PHMSA finds that this amendment maintains the safety standard for the transportation of lithium batteries consistent with the exceptions for smaller cells or batteries found in §§ 173.185(c)(2) and (c)(3) as currently button cell batteries are excepted from the packing requirement to use a strong, rigid outer package, provided the battery is sufficiently protected by the equipment in which it is contained, and the lithium battery marking requirements, respectively. Further, PHMSA is making an editorial amendment by deleting the onset date in paragraph (a)(3) as January 1, 2022, has passed, and the paragraph now applies generally.

Additionally, PHMSA is adding a new paragraph (a)(5) to require marking the outer casing of lithium ion batteries with the Watt-hour (Wh) rating. This is consistent with the provisions for smaller lithium ion batteries in § 173.185(c)(1)(i), which require that ''each lithium ion battery subject to this provision must be marked with the Watt-hour rating on the outside case.'' PHMSA added this provision to the HMR in HM–224F.[28] While the requirement was added to the HMR for smaller lithium ion batteries (as a condition for use of an exception), no similar provision was added for other lithium ion batteries (*i.e.,* those not offered in accordance with, or eligible for, the paragraph (c) exceptions). However, upon review, PHMSA noted that the international regulations generally require the marking of the Wh rating on the outside of the casing. Specifically, this is required in accordance with Special Provision 348 of the UN Model Regulations; Special Provision 188 of the IMDG Code; Section IA.2 of Packing Instruction 965 (for UN3480); and Section I.2 of Packing Instruction 966 (for UN3481) and 967 (for UN3481) of the ICAO Technical Instructions. PHMSA expects that this amendment will improve safety, as the marking of the Wh rating on the outer casing of a lithium ion battery assists a shipper in better understanding the energy capacity of the battery, and thus, ensures compliance with hazard communication and packing provisions associated with Wh limitations.

MDTC and PRBA provided comments noting that the UN Model Regulations, ICAO Technical Instructions, and IMDG Code are clear that the Wh rating is only required on lithium-ion batteries and not lithium-ion cells, which PHMSA originally proposed. MDTC and PRBA conclude that it would be impractical to require the Wh marking on very small cells like those used in medical devices and small consumer devices (*e.g.,* smart glasses and ear buds). PRBA and MDTC request confirmation from PHMSA that it was not the Agency's intent to require the marking on lithium ion cells. PHMSA concurs with the commenters and is not adding lithium ion cells to the requirement in paragraph (a)(5). PHMSA is clarifying in the final rule that the requirement to mark the Wh rating only applies to lithium ion batteries and not lithium ion cells. PHMSA also received a comment from COSTHA in support of this revision.

Paragraph (b) packaging revisions: Section 173.185(b)(3) contains packaging provisions for lithium cells or batteries packed with equipment. Paragraph (b)(3)(iii) provides two authorized packaging configurations for lithium cells and batteries packed with equipment. Specifically, it permits lithium cells and batteries, when packed with equipment, to be placed in: (1) inner packagings that completely enclose the cell or battery, then placed in an outer packaging; or (2) inner packagings that completely enclose the cell or battery, then placed with equipment in a package that meets the PG II performance requirements as specified in paragraph § 173.185(b)(3)(ii). The intent of the first option provided in paragraph (b)(3)(iii)(A) is to permit packing only the cells or batteries in a UN specification packaging, and then place this packaging with the equipment, for

[28] 79 FR 46011 (Aug. 6, 2014).

which the batteries are intended, in a non-UN specification outer packaging. The intent for the second option provided in paragraph (b)(3)(iii)(B) is to pack both the cells or batteries and the equipment in a UN specification outer packaging. In a working paper submitted at the ICAO 2020 Working Group Meeting, it was noted that the actual text for the two options was not clear. Specifically, paragraph (b)(3)(iii)(A) does not clearly state that the specification packaging containing the cells or batteries is then packed with the equipment into a non-specification outer packaging. Consistent with the clarifying revision in the ICAO Technical Instructions, and to align more closely with the text in packing instruction P903 of the UN Model Regulations, PHMSA is revising paragraph (b)(3)(iii)(A) by clearly indicating that the cells or batteries must be placed in a specification package of a type that meets PG II performance requirements and then placed together with the equipment in a strong, rigid outer non-specification packaging. For additional clarity, PHMSA also is revising paragraph (b)(3)(iii)(B) by replacing the text ''package'' with the phrase ''packaging of a type'' when referring to the specification package meeting the PG II performance requirements. PHMSA received a comment from COSTHA in support of this revision.

PHMSA is adding a new paragraph (b)(3)(iii)(C) to include a limitation for the number of cells or batteries in the package, when transported by air. This is consistent with the provisions for smaller cells or batteries found in § 173.185(c)(4)(i)—as revised in this final rule—which currently requires that for smaller cells or batteries contained in or packed with equipment and shipped by aircraft, the number allowed in each package is limited to the number required to power the piece of equipment, plus two spare sets. The original provision limiting the number in each packaging was added in HM–224F but did not apply to fully regulated shipments.

However, PHMSA notes that the limitation on the number of cells or batteries allowed in a package should have also applied to fully regulated shipments of lithium batteries packed with equipment, consistent with Section I.2 of Packing Instruction 966 (for UN3481) and Packing Instruction 969 (for UN3091) of the ICAO Technical Instructions. PHMSA did not intend to limit the scope of this requirement to just smaller cells or batteries, as a condition for the exception from full regulation under paragraph (c), as this packaging requirement is intended to limit the hazard of lithium battery shipments in air transportation. Limiting the number of cells and batteries allowed to be packaged with equipment reduces hazard risks and increases safety.

Section 173.185(b)(4) contains packaging provisions for lithium cells or batteries contained in equipment. Consistent with the ICAO Technical Instructions, PHMSA is adding a new paragraph (b)(4)(iv) clarifying that for transportation by aircraft, when multiple pieces of equipment are packed in the same outer packaging, each piece of equipment must be packed to prevent contact with other equipment. This change is necessary because existing provisions in paragraph (b) could be interpreted to only apply to an outer packaging containing a single piece of equipment; however, an outer packaging may contain multiple pieces of equipment. This provision will more clearly communicate that for multiple pieces of equipment containing lithium cells or batteries in the same outer packaging, the equipment must be packed to prevent damage due to contact between the pieces of equipment. PHMSA received comments from ALPA, PRBA, COSTHA, and MDBTC in support of this revision.

Paragraph (c) exceptions for smaller cells or batteries revisions: Section 173.185(c) provides exceptions for smaller cells or batteries. Paragraph (c)(3) specifies requirements for the lithium battery mark. In the NPRM, PHMSA proposed to remove the telephone number requirement from the lithium battery mark with a phaseout date of December 31, 2026.

The intended use of the telephone number and its effectiveness was discussed by the UNSCOE. Examples pointing to its ineffectiveness include differences in time zones and languages between the origin and destination of a shipment or intermediate transport point, and a lack of clarity on the expected capability of the person responding to a telephone call. The requirement to include a ''telephone number for additional information'' was originally introduced in the 15th revised edition of the UN Model Regulations. It was envisioned that the telephone number would be for the consignor or other responsible individual who could provide further information (*e.g.,* appropriate corrective actions should something be wrong with the package) beyond the minimal information required to be indicated on the package. At that time, there was minimal hazard communication and less awareness than is currently provided for in the UN Model Regulations. The consignor information can now be readily obtained through other means, such as a bill of lading, shipping labels, or other paperwork, thereby rendering the telephone number requirement as a piece of information on the lithium battery mark effectively redundant. The resulting consensus based on both the discussion and experience with transport of small lithium batteries was that the telephone number adds little value, and removing the telephone number requirement from the mark would not reduce the effectiveness of the mark and therefore, not impact safety of transportation. PHMSA received an anonymous comment stating that the transition period authorizing continued use of the current lithium battery mark should extend beyond December 31, 2026. The commenter stated this transition period was decided on the premise that the international harmonization final rule would be published before January 1, 2023. As such, the anonymous commenter suggested that the phaseout date for the lithium battery mark in § 173.185(c)(3) should be extended based on the publication date of the final rule. PHMSA disagrees with the commenter that an extension is needed for the phaseout of the revised lithium battery mark in § 173.185(c)(3). The phaseout date of December 31, 2026, for the old lithium battery mark should still provide adequate time for entities to comply with the revised marking and does not justify PHMSA not being harmonized with the international regulations on this subject. Additionally, PHMSA received a comment from COSTHA in support of keeping the transition time the same as the international regulatory texts to facilitate global harmonization for this transition. Therefore, PHMSA is revising the lithium battery mark by removing the double asterisk from the example figure and the corresponding requirement in paragraph (c)(3)(i)(C) to replace the double asterisk with the telephone number. PHMSA is setting a transition period authorizing the use of the current lithium battery mark until December 31, 2026. ALPA, PRBA, and COSTHA provided comments in support of this revision.

Paragraph (c)(4) contains provisions for exceptions for smaller lithium cells and batteries offered by air transportation. PHMSA is removing the exceptions applicable to small lithium cells and batteries when they are not packed with or contained in equipment. This change was also implemented on

January 1, 2022, by the International Air Transport Association (IATA), and authorization for the exceptions for smaller lithium cells and batteries were removed from Packing Instructions 965 and 968 in the 2023–2024 Edition of the ICAO Technical Instructions. The exceptions in § 173.185(c)(4) were originally developed to facilitate the global transport of small lithium cells and batteries. However, these exceptions removed many of the regulatory safeguards that provide for the safe transport of lithium batteries, including requirements for air operators to perform an acceptance check; information to be provided to the pilot-in-command; and package hazard communication. Furthermore, the exceptions for small lithium cells and batteries limit the ability of air operators to conduct the necessary safety risk assessments. The reduced hazard communication also increased the risk of small lithium cells and battery packages restricted for transport on cargo-only aircraft from being inadvertently loaded on a passenger aircraft. The removal of these exceptions increases the visibility of these shipments to operators who must perform an acceptance check to ensure proper packaging and hazard communication and ensure the information regarding the number and location of packages containing lithium batteries will be provided to the pilot-in-command. The changes do not apply to the exceptions for small lithium cells and batteries packed with or contained in equipment. Specifically, PHMSA is removing the following provisions:

- Paragraph (c)(4)(i) including Table 1, which specifies the number and net quantity of lithium batteries.
- Paragraph (c)(4)(ii), which specifies the limitation of one package per overpack.
- Paragraph (c)(4)(iii), which specifies the limitation of one package per consignment.
- Paragraph (c)(4)(v), which specifies that offering packages and overpacks to an operator must be done separately from cargo not subject to the HMR.
- Paragraph (c)(4)(viii), which limits packing cells and batteries with certain types of hazardous materials in the same package or overpack.

As a consequence, the remaining provisions in paragraph (c)(4) applicable to lithium cells or batteries packed with, or contained in, equipment will be reorganized and renumbered. The paragraph (c)(4) introductory text is revised to read, ''Air transportation for smaller lithium cell or batteries packed with, or contained in, equipment.'' Further, consistent with the ICAO Technical Instructions, paragraph (c)(4)(ii), is revised to require that when placed into an overpack, packages must be secured within the overpack, and the intended function of each package must not be impaired by the overpack. The general provisions for overpacks in Part 5, 1.1 of the ICAO Technical Instructions require that packages must be secured within the overpack, and that the intended function of the package must not be impaired by the overpack. However, with the current construction of the provisions for small cells or batteries in Packing Instructions 966, 967, 969, and 970, the general Part 5 overpack provisions do not apply, which could lead to packages being unsecured or even damaged by being unrestrained within an overpack. These overpack provisions from Part 5 were added to the respective packing instructions to ensure protection against damage of the packages and their contents; therefore, PHMSA is harmonizing this change in § 173.185(c)(4)(ii).

These amendments (*i.e.,* hazard communication clarifications and revisions to lithium battery requirements for consistency) maintain the level of safety currently present in the HMR's high safety standard. Safety benefits will also be derived from improved compliance related to consistency amongst domestic and international regulations. PHMSA received a comment from MDTC in support of this revision.

Section 173.185(c)(5), which corresponds to Packaging Instructions 965 and 968 in Section IB of the ICAO Technical Instructions, provides an exception from specification packing requirements for smaller lithium cells and batteries, not exceeding the size prescribed in paragraph (c)(1) and subject to certain quantity limits. PHMSA is revising the paragraph (c)(5) introductory text to, ''Air transportation for smaller lithium cell and batteries.'' Combined with the revision to the (c)(4) introductory text, this will assist users of this section to understand that the requirements in this section apply to smaller lithium cells and batteries transported by air. PHMSA is also removing the references to paragraph (c)(4) limitations based on their removal, as described above. Additionally, PHMSA is moving the regulatory requirements of paragraph (c)(5) to a new paragraph (c)(5)(i), based on the addition of new paragraph (c)(5)(ii). As mentioned, PHMSA is adding a new paragraph (c)(5)(ii) to require packages to be capable of withstanding a three-meter stack test for a duration of 24 hours. Because lithium cells and batteries offered in accordance with paragraph (c)(5) are excepted from the specification package requirements, they are not presently subject to a stack test. However, the general requirements for limited quantity packages by air in § 173.27(f)(2)(vi), which are also excepted from specification packaging requirements, requires that each package be capable of withstanding a three-meter stack test for a duration of 24 hours. In considering the packaging standards between limited quantity packages and those for smaller lithium cells and batteries, it was agreed by the DGP that packages must be capable of withstanding a stack test, in parallel with the requirement for limited quantity packages. PHMSA agrees with introducing a stack test as a preventative safety measure against potential damage to lithium battery packages from stacking of packages and is including a stack test requirement in new paragraph (c)(5)(ii). PHMSA received comments in response to the NPRM from PRBA, COSTHA, and DGAC in support of this revision.

Lastly, consistent with corresponding revisions to international standards, PHMSA is making editorial revisions in paragraphs (e)(6) and (e)(7), where references to ''battery assemblies'' are removed and replaced with the phrase ''cells and batteries,'' as used throughout the section. Paragraph (a)(1) requires each lithium cell or battery to be of the type proven to meet the criteria in part III, sub-section 38.3, of the UN Manual of Tests and Criteria. The 38.3.2.3 definition for ''battery'' states that:

> ''. . . Units that are commonly referred to as ''battery packs,'' ''modules'' or ''battery assemblies'' having the primary function of providing a source of power to another piece of equipment are, for the purposes of the Model Regulations and this Manual, treated as batteries.''

Use of ''battery assemblies'' may be a source of confusion, as the reader may understand it to have a separate meaning from ''battery,'' yet it is not specifically defined in the HMR. Further, based on the above requirements to comply with the UN Manual of Tests and Criteria and its associated meaning of ''battery assemblies,'' PHMSA considers that the use of the term ''battery assemblies'' is redundant with the term ''battery'' in the context of these transport requirements, and is revising the text to reduce confusion of the provisions in these paragraphs regarding applicability to the assembly or to the cells and batteries contained within an assembly. PHMSA expects that the changes to

§ 173.185 will provide clarity, thus enhancing the safety standard in the HMR for transportation of lithium batteries. PHMSA received comments in response to the NPRM from MDTC and COSTHA in support of this revision.

Section 173.224

Section 173.224 establishes packaging, and control and emergency temperatures for self-reactive materials. The Self-Reactive Materials Table in paragraph (b) of this section specifies requirements for self-reactive materials authorized for transportation that do not require prior approval for transportation by the Associate Administrator for Hazardous Materials Safety. As a result of new self-reactive materials formulations becoming commercially available, the 22nd revised edition of the UN Model Regulations includes updates to the list of specified self-reactive materials authorized for transportation without prior approval. To maintain consistency with the UN Model Regulations, PHMSA is updating the Self-Reactive Materials Table by adding a new entry for ''(7-Methoxy-5-methyl-benzothiophen-2-yl) boronic acid.'' PHMSA also is correcting the name of one of the listed self-reactive substances on the self-reactive substances table. Currently, ''2-(N,N-Methylaminoethylcarbonyl)-4-(3,4-dimethyl-phenylsulphonyl)benzene diazonium zinc chloride'' is listed; however, this formulation name should be ''2-(N,N-Methylaminoethylcarbonyl)-4-(3,4-dimethylphenylsulphonyl) benzenediazonium hydrogen sulphate.'' While reviewing the self-reactive table in the UN Model Regulations and ICAO Technical Instructions, PHMSA discovered that ''2-(N,N-Methylaminoethylcarbonyl)-4-(3,4-dimethyl-phenylsulphonyl)benzene diazonium zinc chloride'' does not appear in any other international regulations but that ''2-(N,N-Methylaminoethylcarbonyl)-4-(3,4-dimethylphenylsulphonyl) benzenediazonium hydrogen sulphate'' does and includes identical packaging provisions. PHMSA does not believe there is any formulation called ''2-(N,N-Methylaminoethylcarbonyl)-4-(3,4-dimethyl-phenylsulphonyl)benzene diazonium zinc chloride'' that exists, and that this entry as it appears is the result of an editorial error in which two individual formulation names were inadvertently combined. Therefore, PHMSA is correcting the name associated with this formulation by removing the suffix ''benzene diazonium zinc chloride'' and replacing it with ''benzenediazonium hydrogen sulphate.''

In addition, PHMSA is assigning a new ''Note 6'' to this entry among the list of notes following the table. ''Note 6'' will provide concentration limits of water and organic impurities for this new self-reactive material. PHMSA expects that adding provisions for the transport of (7-Methoxy-5-methyl-benzothiophen-2-yl) boronic acid formulations will facilitate its transport while maintaining the HMR's safe standard for transportation of self-reactive hazardous materials.

PHMSA is also revising § 173.224(b)(4). In a previous final rule, HM–215O, PHMSA revised § 173.224 to authorize self-reactive materials to be transported and packed in accordance with packing method OP8 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 allowed materials that are authorized in bulk packagings to also be transported in appropriate non-bulk packagings. PHMSA is making an editorial correction to a reference to the formulations listed in § 173.225. In the course of adding this provision, PHMSA incorrectly directed users to the Organic Peroxide IBC Table by referencing 173.225(f); however, the table is found in 173.225(e). Therefore, PHMSA is correcting that sentence to refer to 173.225(e).

Section 173.225

Section 173.225 prescribes packaging requirements and other provisions for organic peroxides. As a result of new peroxide formulations becoming commercially available, the 22nd revised edition of the UN Model Regulations includes updates to the list of identified organic peroxides, which provides for formulations of these materials that are authorized for transportation without prior approval. To maintain consistency with the UN Model Regulations, PHMSA is updating the Organic Peroxide Table in § 173.225(c) by adding new entries for ''tert-Butylperoxy isopropylcarbonate,'' ''tert-hexyl peroxypivalate,'' and ''acetyl acetone peroxide,'' and identifying them as ''UN3105, Organic peroxide type D, liquid;'' ''UN3117, Organic peroxide type E, liquid, temperature controlled;'' and ''UN3107, Organic peroxide type E, liquid,'' respectively. Additionally, PHMSA is adding a ''Note 32'' following the table, in association with the new entry for ''acetyl acetone peroxide,'' to indicate that the active oxygen concentration for this formulation is limited to concentrations of 4.15% active oxygen or less. PHMSA also is revising the Organic Peroxide Portable Tank Table in paragraph (g) to maintain alignment with the 22nd revised edition of UN Model Regulations by adding the new formulation ''tert-Butyl hydroperoxide, not more than 56% with diluent type B,'' identified by ''UN3109, Organic peroxide type F, liquid.'' This amendment will also include the addition of ''Note 2'' following the table to specify that diluent type B is tert-Butyl alcohol. PHMSA expects that adding provisions for the transport of these newly available peroxide formulations will facilitate transportation of these materials, while maintaining the HMR's safety standard for transportation of organic peroxide hazardous materials.

Section 173.232

Section 173.232 outlines the packaging requirements for articles containing hazardous materials. For the purposes of this section, an ''article'' means machinery, apparatus, or other device that contains one or more hazardous materials—or residues thereof—that are an integral element of the article, are necessary for its functioning, and cannot be removed for the purpose of transport. Currently, these articles are forbidden from transport on passenger and cargo-only aircraft, as specified in column (9) of the HMT. However, the 2023–2024 ICAO Technical Instructions include new provisions permitting the transport of certain articles containing hazardous materials aboard passenger and cargo-only aircraft. These new provisions allow articles described and classified as ''UN3548, Articles containing miscellaneous dangerous goods, n.o.s., 9'' or ''UN 3538, Articles containing non-flammable, non-toxic gas, n.o.s., 2.2'' to be transported by cargo-only and passenger aircraft under certain conditions. PHMSA is making changes consistent with those provisions by adding two new packaging provisions in § 173.232, in addition to the new special provisions A224 and A225 discussed above in Section-by-Section Review of amendments for § 172.102. Specifically, PHMSA is specifying in paragraph (h) that air transport is permitted for UN3548 when the articles: (1) do not have an existing proper shipping name; (2) contain only environmentally hazardous substances exceeding 5 L or 5 kg; and (3) all other conditions of § 173.232 are met. In a new paragraph (h)(ii), the same requirements are added for articles transported under UN3538, which: (1) do not have an existing proper shipping name; (2) contain only

gases of Division 2.2 without a subsidiary hazard, except for refrigerated liquefied gases and other gases that are forbidden for transport on passenger aircraft, where the quantity of the Division 2.2 gas exceeds the quantity limits for UN 3363, as prescribed in § 173.222; (3) the quantity of gas in the article does not exceed 75 kg when transported by passenger aircraft or 150 kg when transported by cargo-only aircraft; and (4) gas containing receptacles within the article must meet the requirements of Part 173 and Part 175, as appropriate., or meet a national or regionally recognized pressure receptacle standard.

Additionally, both packaging provisions also permit the transport of these articles, containing lithium cells or batteries, provided that the batteries meet the requirements specified in § 173.185(c). The aim of these new provisions is to facilitate the transport of large articles containing environmentally hazardous substances, such as aircraft landing gear struts filled with hydraulic fluid, and large articles containing a non-flammable, non-toxic gas, such as new types of magnetic resonance imaging (MRI) scanners, which often contain compressed helium, as well as lithium cells or batteries. As a participant on the DGP, PHMSA expects that the packaging provisions provide an appropriate level of safety to allow these items to be transported by air and are appropriate for incorporation in the HMR.

Section 173.301b

Section 173.301b outlines additional general requirements when shipping gases in UN pressure receptacles (*e.g.,* cylinders). The 22nd revised edition of the UN Model Regulations updated references of several authorized standards for ensuring proper valve protection. In order to maintain the current safety standard of the HMR for valve protection and harmonization with the requirements for UN pressure receptacles, PHMSA is also updating these references. Currently, paragraph (c)(1) requires that 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.'' ISO 17871, in conjunction with ISO 10297 and ISO 14246, specifies design, type testing, marking, manufacturing tests, and examination requirements for quick-release cylinder valves, intended to be fitted to refillable transportable gas cylinders and pressure drums, and tubes used to transport compressed or liquefied gases or extinguishing agents charged with compressed gases to be used for fire-extinguishing, explosion protection, and rescue applications. As part of its regular review of its standards, ISO updated and published the second edition of ISO 17871 as ISO 17871:2020(E). PHMSA is revising the valve requirements in this paragraph to require quick release cylinder valves for specification and type testing to conform to ISO 17871:2020(E). After December 31, 2026, conformance with ISO 17871:2015(E) will no longer be authorized in the UN Model Regulations; therefore, for consistency, PHMSA is adding a phaseout date of December 31, 2026, for continued conformance with ISO 17871:2015(E). PHMSA clarified in the ''Section IV: Comment Discussion'' section of this final rule that the phaseout date of December 31, 2026, applies to the manufacturing of valves under ISO 17871:2015(E). Valves manufactured before December 31, 2026, would still be authorized under the HMR. The second edition of this standard broadens the scope to include quick release valves for pressure drums and tubes, and specifically excludes the use of quick-release valves with flammable gases. Other notable changes include the addition of the valve burst test pressure; the deletion of the flame impingement test; and the deletion of the internal leak tightness test at −40 °C for quick-release cylinder valves, used only for fixed firefighting systems installed in buildings. PHMSA expects that updating the requirements for conformance of UN pressure receptacles with this document will maintain the HMR safety standard for these packagings, and facilitate compliance with valve requirements domestically and internationally by aligning the HMR with changes adopted in the 22nd revised edition of the UN Model Regulations. PHMSA reviewed this edition as part of its regular participation in the review of amendments for the UN Model Regulations.

PHMSA also is revising paragraph (c)(2), which requires UN pressure receptacles to have their valves protected from damage to prevent unintentional release of the contents of the receptacles. Various methods on how to achieve damage protection are provided, including equipping the container with a valve cap or guard that conforms to ISO 11117:2008, ''Gas cylinders—Valve protection caps and guards—Design, construction and tests'' and the Technical Corrigendum 1, a complementary document to the standard. As part of its regular review of its existing standards, in 2019, ISO published an updated version of this standard, 11117:2019, which was adopted in the 22nd revised edition of the UN Model Regulations as a permitted conformance standard for valve protection. This document updates the 2008 version, currently authorized in paragraphs (c)(2)(ii) and (c)(2)(iii). In accordance with the UN Model Regulations, PHMSA also is authorizing the continued use of ISO 11117:2008, in conjunction with the Technical Corrigendum, until December 31, 2026. PHMSA clarified in the ''Section IV: Comment Discussion'' section of this final rule that the phaseout date of December 31, 2026, applies to the manufacturing of valve protection caps under ISO 11117:2008. Valves manufactured before December 31, 2026, would still be authorized under the HMR. Similarly, for metal hydride storage systems, damage protection of the valve must be provided in accordance with ISO 16111:2008, ''Transportable gas storage devices—Hydrogen absorbed in reversible metal hydride.'' As part of its regular review of its existing standards, in 2018, ISO published an updated version of this standard, which was adopted in the 22nd revised edition of the UN Model Regulations as a permitted conformance standard for valve protection. Therefore, to maintain alignment with the UN Model Regulations' requirements for UN metal hydride storage systems, PHMSA is updating the required standard for protection of valves to ISO 16111:2018 and including a phaseout date of December 31, 2026, for continued use of valve guards conforming to valve protection standards in ISO 16111:2008. PHMSA clarified in the ''Section IV: Comment Discussion'' section of this final rule that the phaseout date of December 31, 2026, applies to the manufacturing of valves under ISO 16111:2008. Valves manufactured before December 31, 2026, would still be authorized under the HMR. PHMSA has reviewed the updated ISO standards as part of its regular participation in the review of amendments for the UN Model Regulations and has determined use of the update ISO 16111 will maintain the HMR safety standard for protection of valves used in UN metal hydride storage systems.

Paragraph (d) requires that when the use of a valve is prescribed, the valve must conform to the requirements in ISO 11118:2015(E), ''*Gas cylinders—Non-refillable metallic gas cylinders—Specification and test methods.*'' ISO 11118:2015 specifies minimum requirements for the material, design,

inspections, construction and workmanship, manufacturing processes, and tests at manufacture of non-refillable metallic gas cylinders of welded, brazed, or seamless construction for compressed and liquefied gases, including the requirements for their non-refillable sealing devices and their methods of testing. For consistency with the UN Model Regulations, PHMSA is revising the valve conformance requirements to include a reference to the 2019 amendment of ISO 11118, specifically, ISO 11118:2015/Amd 1:2019, which ISO published as a supplement to ISO 11118:2015(E). This supplement corrects the references and numerous typographical errors. The amendment also includes updates to the marking requirements in the normative Annex A, which includes clarifications, corrections, and new testing requirements. Additionally, paragraph (d) currently indicates that the manufacture of valves to ISO 13340:2001(E) is authorized until December 31, 2020. Since this date has passed, PHMSA is removing reference to this expired authorization.

Updating references to these documents will align the HMR with changes adopted in the 22nd revised edition of the UN Model Regulations pertaining to the design and construction of UN pressure drums. PHMSA has reviewed this edition as part of its regular participation in the review of amendments for the UN Model Regulations and does not expect any degradation of safety standards in association with its use.

Lastly, paragraph (f) of this section requires that for the transportation of hydrogen bearing gases, a steel UN pressure receptacle bearing an ''H'' mark must be used. The ''H'' marking indicates that the receptacle is compatible with hydrogen embrittling gases. However, some hydrogen bearing gases may also be transported in composite pressure receptacles with steel liners as provided in § 173.311. Therefore, PHMSA is amending § 173.301b(f) to clarify that these compatibility provisions apply to steel UN cylinders as well as composite pressure receptacles that include steel liners. PHMSA expects that this amendment will add an additional level of safety by ensuring that suitability of materials is considered when shippers opt to use composite cylinders for the transport of hydrogen bearing gases.

Section 173.302b

In the NPRM, PHMSA proposed to add a new Special Provision 441, assigning it to ''UN1045, Fluorine, compressed.'' As previously discussed in ''Section IV: Comment Discussion'' section of this final rule, PHMSA is moving the regulatory language from the proposed special provision 441 into § 173.302b(g). This new paragraph addresses gas mixtures containing fluorine and inert gases in UN pressure receptacles in accordance with changes adopted in the 22nd revised edition of the UN Model Regulations. Specifically, this change provides latitude with regard to the maximum allowable working pressure when fluorine is a part of a mixture, which contains less reactive gases, such as nitrogen, when the mixture is transported in UN pressure receptacles. As a strongly oxidizing gas, pure fluorine requires specific safety measures because it reacts spontaneously with many organic materials and metals. Additionally, because of its reactive properties, the UN Model Regulations limit the maximum allowable working pressure for pure fluorine in cylinders to 30 bar; a minimum test pressure of 200 bar is also required. However, prior to changes adopted in the 22nd revised edition of the UN Model Regulations, there was no guidance on the maximum allowable working pressure and minimum test pressure for mixtures of gases that contain fluorine. Commercially, these mixtures are often placed on the market and used in concentrations, which may include as little as one percent fluorine combined with noble gases, or 10 to 20 percent fluorine mixed with nitrogen. Due to the lack of specific provisions addressing fluorine gas mixtures, such mixtures containing relatively inconsequential amounts of fluorine were subject to the same requirements (restrictive maximum allowable working pressures) as pure fluorine. Given that fluorine, in a mixture with inert gases or nitrogen, is less reactive towards materials than pure fluorine, the UNSCOE determined that gas mixtures containing less than 35% fluorine by volume should no longer be treated like pure fluorine and may use a higher maximum allowable working pressure. The new packing provision added in the 22nd revised edition of the UN Model Regulations allows for pressure receptacles containing mixtures of fluorine and inert gases (including nitrogen) to have higher working pressures by allowing for consideration of the partial pressures exerted by the other constituents in the mixture, rather than limiting the pressure in the receptacle based on fluorine alone. Specifically, the provision permits mixtures of fluorine and nitrogen with a fluorine concentration below 35% by volume to be filled in pressure receptacles up to a maximum allowable working pressure for which the partial pressure of fluorine does not exceed 31 bar absolute. Additionally, for mixtures of true inert gases and fluorine, where the concentration of fluorine is below 35% by volume, pressure receptacles may be filled up to a maximum allowable working pressure for which the partial pressure of fluorine does not exceed 31 bar absolute, provided that when calculating the partial pressure, the coefficient of nitrogen equivalency is determined and accounted for in accordance with ISO 10156:2017. Finally, the newly added provision for these two types of gas mixtures limits the working pressure to 200 bar or less, and requires that the minimum test pressure of pressure receptacles for these mixtures equals 1.5 times the working pressure or 200 bar, with the greater value to be applied. While PHMSA is not adding similar provisions for this type of mixture in DOT specification cylinders in this rulemaking, PHMSA has evaluated the rationale and methods for determining the pressure limits in UN pressure receptacles, and finds that they provide an equivalent level of safety. For this reason, PHMSA is adopting the packing instruction as drafted in the UN Model Regulations as a new paragraph to § 173.302b of the HMR.

Section 173.302c

Section 173.302c outlines additional requirements for the shipment of adsorbed gases in UN pressure receptacles. Currently paragraph (k) requires that filling of UN pressure receptacles with adsorbed gases be performed in accordance with Annex A of ISO 11513:2011, ''*Gas cylinders—Refillable welded steel cylinders containing materials for sub-atmospheric gas packaging (excluding acetylene)—Design, construction, testing, use and periodic inspection.*'' As part of its periodic review and updates of standards, ISO has developed an updated second edition (published in 2019). The updated ISO 11513 standard was adopted in the 22nd revised edition of the UN Model Regulations for use in cylinders filled with adsorbed gases. Similarly, PHMSA is requiring use of Annex A of ISO 11513:2019. Specifically, this amendment will require the use of the 2019 standard and provide a phaseout date for continued use of the ISO 11513:2011 until December 31, 2024. Updating references to this document will align the HMR with changes adopted in the 22nd revised edition of the UN Model Regulations pertaining to the shipment

of adsorbed gases in UN pressure receptacles. PHMSA has reviewed this edition as part of its regular participation in the review of amendments for the UN Model Regulations and does not expect any degradation of safety standards in association with its use.

Section 173.311

Section 173.311 specifies requirements for transportable UN metal hydride storage systems (UN3468) that are comprised of pressure receptacles not exceeding 150 L (40 gallons) in water capacity, and having a maximum developed pressure not exceeding 25 MPa (145 psi). Currently, the HMR requires that these metal hydride storage systems be designed, constructed, initially inspected, and tested in accordance with ISO 16111:2008, ''Transportable gas storage devices—Hydrogen absorbed in reversible metal hydride.'' However, the 22nd revised edition of the UN Model Regulations updated references to this standard to authorize the use of the updated 2018 version of ISO 16111, while allowing the 2008 version to remain authorized for use until December 31, 2026. PHMSA clarified in the ''Section IV: Comment Discussion'' section of this final rule that the phaseout date of December 31, 2026, applies to the manufacturing of cylinders under ISO 16111:2008. Cylinders manufactured before December 31, 2026, would still be authorized under the HMR. Therefore, for consistency with the requirements for UN metal hydride storage systems, PHMSA is adopting changes made in the 22nd revised edition of the UN Model Regulations to authorize the use of ISO 16111:2018 and add a phaseout date of December 31, 2026, for continued use of ISO 16111:2008. PHMSA has reviewed this edition as part of its regular participation in the review of amendments for the UN Model Regulations and has determined the updated edition of ISO 16111 will maintain the HMR safety standards for the design, construction, initial inspection, and testing of UN metal hydride storage systems.

D. Part 175

Section 175.1

Section 175.1 outlines the purpose, scope, and applicability of the Part 175 requirements for the transport of hazardous materials by aircraft. Specifically, these requirements are in addition to other requirements contained in the HMR. The aircraft-level risk presented by hazardous materials depends on several factors, such as the total quantity and type, potential interactions, and existing risk mitigation measures. When accepting hazardous materials for transportation by aircraft, certain aircraft operators (*i.e.,* air carriers) must also comply with the Federal Aviation Administration (FAA) Safety Management System (SMS) requirements in 14 CFR part 5—Safety Management Systems, which impacts how operators comply with requirements of the HMR.

PHMSA is adding a new paragraph (e) to this sections that directs 14 CFR part 121 certificate holders to the FAA's requirements to have an SMS in accordance with 14 CFR part 5. This action will not introduce new regulatory burden, as the SMS requirements for Part 121 certificate holders have been in place for several years. However, PHMSA expects that adding a reference to these requirements in the HMR will provide additional clarity for Part 121 aircraft operators, particularly with SMS applicability to the acceptance and transport of hazardous materials at the aircraft level. Finally, PHMSA notes that the FAA Advisory Circular (AC) 120–121 [29] provides information relating to safety risk assessments (which is the process within the SMS composed of describing the system, identifying the hazards, and analyzing, assessing, and controlling risk) and potential mitigation strategies to items in the aircraft cargo compartment. When using this document, aircraft operators should refer to requisite ICAO documents; check the FAA website for additional information on cargo safety and mitigations relating to fire events; and consider safety enhancements developed and promoted by industry groups.

Section 175.10

Section 175.10 specifies the conditions under which passengers, crew members, or an air operator may carry hazardous materials aboard an aircraft. Consistent with revisions to the ICAO Technical Instructions, PHMSA is making revisions in paragraphs (a)(15) and (a)(17) applicable to the carriage of wheelchairs or other mobility aids powered by batteries. Specifically, in paragraphs (a)(15)(v)(A), (a)(15)(vi)(A) and (a)(17)(ii)(C), which currently require that the battery be securely attached to the wheelchair or mobility aid, PHMSA is adding the supplemental requirement that the battery is also adequately protected against damage by the design of the wheelchair or mobility aid. The revisions will enhance the safe carriage of these battery-powered items aboard passenger aircraft by requiring combined measures of protection against damage and securement of the batteries. Furthermore, the revisions will assist passengers traveling with battery-powered wheelchairs or mobility aids by providing better clarity on the required safety measures. Additionally, PHMSA is revising introductory text to paragraphs (a)(14) and (a)(26) to specifically state that each lithium battery must be of a type that meets the requirements of the UN Manual of Tests and Criteria, Part III, Subsection 38.3. Currently this requirement is outlined in every other subparagraph under paragraph (a) pertaining to lithium batteries but was inadvertently omitted in prior rulemakings for paragraphs (a)(14) and (a)(26). In its comment to the NPRM, COSTHA notes that PHMSA inadvertently left out the word ''lithium'' to clarify the testing requirements in this section apply to lithium batteries. PHMSA concurs with the COSTHA comment and is revising § 175.10(a)(14) to clarify that the testing requirements in this section only apply to lithium powered batteries. Additionally, PHMSA received comments from ALPA, MDTC, and PRBA in support of this proposal. Therefore, for clarity and consistency with the ICAO Technical Instructions, PHMSA is making this editorial change and expects it will improve safety by ensuring it is understood that all lithium batteries transported under the provisions of that paragraph are subject to UN testing.

PHMSA is revising paragraph (a)(18) regarding the carriage of portable electronic devices (*e.g.,* watches, cell phones, etc.). Currently, the HMR allows these devices to be carried both in carry-on baggage and checked baggage. However, this paragraph stipulates that for lithium battery-powered devices carried in checked baggage, the devices must be completely switched off (*i.e.,* not in sleep or hibernation mode). The requirement to turn off battery powered devices was added in the ICAO Technical Instructions and the HMR as a result of temporary security restrictions that prohibited the carriage of large portable electronic devices in the cabin on certain flights. In addition to the restriction of electronic devices in the aircraft cabin, a requirement to turn off all devices powered by lithium batteries when placed in checked baggage was added to prevent risks from overheating in those devices that might remain

[29] *https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_120-121.pdf.*

active when not powered off (*e.g.,* laptops). This requirement to turn devices off was applied to all devices powered by batteries or cells, regardless of their size and level of risk, primarily to simplify the regulations and facilitate its implementation. However, in light of the need for passengers to carry active devices powered by small cells in checked baggage (*e.g.,* small tracking devices), PHMSA is providing some conditional relief from this requirement for passengers and crew by applying the provision to switch off the device to only those devices powered by lithium metal batteries exceeding 0.3 grams lithium content or lithium-ion batteries exceeding 2.7 Wh. This is consistent with paragraph (a)(26), which allows baggage equipped with lithium batteries to be carried as checked baggage if the batteries do not exceed 0.3 grams of lithium content or 2.7 Wh, respectively. Based on similar battery size criteria in paragraph (a)(26), PHMSA does not expect a reduction in safety of transporting lithium battery-powered devices aboard passenger aircraft under the exception. Moreover, small lithium battery-powered devices are not known or expected to create heat in the same manner as portable electronic devices powered by much larger batteries. PHMSA expects this amendment will avoid unnecessary operational challenges for states, operators, and the travelling public without compromising safety. In response to the NPRM, PHMSA received comments from ALPA, COSTHA, MDTC, and PRBA in support of this revision.

Additionally, PHMSA is adding clarification in paragraph (a) that the most appropriate exception from this section shall be selected when hazardous materials are carried by aircraft passengers or crewmembers. For example, paragraph (a)(19) specifies conditions for battery-powered smoking devices such that a person cannot opt to follow the more generalized portable electronic device conditions of paragraph (a)(18). PHMSA expects this clarification will support the safe transport of excepted hazardous materials by ensuring they will be transported in a manner that is most appropriate for the hazard they may pose.

Finally, PHMSA is making a clarifying amendment to paragraph (a)(26) regarding baggage equipped with lithium batteries. Oftentimes, the baggage has built-in features that cannot be turned off, and the intent of paragraph (a)(26) is that the devices are not required to be turned off when the baggage is checked. Therefore, PHMSA is clarifying paragraph (a)(26) to state plainly that, under the conditions allowing baggage to be checked without removing the batteries, electronic features of the baggage do not have to be switched off if the lithium batteries meet the size limitations in paragraphs (a)(26)(i) and (ii). In response to the NPRM, COSTHA was supportive of this revision but proposes PHMSA add ''lithium'' to the sentence to clarify the requirement is for lithium batteries, *i.e.,* ''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 . . .'' PHMSA concurs with COSTHA's comment and has revised paragraph (a)(26) as suggested. Additionally, ALPA, MDTC, and PRBA provided comments in support of this revision.

Section 175.33

Section 175.33 establishes requirements for shipping papers and for the notification of the pilot-in-command when hazardous materials are transported by aircraft. Currently, paragraph (a)(13)(iii) conditionally excepts lithium batteries [30] that are prepared in accordance with the paragraph § 173.185(c) exceptions for smaller cells and batteries from the requirement to be included with the information to be provided to the pilot-in-command. Since smaller lithium cells and batteries that are not packed with or contained in equipment (*e.g.,* UN3480, Lithium ion batteries, and UN3090, Lithium metal batteries) are no longer provided relief from hazard communication requirements, such as shipping papers, PHMSA is making a conforming change to this section to also remove the exception for UN3480 and UN3090 from being excepted from the pilot-in-command requirement. This revision maintains the HMR standard of hazard communication for transportation of lithium cells and batteries by air. In response to the NPRM, PHMSA received comments from COSTHA and MDTC is support of this revision.

E. Part 178

Section 178.37

Section 178.37 outlines the construction requirements for DOT specification 3AA and 3AAX seamless steel cylinders. As summarized in the Section IV. Section-by-Section Review discussion of changes to § 171.7, PHMSA is incorporating by reference the revised third edition (published in 2019) of ISO 9809–1, ''Gas cylinders—Design, construction and testing of refillable seamless steel gas cylinders and tubes—Part 1: Quenched and tempered steel cylinders and tubes with tensile strength less than 1100 *MPa*.'' Currently, ISO 9809–1 is referenced in § 178.37 as an approved methodology by which to perform bend tests, instead of the required flattening test specified in paragraph (j). As currently written, paragraph (j) does not specify which edition is authorized, yet multiple editions are incorporated by reference in § 171.7. PHMSA aims to make the requirement clearer by authorizing use of the most current version of ISO 9809–1 only. PHMSA reviewed the 2019 version and concludes that the bend test provisions in the standard remain a suitable alternative for the flattening test provisions of paragraph (j). This clarification will improve compliance with the appropriate version of ISO 9809–1 and ensure an appropriate level of safety.

Section 178.71

Section 178.71 prescribes specifications for UN pressure receptacles. Several updates to referenced standards pertaining to the design, construction, and maintenance of UN pressure receptacles were added in the 22nd revised edition of the UN Model Regulations. To maintain consistency with the UN Model Regulations, PHMSA is making similar updates to those ISO standards incorporated by reference in this section. In its comments to the NPRM, CGA suggests that PHMSA consider using the current method of stating the applicability of older editions of ISO standards that more specifically set the endpoint for use of the standard to the manufacture of the cylinders. CGA adds that using the word ''manufacture'' better aligns with the term ''applicable for manufacture'' used throughout section 6.2.2 in the 22nd edition of the UN Model Regulations. PHMSA agrees and is revising the language in this section to better reflect the intent in the UN Model Regulations, that the year of manufacture should be used to describe the phaseout of these ISO standards.

Paragraph (f) outlines required conformance to ISO design and construction standards, as applicable, for UN refillable welded cylinders and UN pressure drums in addition to the general requirements of the section. ISO 21172–1:2015, ''*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

[30] UN3480, Lithium-ion batteries, UN3481, Lithium-ion batteries, contained in equipment *or* packed in equipment, UN3090, Lithium metal batteries, and UN3091, Lithium metal batteries contained in equipment *or* packed with equipment.

currently included in paragraph (f)(4) and specifies the minimum requirements for the material, design, fabrication, construction and workmanship, inspection, and testing at manufacture of refillable welded steel pressure drums of volumes up to 1,000 L (264 gallons). The 22nd revised edition of the UN Model Regulations includes an amendment to ISO 21172:2015—ISO 21172–1:2015/Amd1:2018, ''*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—Amendment 1*.'' ISO 21172–1:2015/Amd1:2018 is a short supplemental amendment to be used in conjunction with ISO 21172–1:2015. It removes the restriction on use of UN pressure drums for transportation of corrosive materials. In addition to adding a reference for use of this supplemental document, the UN Model Regulations added a phase out date of manufacture of December 31, 2026, until which ISO 21172–1:2015 UN pressure drums may continue to be manufactured without the supplement. Similarly, PHMSA is requiring conformance of UN pressure drums with ISO 21172 used in combination with the supplemental amendment, and adding a phaseout date of December 31, 2026, for continued manufacture of UN pressure drums in conformance with ISO 21172–1:2015 without the supplemental amendment.

Additionally, PHMSA is revising paragraphs (g), (k), and (n), which outline the design and construction requirements for UN refillable seamless steel cylinders, UN acetylene cylinders, and UN cylinders for the transportation of adsorbed gases, respectively. Currently this section requires that these UN cylinders conform to the second edition (published in 2010) of one or more of following ISO standards:

(1) ISO 9809–1:2010 ''*Gas cylinders—Refillable seamless steel gas cylinders—Design, construction and testing—Part 1: Quenched and tempered steel cylinders with tensile strength less than 1100 MPa*.''

(2) ISO 9809–2, ''*Gas cylinders—Refillable seamless steel gas cylinders—Design, construction and testing—Part 2: Quenched and tempered steel cylinders with tensile strength greater than or equal to 1100 MPa*.''

(3) ISO 9809–3, ''*Gas cylinders—Refillable seamless steel gas cylinders—Design, construction and testing—Part 3: Normalized steel cylinders*.''

This series of ISO standards specifies minimum requirements for the material, design, construction and workmanship, manufacturing processes, examination, and testing at time of manufacture for refillable seamless steel gas cylinders and tubes with water capacities up to and including 450 L (119 gallons). PHMSA is modifying the design and construction requirements for UN cylinders by authorizing the use of the revised third edition of ISO 9809, Parts 1 through 3. Additionally, PHMSA is adding a phaseout date of December 31, 2026, for continued design, construction, and testing of UN cylinders conforming to the second edition. Finally, PHMSA is removing reference to the first edition of these standards as the authorized date (December 31, 2018) for continued manufacture in accordance with this edition has expired. PHMSA has reviewed these updated standards as part of its regular participation in the review of amendments for the UN Model Regulations and expects their required use will maintain the HMR safety standard for manufacture of UN cylinders.

Paragraph (i) outlines required conformance to ISO design and construction standards for UN non-refillable metal cylinders. PHMSA is removing reference to ISO 11118:1999 and adding a reference to a supplemental amendment, ISO 11118:2015/Amd 1:2019. Current paragraph (i) requires, in addition to the general requirements of the section, conformance with ISO 11118:2015, ''*Gas cylinders—Non-refillable metallic gas cylinders—Specification and test methods*.'' ISO 11118:2015 specifies minimum requirements for the material, design, inspections, construction, workmanship, manufacturing processes, and tests for manufacture of non-refillable metallic gas cylinders of welded, brazed, or seamless construction for compressed and liquefied gases, including the requirements for their non-refillable sealing devices and their methods of testing. PHMSA is revising the valve conformance requirements to include a reference to the 2019 supplemental amendment (ISO 11118:2015/Amd 1:2019), which ISO published to be used in conjunction with an ISO 11118:2015. Additionally, PHMSA is adding an end date of December 31, 2026, to the authorization to use ISO 11118:2015 when not used in conjunction with the supplemental 2019 amendment, ISO 11118:2015 +Amd.1:2019. This supplemental amendment corrects the identity of referenced clauses and corrects numerous typographical errors. PHMSA has reviewed this supplemental amendment as part of its regular participation in the review of amendments for the UN Model Regulations and does not expect any degradation of safety standards in association with the use of these two documents.

Paragraph (m) outlines required conformance to ISO standards for the design and construction requirements of UN metal hydride storage systems. Currently this paragraph requires that metal hydride storage systems conform to ISO 16111:2008, ''*Transportable gas storage devices—Hydrogen absorbed in reversible metal hydride,*'' in addition to the general requirements of this section. As part of its regular review of its existing standards, in 2018 ISO published an updated version of this standard, which was adopted in the 22nd revised edition of the UN Model Regulations. In addition to permitting construction in accordance with ISO 16111:2018, the 22nd revised edition of the UN Model Regulations added a December 31, 2026, phaseout date for the continued construction of UN metal hydride storage systems conforming to ISO 16111:2008. Therefore, to maintain alignment with the UN Model Regulations, PHMSA is adding the same phaseout date of December 31, 2026.

Paragraph (n) prescribes the design and construction requirements for UN cylinders for the transportation of adsorbed gases. In addition to updating reference for required conformance with ISO 9809–1:2019 as discussed above, PHMSA is requiring conformance to an updated version of ISO 11513, ''*Gas cylinders—Refillable welded steel cylinders containing materials for sub-atmospheric gas packaging (excluding acetylene)—Design, construction, testing, use and periodic inspection*.'' ISO 11513 specifies minimum requirements for the material, design, construction, workmanship, examination, and testing at manufacture of refillable welded steel cylinders for the sub-atmospheric pressure storage of liquefied and compressed gases. The second edition has updated packing instructions and allows the use of ultrasonic testing as a nondestructive method for inspection of the cylinders. Currently the HMR requires that UN cylinders that are used for the transportation of adsorbed gases conform to either ISO 9809–1:2010 or ISO 11513:2011. PHMSA is requiring conformance with the updated ISO 11513:2019 in addition to the option of the updated ISO 9809–1:2019 edition. PHMSA also is adding a phaseout date of December 31, 2026, to allow UN cylinders to continue to be built in conformance with ISO 11513:2011.

Updating the reference to this standard aligns the HMR with changes

adopted in the 22nd revised edition of the UN Model Regulations, pertaining to the design and construction of UN cylinders used for the transportation of adsorbed gases. PHMSA has reviewed this edition as part of its regular participation in the review of amendments for the UN Model Regulations and expects that the required use will maintain the HMR safety standard for the manufacture of UN cylinders.

Section 178.75

Section 178.75 prescribes specifications for multiple-element gas containers (MEGCs), which are assemblies of UN cylinders, tubes, or bundles of cylinders interconnected by a manifold and assembled within a framework. PHMSA is revising paragraph (d)(3), which outlines the general design and construction requirements for MEGCs. In its comments to the NPRM, CGA suggests that PHMSA consider using the current method of stating the applicability of older editions of ISO standards that more specifically set the endpoint for use of the standard to the manufacture of the cylinders. CGA adds that using the word ''manufacture'' better aligns with the term ''applicable for manufacture'' used throughout section 6.2.2 in the 22nd edition of the UN Model Regulations. PHMSA agrees and is revising the language in this section to better reflect the intent in the UN Model Regulations that the year of manufacture should be used to describe the phaseout of these ISO standards. Currently this paragraph requires that each pressure receptacle of a MEGC be of the same design type, seamless steel, and constructed and tested according to one of five ISO standards including the second editions of:

(1) ISO 9809–1 ''*Gas cylinders—Refillable seamless steel gas cylinders—Design, construction and testing—Part 1: Quenched and tempered steel cylinders with tensile strength less than 1100 MPa.*''

(2) ISO 9809–2, ''*Gas cylinders—Refillable seamless steel gas cylinders—Design, construction and testing—Part 2: Quenched and tempered steel cylinders with tensile strength greater than or equal to 1100 MPa.*''

(3) ISO 9809–3, ''*Gas cylinders—Refillable seamless steel gas cylinders—Design, construction and testing—Part 3: Normalized steel cylinders.*''

This series of ISO standards specifies minimum requirements for the material, design, construction, workmanship, manufacturing processes, examination, and testing at time of manufacture for refillable seamless steel gas cylinders and tubes with water capacities up to and including 450 L (119 gallons). The standards were updated and revised, as discussed in the Section IV. Section-by-Section Review discussion of § 171.7 changes. PHMSA is authorizing the use of the third edition of ISO 9809, Parts 1 through 3, and adding a phaseout date of December 31, 2026, for continued manufacture of pressure receptacles using the second edition. Finally, PHMSA is removing reference to the first edition of these standards, as the authorization date (December 31, 2018) for continued manufacture in accordance with this edition has expired. Authorizing the use of these updated references to this document will align the HMR with changes adopted in the 22nd revised edition of the UN Model Regulations pertaining to the design and construction of pressure vessels, including MEGCs, while maintaining the HMR safety standard for use of MEGCs.

Section 178.609

Section 178.609 provides test requirements for packagings intended for transport of infectious substances. PHMSA is making an editorial change in paragraph (d) to clarify the drop testing requirements for these packagings. In rule HM–215P,[31] PHMSA made editorial changes in paragraph (g) to clarify the performance requirements for packagings intended to also contain dry ice consistent with changes to the 21st revised edition of UN Model Regulations. However, some additional editorial changes regarding the drop test requirements for these packagings were later added to the UN Model Regulations that were not reflected in HM–215P. Therefore, in this final rule, PHMSA is making additional editorial corrections to this section pertaining to the drop test requirements in paragraph (d). Currently, paragraph (d)(2) states that where the samples are in the shape of a drum, three samples must be dropped, in three different orientations. However, during the course of the finalization of these changes in the UN Model Regulations, an additional precision was made regarding the word ''chime,'' which was removed from these testing requirements and replaced with the word ''edge.'' The wording was changed so as not to specify which direction the package should be dropped. PHMSA does not consider this change to be technical, but editorial, with the intent of conveying the testing protocol, as it was designed, more clearly. For that reason, PHMSA expects this change to maintain the current level of safety for packagings intended to contain infectious substances. This change will simply result in a packaging being tested in line with the design of the original packaging test method. PHMSA received a comment from MDTC in support of this revision.

Section 178.706

Section 178.706 prescribes construction standards for rigid plastic IBCs. PHMSA is revising paragraph (c)(3) to allow the use of recycled plastic (*i.e.,* used material) in the construction of rigid plastic IBCs with the approval of the Associate Administrator consistent with a similar change adopted in the 22nd revised edition of the UN Model Regulations and international standards. PHMSA is including a slight variation from the international provision by requiring prior approval of the Associate Administrator for use of recycled plastics in the construction of rigid plastic IBCs. This approach is consistent with current requirements for the construction of plastic drums and jerricans in § 178.509(b)(1) that restrict use of ''used material'' unless approved by the Associate Administrator. The UN Model Regulations incorporate quality assurance program requirements that require recognition by a governing body. By requiring approval of the Associate Administrator, PHMSA is able to maintain oversight of procedures, such as batch testing, that manufacturers will use to ensure the quality of recycled plastics used in the construction of rigid plastic IBCs. This action will facilitate environmentally friendly processes in the construction of rigid plastic IBCs while maintaining the high safety standards in the production of these packagings for use in transportation of hazardous materials. RIBCA and RIPA provided comments in support of allowing the manufacturing of rigid plastic IBCs from recycled plastics.

Section 178.707

Section 178.707 prescribes construction standards for composite IBCs. PHMSA is revising paragraph (c)(3)(iii) to allow the use of recycled plastic (*i.e.,* used material) in the construction of inner receptacles of composite IBCs, with the approval of the Associate Administrator, consistent with a similar change adopted in the 22nd revised edition of the UN Model Regulations and the modal international standards. PHMSA is including a slight variation from the international provision by requiring prior approval by the Associate Administrator to use recycled plastics in the construction of inner plastic receptacles of composite

[31] 87 FR 44944 (July 26, 2022).

IBCs. This approach is consistent with current requirements for construction of plastic drums and jerricans in § 178.509(b)(1), which restrict use of ''used material,'' unless approved by the Associate Administrator. The UN Model Regulations incorporate quality assurance program requirements that require recognition by a governing body. By requiring approval of the Associate Administrator, PHMSA is able to maintain oversight of procedures, such as batch testing, that manufacturers will use to ensure the quality of recycled plastics used in the construction of inner plastic receptacles of composite IBCs. This action will facilitate environmentally friendly processes in the construction of composite IBCs while maintaining the high safety standards in the production of these packagings for use in transportation of hazardous materials. RIBCA and RIPA provided comments in support of allowing the manufacturing of composite IBCs from recycled plastics.

F. Part 180

Section 180.207

Section 180.207 outlines the requirements for requalification of UN pressure receptacles. The 22nd revised edition of the UN Model Regulations includes numerous updates to referenced standards for inspection and maintenance of UN pressure receptacles. PHMSA is adopting similar amendments in the HMR to maintain consistency with the UN Model Regulations. To that end, PHMSA is revising paragraph (d), which specifies the requalification procedures and conformance standards for specific procedures. Specifically, paragraph (d)(3) currently requires that dissolved acetylene UN cylinders be requalified in accordance with ISO 10462:2013, ''*Gas cylinders—Acetylene cylinders—Periodic inspection and maintenance.*'' ISO 10462:2013 specifies requirements for the periodic inspection and maintenance of acetylene cylinders. It applies to acetylene cylinders with and without solvent, and with a maximum nominal water capacity of 150 L. As part of a periodic review of its standards, the ISO reviewed this standard, and in June 2019 published a short supplemental amendment, ISO 10462:2013/Amd 1:2019. The supplemental document provides amendments that simplify the marking of rejected cylinders to render them unserviceable. This supplemental document is intended for use in conjunction with ISO 10462:2013 for the periodic inspection and maintenance of dissolved acetylene UN cylinders. As such, PHMSA is adding a reference to ISO 10462:2013/Amd 1:2019 in § 180.207(d)(3) where ISO 10462:2013 is currently required, and adding a phaseout date of December 31, 2024, for authorized use of ISO 10462:2013 without the supplemental amendment.

PHMSA is revising paragraph (d)(5) which requires that UN cylinders used for adsorbed gases be inspected and tested in accordance with § 173.302c and ISO 11513:2011. ISO 11513 specifies minimum requirements for the material, design, construction, workmanship, examination, and testing at manufacture of refillable welded steel cylinders for the sub-atmospheric pressure storage of liquefied and compressed gases. The 22nd revised edition of the UN Model Regulations updated references to ISO 11513 to authorize the use of the second edition, ISO 11513:2019. This second edition has been updated to amend packing instructions and remove the prohibition on the use of ultrasonic testing during periodic inspection. PHMSA is authorizing the use of ISO 11513:2019 and adding a sunset date of December 31, 2024, until which the current edition of ISO 11513 may continue to be used.

Lastly, PHMSA is adding paragraph (d)(8) to reference ISO 23088:2020, ''*Gas cylinders—Periodic inspection and testing of welded steel pressure drums—Capacities up to 1 000 L,*'' to provide a requalification standard for UN pressure drums because requalification procedures may differ for pressure drums versus other UN pressure receptacles. The ISO 23088:2020 standard complements the design and construction standard ISO 21172–1, ''*Gas cylinders—Welded steel pressure drums up to 3,000 litre capacity for the transport of gases—Design and construction—Part 1: Capacities up to 1,000 litres,*'' referenced in § 178.71 for UN pressure drums. ISO 21172–1:2015 was added in the HMR in rule HM–215O. PHMSA expects that incorporating by reference a safety standard for requalification will reduce business costs and environmental effects by allowing existing UN pressure drums to be reintroduced into service for continued use for an extended period of time.

These revisions will align the HMR with changes adopted in the 22nd revised edition of the UN Model Regulations pertaining to industry consensus standards for requalification and maintenance procedures for UN pressure receptacles. PHMSA has reviewed this edition as part of its regular participation in the review of amendments for the UN Model Regulations and does not expect any degradation of safety standards in association with its use. PHMSA expects that these amendments will enhance safety by providing cylinder and pressure drum users with the necessary guidelines for the continued use of UN pressure receptacles.

VI. Regulatory Analyses and Notices

A. Statutory/Legal Authority for This Rulemaking

This final rule is published under the authority of Federal Hazardous Materials Transportation Law (49 U.S.C. 5101 *et seq.*). Section 5103(b) 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 authorizes the Secretary to consult with interested international authorities to ensure that, to the extent practicable, regulations governing the transportation of hazardous materials in commerce are consistent with the standards adopted by international authorities. The Secretary has delegated the authority granted in the Federal Hazardous Materials Transportation Law to the PHMSA Administrator at 49 CFR 1.97(b).

B. Executive Orders 12866 and 14094, and DOT Regulatory Policies and Procedures

Executive Order 12866 (''Regulatory Planning and Review''),[32] as amended by Executive Order 14094 (''Modernizing Regulatory Review''),[33] requires that agencies ''should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating.'' Agencies should consider quantifiable measures and qualitative measures of costs and benefits that are difficult to quantify. Further, Executive Order 12866 requires that ''agencies should select those [regulatory] approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.'' Similarly, DOT Order

[32] 58 FR 51735 (Oct. 4, 1993).

[33] 88 FR 21879 (April 11, 2023). PHMSA acknowledges that a recent update to Circular A–4 contemplates that agencies will use a different discount rate than those employed in the discussion below and the RIA beginning in January 2025. However, PHMSA notes that that update to Circular A–4 permits the use of those historical discount rates based on the **Federal Register** publication date of this final rule. See OMB, Circular A–4, ''Regulatory Analysis'' at 93 (Nov. 9, 2023).

2100.6A (''Rulemaking and Guidance Procedures'') requires that regulations issued by PHMSA and other DOT Operating Administrations should consider an assessment of the potential benefits, costs, and other important impacts of the proposed action, and should quantify (to the extent practicable) the benefits, costs, and any significant distributional impacts, including any environmental impacts. Executive Order 12866 and DOT Order 2100.6A require that PHMSA submit ''significant regulatory actions'' to the Office of Management and Budget (OMB) for review. This rulemaking is not considered a significant regulatory action under section 3(f) of Executive Order 12866 and, therefore, was not formally reviewed by OMB. This rulemaking is also not considered a significant rule under DOT Order 2100.6A.

The following is a brief summary of costs, savings, and net benefits of some of the amendments in this final rule. PHMSA has developed a more detailed analysis of these costs and benefits in the RIA, a copy of which has been placed in the docket.

PHMSA is amending the HMR to maintain alignment with international regulations and standards, thereby maintaining the high safety standard currently achieved under the HMR; facilitating the safe transportation of; and aligning HMR requirements with anticipated increases in the volume of lithium batteries transported by interstate commerce from electrification of the transportation and other economic sectors. PHMSA examined the likely impacts of finalizing and implementing the provisions in the final rule in order to assess the benefits and costs of these amendments. This analysis allowed PHMSA to quantitatively assess the material effects of four of the amendments in the rulemaking. The effects of six remaining amendments are not quantified but are assessed qualitatively.

PHMSA estimates that the net annualized quantified net cost savings of this rulemaking, using a 2% discount rate, are between $6.3 million and $14.7 million per year. The following table presents a summary of the monetized impacts that these changes may have.

SUMMARY OF NET REGULATORY COST SAVINGS, DISCOUNT RATE = 2%, 2023–2032

[Millions, 2022$]

Amendment	10 Year costs		10 Year cost savings		10 Year net cost savings		Annual costs		Annual cost savings		Annual net cost savings	
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
1: Incorporation by reference	$9.2	$9	$0	$0	$(9)	$(9)	$1	$1	$0	$0	$(1)	$(1)
2: HMT additions	0.1	0.1	0	0	(0.1)	(0.1)	0.01	0.01	0	0	(0.01)	(0.01)
3: Self-reactive materials and organic peroxides	0	0	0.01	0.05	0.01	0.05	0	0	0.001	0.005	0.001	0.005
5: Lithium battery changes	5	9	76	147	66	142	0.6	1	8.4	16	7.4	16
Total	14.6	18.7	75.6	146.9	56.8	132.3	1.6	2.1	8.4	16.4	6.3	14.7

Note: Values in parenthesis in net cost savings columns indicate costs. Low net cost savings for each amendment are determined by subtracting the highest costs from the lowest cost savings. High net cost savings are determined by subtracting the lowest costs from the highest cost savings.

The safety and environmental benefits of the final rule have not been quantified. However, PHMSA expects the amendments will help to improve public safety and reduce the risk of environmental harm by maintaining consistency between these international regulations and the HMR. Harmonization of the HMR with international consensus standards could reduce delays and interruptions of hazardous materials during transportation, thereby lowering GHG emissions and safety risks to communities (including minority, low income, underserved, and other disadvantaged populations and communities) in the vicinity of interim storage sites and transportation arteries and hubs.

C. Executive Order 13132

PHMSA analyzed this rulemaking in accordance with the principles and criteria contained in Executive Order 13132 (''Federalism'') [34] and the Presidential memorandum (''Preemption'') that was published in the **Federal Register** on May 22, 2009.[35] Executive Order 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 rulemaking may preempt state, local, and Native American tribe requirements, but does not amend any regulation that has substantial direct effects on the states, the relationship between the national government and the states, or the distribution of power and responsibilities among the various levels of government. The Federal Hazardous Materials Transportation Law contains an express preemption provision at 49 U.S.C. 5125(b) that preempts state, local, and tribal requirements on certain covered subjects, unless the non-federal requirements are ''substantively the same'' as the federal requirements, including the following:

(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.

(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), (4), and (5) above, and will preempt state, local, and tribal requirements not meeting the ''substantively the same'' standard. In this instance, the preemptive effect of the final rule is limited to the minimum level necessary to achieve the objectives of the hazardous materials transportation law under which the final rule is promulgated. Therefore, the consultation and funding requirements of Executive Order 13132 do not apply.

[34] 64 FR 43255 (Aug. 10, 1999).

[35] 74 FR 24693 (May 22, 2009).

D. Executive Order 13175

PHMSA analyzed this rulemaking in accordance with the principles and criteria contained in Executive Order 13175 (''Consultation and Coordination with Indian Tribal Governments'') [36] and DOT Order 5301.1A (''Department of Transportation Tribal Consultation Policy and Procedures''). Executive Order 13175 and DOT Order 5301.1A require DOT Operating Administrations to assure meaningful and timely input from Native American 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 Native American tribes.

PHMSA assessed the impact of the rulemaking and determined that it will not significantly or uniquely affect tribal communities or Native American tribal governments. The changes to the HMR in this final rule are facially neutral and will have broad, national scope; it will neither significantly nor uniquely affect tribal communities, much less impose substantial compliance costs on Native American tribal governments or mandate tribal action. And because the rulemaking will not adversely affect the safe transportation of hazardous materials generally, it will not entail disproportionately high adverse risks for tribal communities. For these reasons, PHMSA finds that the funding and consultation requirements of Executive Order 13175 and DOT Order 5301.1A to apply.

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

The Regulatory Flexibility Act (5 U.S.C. 601, *et seq.*) requires agencies to review regulations to assess their impact on small entities, unless the agency head certifies that a rulemaking will not have a significant economic impact on a substantial number of small entities, including small businesses; not-for-profit organizations that are independently owned and operated and are not dominant in their fields; and governmental jurisdictions with populations under 50,000. The Regulatory Flexibility Act directs agencies to establish exceptions and differing compliance standards for small businesses, where possible to do so and still meet the objectives of applicable regulatory statutes. Executive Order 13272 (''Proper Consideration of Small Entities in Agency Rulemaking'') [37] 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. The DOT posts its implementing guidance on a dedicated web page.[38]

As discussed at length in the RIA, this rulemaking has been developed in accordance with Executive Order 13272 and with DOT's procedures and policies to promote compliance with the Regulatory Flexibility Act to ensure that potential impacts of draft rules on small entities are properly considered. This final rule facilitates the transportation of hazardous materials in international commerce by providing consistency with international standards. It applies to offerors and carriers of hazardous materials, some of whom are small entities, such as chemical manufacturers, users, suppliers, packaging manufacturers, distributors, and training companies. As discussed at length in the RIA found in the rulemaking docket, the amendments in this final rule will result in net cost savings that will ease the regulatory compliance burden for those and other entities engaged in domestic and international commerce, including trans-border shipments within North America. Additionally, the changes in 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. Therefore, PHMSA certifies that these amendments will not have a significant economic impact on a substantial number of small entities.

F. Paperwork Reduction Act

Under the Paperwork Reduction Act of 1995 (44 U.S.C. 3501, *et seq.*), no person is required to respond to an information collection unless it has been approved by OMB and displays a valid OMB control number. Pursuant to 44 U.S.C. 3506(c)(2)(B) and 5 CFR 1320.8(d), PHMSA must provide interested members of the public and affected agencies with an opportunity to comment on information collection and recordkeeping requests.

PHMSA has analyzed this final rule in accordance with the Paperwork Reduction Act. PHMSA currently accounts for shipping paper burdens under OMB Control Number 2137–0034, ''Hazardous Materials Shipping Papers and Emergency Response Information.'' PHMSA asserts that some amendments may impact OMB Control Number 2137–0034, such as the requirement to indicate the use of Special Provisions A54 on the shipping papers; however, PHMSA expects the overall impact to annual paperwork burden is negligible in relation to the number of burden hours currently associated with this information collection. While PHMSA expects this amendment to reduce the burden associated with this information collection, PHMSA anticipates the reduction is negligible in relation to the total burden hours associated with special permit applications.

Additionally, PHMSA is revising § 173.185(c)(4) to require that shippers and carriers of small lithium batteries not contained in equipment have shipping papers and perform NOPIC checks when transported by air. PHMSA estimates that 45 domestic airlines transporting 4,044 shipments of affected lithium batteries may be affected by this provision. PHMSA estimates a burden increase of 16 minutes per shipment, or 64,704 minutes (1,078 hours), in the first year. PHMSA estimates the increased burden for this information collection as follows:

OMB Control No. 2137–0034: Hazardous Materials Shipping Papers & Emergency Response Information

Annual increase in number of respondents: 45.

Annual increase in number of responses: 4,044.

Annual increase in burden hours: 1,078.

Increase in Annual Burden Cost: $0.

PHMSA accounts for the burden from approval applications in OMB Control Number 2137–0557, ''Approvals for Hazardous Materials.'' PHMSA also is adding new entries to the § 173.224 Self Reactives Table and § 173.225 Organic Peroxide Table, which PHMSA expects estimates will decrease the number of annual approval applicants. However, PHMSA expects that these changes are negligible to the overall impact of the total burden, in relation to the number of burden hours associated with this information collection. Based on estimates provided in the RIA, PHMSA estimates that this final rule will reduce the number of approvals by one annually. PHMSA estimates the reduction in this information collection as follows:

[36] 65 FR 67249 (Nov. 9, 2000).

[37] 67 FR 53461 (Aug. 16, 2002).

[38] DOT, ''Rulemaking Requirements Related to Small Entities,'' *www.transportation.gov/regulations/rulemaking-requirements-concerning-small-entities.*

OMB Control No. 2137–0557: Approvals for Hazardous Materials

Decrease in Annual Number of Respondents: 1.

Decrease in Annual Responses: 1.

Decrease in Annual Burden Hours: 4.75.

Decrease in Annual Burden Cost: $0.

G. Unfunded Mandates Reform Act of 1995

The Unfunded Mandates Reform Act of 1995 (UMRA; 2 U.S.C. 1501, *et seq.*) requires agencies to assess the effects of federal regulatory actions on state, local, and tribal governments, and the private sector. For any NPRM or final rule that includes a federal mandate that may result in the expenditure by state, local, and tribal governments, or by the private sector, of $100 million or more in 1996 dollars in any given year, the agency must prepare, amongst other things, a written statement that qualitatively and quantitatively assesses the costs and benefits of the federal mandate.

As explained in the RIA, this rulemaking does not impose unfunded mandates under the UMRA. It will not result in costs of $100 million or more in 1996 dollars to either state, local, or tribal governments, or to the private sector, in any one year. A copy of the RIA is available for review in the docket.

H. Environmental Assessment

The National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321, *et seq.*), requires that federal agencies analyze actions to determine if the action would have a significant impact on the human environment. The Council on Environmental Quality implementing regulations (40 CFR, parts 1500–1508) 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. DOT Order 5610.1C (''Procedures for Considering Environmental Impacts'') establishes departmental procedures for evaluation of environmental impacts under NEPA and its implementing regulations. This Environmental Assessment incorporates by reference the analysis discussing safety impacts that is included in the preamble language above.

1. Purpose and Need

This final rule amends the HMR to maintain alignment with international consensus standards by incorporating into the HMR various amendments, including changes to proper shipping names, hazard classes, packing groups, special provisions, packaging authorizations, air transport quantity limitations, and vessel stowage requirements. PHMSA notes that the amendments in this final rule are intended to result in cost savings and reduced regulatory burden for shippers engaged in domestic and international commerce, including trans-border shipments within North America. Absent adoption of the amendments in the final rule, U.S. companies—including numerous small entities competing in foreign markets—may be at an economic disadvantage because of their need to comply with a dual system of regulations. Further, among the HMR amendments introduced in this rulemaking are those aligning HMR requirements with anticipated increases in the volume of lithium batteries transported in interstate commerce, from electrification of the transportation and other economic sectors.

As explained at greater length above in the preamble of this final and in the RIA (each of which is incorporated by reference in this discussion of the environmental impacts of the Final Action Alternative), PHMSA finds that the adoption of the regulatory amendments in this final rule maintains the high safety standard currently achieved under the HMR. PHMSA has evaluated the safety of each of the amendments in this final rule on its own merit, as well as the aggregate impact on transportation safety from adoption of those amendments.

2. Alternatives

In this rulemaking, PHMSA considered the following alternatives:

No Action Alternative

If PHMSA were to select the No Action Alternative, current regulations remain in place and no provisions are amended or added.

Final Action Alternative

This alternative is the current amendments as they appear in this final rule, applying to transport of hazardous materials by various transport modes (highway, rail, vessel, and aircraft). The amendments included in this alternative are more fully discussed in the preamble and regulatory text sections of this final rule.

3. Reasonably Foreseeable Environmental Impacts of the Alternatives

No Action Alternative

If PHMSA were to select the No Action Alternative, the HMR remains unchanged, and no provisions would be amended or added. However, any economic benefits gained through harmonization of the HMR with updated international consensus standards (including, but not limited to, the 22nd revised edition of the UN Model Regulations, the 2023–2024 ICAO Technical Instructions, and amendment 41–22 of the IMDG Code) governing shipping of hazardous materials would not be realized.

Additionally, the No Action Alternative would not adopt enhanced and clarified regulatory requirements expected to maintain the high level of safety in transportation of hazardous materials provided by the HMR. As explained in the preamble to the final rule, consistency between the HMR and current international standards can enhance safety by:

(1) Ensuring the HMR is informed by the latest best practices and lessons learned.

(2) Improving understanding of, and compliance with, pertinent requirements.

(3) Enabling consistent emergency response procedures in the event of a hazardous materials incident.

(4) Facilitating the smooth flow of hazardous materials from their points of origin to their points of destination, thereby avoiding risks to the public and the environment from release of hazardous materials from delays or interruptions in the transportation of those materials.

PHMSA would not capture those benefits if it were to pass on incorporating updated international standards into the HMR under the No Action Alternative.

PHMSA expects that the No Action Alternative could have a modest impact on GHG emissions. Because PHMSA expects that the differences between the HMR and international standards for transportation of hazardous materials could result in transportation delays or interruptions, PHMSA anticipates that there could be modestly higher GHG emissions from some combination of transfer of delayed hazardous materials to and from interim storage, return of improperly shipped materials to their point of origin, and reshipment of returned materials. PHMSA notes that it is unable to quantify such GHG emissions because of the difficulty in identifying the precise quantity or characteristics of such interim storage or returns/re-shipments. PHMSA also submits that, as explained at greater length in Section IV.J., to the extent that there are any delays arising from inconsistencies between the HMR and recently updated international

standards, there could also be adverse impacts from the No Action Alternative for minority populations, low-income populations, or other underserved and other disadvantaged communities.

4. Environmental Justice

Executive Order 12898 (''Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations''),[39] and DOT Order 5610.2C (''Department of Transportation Actions to Address Environmental Justice in Minority Populations and Low-Income Populations'') directs federal agencies to take appropriate and necessary steps to identify and address disproportionately high and adverse effects of federal actions on the health or environment of minority and low-income populations ''[t]o the greatest extent practicable and permitted by law.'' DOT Order 5610.2C (''U.S. Department of Transportation Actions to Address Environmental Justice in Minority Populations and Low-Income Populations'') establishes departmental procedures for effectuating E.O. 12898 promoting the principles of environmental justice through full consideration of environmental justice principles throughout planning and decision-making processes in the development of programs, policies, and activities—including PHMSA rulemaking.

PHMSA has evaluated this final rule under the above Executive Order and DOT Order 5610.2C. PHMSA finds the final rule will not cause disproportionately high and adverse human health and environmental effects on minority, low-income, underserved, and other disadvantaged populations and communities. The rulemaking is facially neutral and national in scope; it is neither directed toward a particular population, region, or community, nor is it expected to adversely impact any particular population, region, or community. And because the rulemaking will not adversely affect the safe transportation of hazardous materials generally, its revisions will not entail disproportionately high adverse risks for minority populations, low-income populations, or other underserved and other disadvantaged communities.

PHMSA submits that the final rule will in fact reduce risks to minority populations, low-income populations, or other underserved and other disadvantaged communities. Because the HMR amendments could avoid the release of hazardous materials, and reduce the frequency of delays and returned/resubmitted shipments of hazardous materials resulting from conflict between the current HMR and updated international standards, the final rule will reduce risks to populations and communities—including any minority, low-income, underserved, and other disadvantaged populations and communities—in the vicinity of interim storage sites and transportation arteries and hubs. Additionally, as explained in the above discussion of NEPA, PHMSA expects that these HMR amendments will yield modest GHG emissions reductions, thereby reducing the risks posed by anthropogenic climate change to minority, low-income, underserved, and other disadvantaged populations and communities.

5. Final Action Alternative

As explained further in the discussions in each of the No Action Alternative above, the preamble, and the RIA, PHMSA finds the changes under the Final Action Alternative will maintain the high safety standards currently achieved under the HMR. Harmonization of the HMR with updated international consensus standards is also expected to capture economic efficiencies gained from avoiding shipping delays and compliance costs associated with having to comply with divergent U.S. and international regulatory regimes for transportation of hazardous materials. Further, PHMSA expects revision of the HMR in the final rule will accommodate safe transportation of emerging technologies (in particular components of lithium battery technologies) and facilitate safe shipment of hazardous materials.

PHMSA expects that the Final Action Alternative could realize modest reductions in GHG emissions. Because PHMSA expects that the differences between the HMR and international standards for transportation of hazardous materials could result in delays or interruptions, PHMSA anticipates that the No Action Alternative could result in modestly higher GHG emissions from some combination of transfer of delayed hazardous materials to and from interim storage, return of improperly shipped materials to their point of origin, or reshipment of returned materials. The Final Action Alternative avoids those risks resulting from divergence of the HMR from updated international standards. PHMSA notes, however, that it is unable to quantify any GHG emissions benefits because of the difficulty in identifying the precise quantity or characteristics of such interim storage or returns/re-shipments. Lastly, PHMSA also submits that, as explained at greater length in Section IV.J., the Final Action Alternative would avoid any delayed or interrupted shipments arising from the divergence of the HMR from updated international standards under the No Action Alternative that could result in adverse impacts for minority populations, low-income populations, or other underserved and other disadvantaged communities.

6. Agencies Consulted

PHMSA has coordinated with FAA, FMCSA, FRA, and USCG in the development of this final rule.

7. Finding of No Significant Impact

PHMSA finds the adoption of the Final Action Alternative's regulatory amendments will maintain the HMR's current high level of safety for shipments of hazardous materials transported by highway, rail, aircraft, and vessel, and as such finds the HMR amendments in the final rule will have no significant impact on the human environment. PHMSA finds that the Final Action Alternative will avoid adverse safety, environmental justice, and GHG emissions impacts of the No Action Alternative. Furthermore, based on PHMSA's analysis of these provisions described above, PHMSA finds that codification and implementation of this rule will not result in a significant impact to the human environment. This finding is consistent with Executive Order 14096 (''Revitalizing Our Nation's Commitment to Environmental Justice for All'') [40] by achieving several goals, including continuing to deepen the Biden-Harris Administration's whole of government approach to environmental justice and to better protect overburdened communities from pollution and environmental harms.

I. 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 and including any personal information that the commenter includes, in the system of records notice. DOT's complete Privacy Act Statement is in the **Federal Register** published on April 11, 2000,[41] or on DOT's website at *http://www.dot.gov/privacy.*

[39] 59 FR 7629 (Feb. 16, 1994).

[40] 88 FR 25251 (April 26, 2023).

[41] 65 FR 19477 (Apr. 11, 2000).

J. Executive Order 13609 and International Trade Analysis

Executive Order 13609 (''Promoting International Regulatory Cooperation'')[42] requires that agencies consider whether the impacts associated with significant variations between domestic and international regulatory approaches are unnecessary or may impair the ability of American business to export and compete internationally. In meeting shared challenges involving health, safety, labor, security, environmental, and other issues, international regulatory cooperation can identify approaches that are at least as protective as those that are or would be adopted in the absence of such cooperation. International regulatory cooperation can also reduce, eliminate, or prevent unnecessary differences in regulatory requirements.

Similarly, the Trade Agreements Act of 1979 (Pub. L. 96–39), as amended by the Uruguay Round Agreements Act (Pub. L. 103–465) (as amended, the Trade Agreements Act), prohibits agencies from establishing any standards or engaging in related activities that create unnecessary obstacles to the foreign commerce of the United States. Pursuant to the Trade Agreements Act, 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 providing for safety—and do not operate to exclude imports that meet this objective. The statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards.

PHMSA participates in the establishment of international standards to protect the safety of the American public, and it has assessed the effects of the final rule to ensure that it does not cause unnecessary obstacles to foreign trade. In fact, the final rule is expected to facilitate international trade by harmonizing U.S. and international requirements for the transportation of hazardous materials so as to reduce regulatory burdens and minimize delays arising from having to comply with divergent regulatory requirements. Accordingly, this rulemaking is consistent with Executive Order 13609 and PHMSA's obligations under the Trade Agreements Act.

[42] 77 FR 26413 (May. 4, 2012).

K. 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 rulemaking involves multiple voluntary consensus standards, which are discussed at length in the discussion on § 171.7. *See* Section 171.7 of the Section-by-Section Review for further details.

L. Executive Order 13211

Executive Order 13211 (''Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use'')[43] requires federal agencies to prepare a Statement of Energy Effects for any ''significant energy action.'' Executive Order 13211 defines a ''significant energy action'' as any action by an agency (normally published in the **Federal Register**) that promulgates, or is expected to lead to the promulgation of, a final rule or regulation that (1)(i) is a significant regulatory action under Executive Order 12866 or any successor order, and (ii) is likely to have a significant adverse effect on the supply, distribution, or use of energy (including a shortfall in supply, price increases, and increased use of foreign supplies); or (2) is designated by the Administrator of the Office of Information and Regulatory Affairs (OIRA) as a significant energy action.

This final rule is not a significant action under Executive Order 12866, nor is it expected to have an annual effect on the economy of $100 million. Further, this final rule will not have a significant adverse effect on the supply, distribution, or use of energy in the United States. The Administrator of OIRA has not designated the final rule as a significant energy action. For additional discussion of the anticipated economic impact of this rulemaking, please review the RIA posted in the rulemaking docket.

M. Cybersecurity and Executive Order 14028

Executive Order 14028 (''Improving the Nation's Cybersecurity'')[44] directed the federal government to improve its efforts to identify, deter, and respond to ''persistent and increasingly sophisticated malicious cyber campaigns.'' PHMSA has considered the effects of the final rule and determined that its regulatory amendments will not materially affect the cybersecurity risk profile for transportation of hazardous materials.

[43] 66 FR 28355 (May 22, 2001).

[44] 86 FR 26633 (May 17, 2021).

N. Severability

The purpose of this final rule is to operate holistically and, in concert with existing HMR requirements, provide defense-in-depth to ensure safe transportation of hazardous materials. However, PHMSA recognizes that certain provisions focus on unique topics. Therefore, PHMSA finds that the various provisions of this final rule are severable and able to operate functionally if severed from each other. In the event a court were to invalidate one or more of the unique provisions of this final rule, the remaining provisions should stand, thus allowing their continued effect.

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.

49 CFR Part 175

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

49 CFR Part 176

Cargo vessels, 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, Incorporation by reference, Motor carriers, Motor vehicle safety, Packaging and containers, Reporting and recordkeeping requirements.

In consideration of the foregoing, PHMSA is amending 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 701 (28 U.S.C. 2461 note); 49 CFR 1.81 and 1.97.

■ 2. In § 171.7:
■ a. Revise paragraphs (t)(1), (v)(2), and (w)(32) through (81);
■ b. Add paragraphs (w)(82) through (92); and
■ c. Revise paragraphs (aa)(3) and (dd)(1) through (4).

The revisions and additions read as follows:

§ 171.7 Reference material.

* * * * *

(t) * * *

(1) ICAO Doc 9284 Technical Instructions for the Safe Transport of Dangerous Goods by Air, 2023–2024 Edition, 2022; into §§ 171.8; 171.22 through 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 41–22 (English Edition), 2022 Edition; 2022; 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.

(i) Volume 1, Incorporating Amendment 41–22 (Vol. 1).

(ii) Volume 2, Incorporating Amendment 41–22 (Vol. 2).

(w) * * *

(32) ISO 9809–1:2019(E), Gas cylinders—Design, construction and testing of refillable seamless steel gas cylinders and tubes—Part 1: Quenched and tempered steel cylinders and tubes with tensile strength less than 1100 MPa, Third edition, 2019–08; into §§ 178.37; 178.71; 178.75.

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

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

(35) ISO 9809–2:2019(E): Gas cylinders—Design, construction and testing of refillable seamless steel gas cylinders and tubes—Part 2: Quenched and tempered steel cylinders and tubes with tensile strength greater than or equal to 1100 MPa, Third edition, 2019–08; into §§ 178.71; 178.75.

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

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

(38) ISO 9809–3:2019(E), Gas cylinders—Design, construction and testing of refillable seamless steel gas cylinders and tubes—Part 3: Normalized steel cylinders and tubes, Third edition, 2019–08; into §§ 178.71; 178.75

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

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

(41) ISO 10156:2017(E), Gas cylinders—Gases and gas mixtures—Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets, Fourth edition, 2017–07; into § 173.115.

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

(43) ISO 10297:2006(E), Transportable gas cylinders—Cylinder valves—Specification and type testing, Second edition, 2006–01; into §§ 173.301b; 178.71.

(44) ISO 10297:2014(E), Gas cylinders—Cylinder valves—Specification and type testing, Third edition, 2014–07; into §§ 173.301b; 178.71.

(45) ISO 10297:2014/Amd 1:2017(E), Gas cylinders—Cylinder valves—Specification and type testing—Amendment 1: Pressure drums and tubes, Third edition, 2017–03; into §§ 173.301b; 178.71.

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

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

(48) ISO 10462:2013/Amd 1:2019(E), ''Gas cylinders—Acetylene cylinders—Periodic inspection and maintenance, Third edition, 2013–12–15, Amendment 1, 2019–06; into § 180.207.

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

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

(51) ISO 11114–1:2012/Amd 1:2017(E), Gas cylinders—Compatibility of cylinder and valve materials with gas contents—Part 1: Metallic materials—Amendment 1, Second edition, 2017–01; into §§ 172.102, 173.301b, 178.71.

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

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

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

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

(56) ISO 11117:2019(E), ''Gas cylinders—Valve protection caps and

guards—Design, construction and tests, 2019–11; into § 173.301b

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

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

(59) ISO 11118:2015/Amd 1:2019(E), Gas cylinders—Non-refillable metallic gas cylinders—Specification and test methods, Second edition, 2015–09–15—Amendment 1, 2019–10; into §§ 173.301b; 178.71.

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

(61) ISO 11119–1:2012(E), Gas cylinders—Refillable composite gas cylinders and tubes—Design, construction, and testing—Part 1: Hoop wrapped fibre reinforced composite gas cylinders and tubes up to 450 L, Second edition, 2012–08; into §§ 178.71; 178.75.

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

(63) ISO 11119–2:2012(E), Gas cylinders—Refillable composite gas cylinders and tubes—Design, construction, and testing—Part 2: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 l with load-sharing metal liners, Second edition, 2012–07; into §§ 178.71; 178.75.

(64) ISO 11119–2:2012/Amd.1:2014(E), Gas cylinders—Refillable composite gas cylinders and tubes—Design, construction and testing—Part 2: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 l with load-sharing metal liners, Amendment 1, 2014–08; into §§ 178.71; 178.75.

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

(66) ISO 11119–3:2013(E), Gas cylinders—Refillable composite gas cylinders and tubes—Design, construction and testing—Part 3: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 l with non-load-sharing metallic or non-metallic liners, Second edition, 2013–04; into §§ 178.71; 178.75.

(67) ISO 11119–4:2016(E), Gas cylinders—Refillable composite gas cylinders—Design, construction, and testing—Part 4: Fully wrapped fibre reinforced composite gas cylinders up to 150 l with load-sharing welded metallic liners, First edition, 2016–02; into § 178.71; 178.75.

(68) ISO 11120(E), Gas cylinders—Refillable seamless steel tubes of water capacity between 150 l and 3000 l—Design, construction, and testing, First Edition, 1999–03; into §§ 178.71; 178.75.

(69) 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; into §§ 178.71; 178.75.

(70) ISO 11513:2011(E), Gas cylinders—Refillable welded steel cylinders containing materials for sub-atmospheric gas packaging (excluding acetylene)—Design, construction, testing, use, and periodic inspection, First edition, 2011–09; into §§ 173.302c; 178.71; 180.207.

(71) ISO 11513:2019(E), Gas cylinders—Refillable welded steel cylinders containing materials for sub-atmospheric gas packaging (excluding acetylene)—Design, construction, testing, use, and periodic inspection, Second edition, 2019–09; into §§ 173.302c; 178.71; 180.207.

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

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

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

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

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

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

(78) ISO 14246:2014/Amd 1:2017(E), Gas cylinders—Cylinder valves—Manufacturing tests and examinations—Amendment 1, Second edition, 2017–06; into § 178.71.

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

(80) ISO 16111:2018(E), Transportable gas storage devices—Hydrogen absorbed in reversible metal hydride, Second edition, 2018–08; into §§ 173.301b; 173.311; 178.71.

(81) 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; into § 180.207.

(82) ISO 17871:2015(E), Gas cylinders—Quick-release cylinder valves—Specification and type testing, First edition, 2015–08; into § 173.301b.

(83) ISO 17871:2020(E), Gas cylinders—Quick-release cylinder valves—Specification and type testing, Second edition, 2020–07; into § 173.301b.

(84) ISO 17879:2017(E), Gas cylinders—Self-closing cylinder valves—Specification and type testing, First edition, 2017–07; into §§ 173.301b; 178.71.

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

(86) ISO 20475:2018(E), Gas cylinders—Cylinder bundles—Periodic inspection and testing, First edition, 2018–02; into § 180.207.

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

(88) 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 1000 litres, First edition, 2015–04; into § 178.71.

(89) ISO 21172–1:2015/Amd 1:2018(E), Gas cylinders—Welded steel pressure drums up to 3000 litres capacity for the transport of gases—Design and construction—Part 1: Capacities up to 1000 litres, First edition, 2015–04–01, Amendment 1,2018–11; into § 178.71.

(90) ISO 22434:2006(E), Transportable gas cylinders—Inspection and maintenance of cylinder valves, First edition, 2006–09; into § 180.207.

(91) ISO 23088:2020, Gas cylinders—Periodic inspection and testing of welded steel pressure drums—Capacities up to 1000 l, First edition, 2020–02; into § 180.207.

(92) 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; into § 178.71.

* * * * *

(aa) * * *

(3) Test No. 439: *In Vitro* Skin Irritation: Reconstructed Human Epidermis (RHE) Test Method, OECD Guidelines for the Testing of Chemicals, 29 July 2015; into § 173.137.

* * * * *

(dd) * * *

(1) UN Recommendations on the Transport of Dangerous Goods, Model Regulations (UN Recommendations), 22nd revised edition, (2021); 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 as follows:

(i) Volume I, ST/SG/AC.10/1/Rev.22 (Vol. I).

(ii) Volume II, ST/SG/AC.10/1/Rev.22 (Vol. II).

(2) 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 as follows:

(i) Seventh revised edition (2019).

(ii) Seventh Revised Edition, Amendment 1 (2021).

(3) Globally Harmonized System of Classification and Labelling of Chemicals (GHS), 9th Revised Edition, ST/SG/AC.10/30/Rev.9 (2021); into § 172.401.

(4) Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), copyright 2020; into §§ 171.8; 171.23 as follows:

(i) Volume I, ECE/TRANS/300 (Vol. I).

(ii) Volume II, ECE/TRANS/300 (Vol. II).

(iii) Corrigendum, ECE/TRANS/300 (Corr. 1).

* * * * *

■ 3. In § 171.12, revise paragraph (a)(4)(iii) to read as follows:

§ 171.12 North American Shipments.

* * * * *

(a) * * *

(4) * * *

(iii) Authorized CRC, BTC, CTC, or TC specification cylinders that correspond with a DOT specification cylinder are as follows:

TABLE 1 TO PARAGRAPH (a)(4)(iii): CORRESPONDING SPECIFICATION CYLINDERS

TC	DOT (some or all of these specifications may instead be marked with the prefix ICC)	CTC (some or all of these specifications may instead be marked with the prefix BTC or CRC)
TC–3AM	DOT–3A [ICC–3]	CTC–3A
TC–3AAM	DOT–3AA	CTC–3AA
TC–3ANM	DOT–3BN	CTC–3BN
TC–3EM	DOT–3E	CTC–3E
TC–3HTM	DOT–3HT	CTC–3HT
TC–3ALM	DOT–3AL	CTC–3AL
	DOT–3B	CTC–3B
TC–3AXM	DOT–3AX	CTC–3AX
TC–3AAXM	DOT–3AAX	CTC–3AAX
	DOT–3A480X	CTC–3A480X
TC–3TM	DOT–3T	.....
TC–4AAM33	DOT–4AA480	CTC–4AA480
TC–4BM	DOT–4B	CTC–4B
TC–4BM17ET	DOT–4B240ET	CTC–4B240ET
TC–4BAM	DOT–4BA	CTC–4BA
TC–4BWM	DOT–4BW	CTC–4BW
TC–4DM	DOT–4D	CTC–4D
TC–4DAM	DOT–4DA	CTC–4DA
TC–4DSM	DOT–4DS	CTC–4DS
TC–4EM	DOT–4E	CTC–4E
TC–39M	DOT–39	CTC–39
TC–4LM	DOT–4L	CTC–4L
TC–8WM	DOT–8	CTC–8
TC–8WAM	DOT–8AL	CTC–8AL

* * * * *

■ 4. In § 171.23, revise paragraph (a)(3) to read as follows:

§ 171.23 Requirements for specific materials and packagings transported under the ICAO Technical Instructions, IMDG Code, Transport Canada TDG Regulations, or the IAEA Regulations.

(a) * * *

(3) *Pi-marked cylinders.* Cylinders with a water capacity not exceeding 150 L and that are marked with a pi mark, in accordance with the European Directive 2010/35/EU (IBR, see § 171.7), on transportable pressure equipment (TPED), and that comply with the requirements of Packing Instruction P200 or P208, and 6.2 of the Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR) (IBR, see § 171.7), concerning pressure relief device use, test period, filling ratios, test pressure, maximum working pressure, and material compatibility for the lading contained or gas being filled, are authorized as follows:

(i) Filled cylinders imported for intermediate storage, transport to point of use, discharge, and export without further filling; and

(ii) Cylinders imported or domestically sourced for the purpose of filling, intermediate storage, and export.

(iii) The bill of lading or other shipping paper must identify the cylinder and include the following certification: ''This cylinder (These cylinders) conform(s) to the requirements for pi-marked cylinders found in § 171.23(a)(3).''

* * * * *

■ 5. In § 171.25:

■ a. Revise paragraphs (c)(3) and (4); and

■ b. Add paragraph (c)(5).

To read as follows:

§ 171.25 Additional requirements for the use of the IMDG Code.

* * * * *

(c) * * *

(3) Except as specified in this subpart, for a material poisonous (toxic) by inhalation, the T Codes specified in Column 13 of the Dangerous Goods List in the IMDG Code may be applied to the transportation of those materials in IM, IMO, and DOT Specification 51 portable tanks, when these portable tanks are authorized in accordance with the requirements of this subchapter;

(4) No person may offer an IM or UN portable tank containing liquid hazardous materials of Class 3, PG I or II, or PG III with a flash point less than 100 °F (38 °C); Division 5.1, PG I or II; or Division 6.1, PG I or II, for unloading while it remains on a transport vehicle with the motive power unit attached, unless it conforms to the requirements in § 177.834(o) of this subchapter; and

(5) No person may offer a UN fiber-reinforced plastic portable tank meeting the provisions of Chapter 6.10 of the IMDG Code (IBR, see § 171.7), except for transportation falling within the single port area criteria in paragraph (d) of this section.

* * * * *

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

■ 6. 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.

■ 7. In § 172.101:

■ a. Revise the section heading and paragraph (c)(12)(ii); and

■ b. In the Hazardous Materials Table, remove the entries under ''[REMOVE]'', add the entries under ''[ADD]'', and revise entries under ''[REVISE]'' in the appropriate alphabetical sequence.

The additions and revisions read as follows:

§ 172.101 Purpose and use of the hazardous materials table.

* * * * *

(c) * * *

(12) * * *

(ii) *Generic or n.o.s. descriptions.* If an appropriate technical name is not shown in the Table, selection of a proper shipping name shall be made from the generic or n.o.s. descriptions corresponding to the specific hazard class, packing group, hazard zone, or subsidiary hazard, if any, for the material. The name that most appropriately describes the material shall be used, *e.g.,* an alcohol not listed by its technical name in the Table shall be described as ''Alcohol, n.o.s.'' rather than ''Flammable liquid, n.o.s.'' Some mixtures may be more appropriately described according to their application, such as ''Coating solution'' or ''Extracts, liquid, for flavor or aroma,'' rather than by an n.o.s. entry, such as ''Flammable liquid, n.o.s.'' It should be noted, however, that an n.o.s. description as a proper shipping name may not provide sufficient information for shipping papers and package markings. Under the provisions of subparts C and D of this part, the technical name of one or more constituents that makes the product a hazardous material may be required in association with the proper shipping name.

* * * * *

§ 172.101 Hazardous Materials Table

BILLING CODE 4910–60–P

							(8)			(9)		(10)	
							Packaging (§ 173.***)			Quantity limitations (see §§ 173.27 and 175.75)		Vessel stowage	
Symbols	Hazardous materials descriptions and proper shipping names	Hazard class or division	Identification Numbers	PG	Label Codes	Special Provisions (§ 172.102)	Exceptions (8A)	Non-bulk (8B)	Bulk (8C)	Passenger aircraft/rail (9A)	Cargo aircraft only (9B)	Location (10A)	Other (10B)
(1)	(2)	(3)	(4)	(5)	(6)	(7)							
	[REMOVE]												
	*		*		*		*		*		*		*
G	Desensitized explosives, solid, n.o.s.	4.1	UN3380	I	4.1	164, 197	None	211	None	Forbidden	Forbidden	D	28, 36
	*		*		*		*		*		*		*
	Ethyl bromide	6.1	UN1891	II	6.1	IB2, IP8, T7, TP2, TP13	153	202	243	5 L	60 L	B	40, 85
	*		*		*		*		*		*		*
	Extracts, aromatic, liquid	3	UN1169	II	3	149, IB2, T4, TP1, TP8	150	202	242	5 L	60 L	B	
	Extracts, aromatic, liquid	3	UN1169	III	3	B1, IB3, T2, TP1	150	203	242	60 L	220 L	A	
	Extracts, flavoring, liquid	3	UN1197	II	3	149, IB2, T4, TP1, TP8	150	202	242	5 L	60 L	B	
	Extracts, flavoring, liquid	3	UN1197	III	3	B1, IB3, T2, TP1	150	203	242	60 L	220 L	A	
	*		*		*		*		*		*		*
	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
	*		*		*		*		*		*		*
	[ADD]												
	*		*		*		*		*		*		*
G	Desensitized explosive, solid, n.o.s.	4.1	UN3380	I	4.1	164, 197	None	211	None	Forbidden	Forbidden	D	28, 36
	*		*		*		*		*		*		*
	Cobalt dihydroxide powder, *containing not less than 10% respirable particles*	6.1	UN3550	I	6.1	IP22, TP33	None	211	242	5 kg	50 kg	A	
	*		*		*		*		*		*		*
	Ethyl bromide	3	UN1891	II	3, 6.1	IB2, IP8, T7, TP2, TP13	150	202	243	1 L	60 L	B	40, 85
	*		*		*		*		*		*		*
	Extracts, liquid, *for flavor or aroma*	3	UN1197	II	3	149, IB2, T4, TP1, TP8	150	202	242	5 L	60 L	B	

	Extracts, liquid, *for flavor or aroma*	3	UN1197	III	3	B1, IB3, T2, TP1	150	203	242	60 L	220 L	A	
	*		*		*		*		*		*		*
	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
	*		*		*		*		*		*		*
	[REVISE]												
	*		*		*		*		*		*		*
G	Articles containing miscellaneous dangerous goods, n.o.s.	9	UN3548			391, A224	None	232	232	Forbidden	Forbidden	A	
	Articles containing non-flammable, non-toxic gas, n.o.s.	2.2	UN3538		2.2	391,396, A225	None	232	232	Forbidden	Forbidden	A	
	*		*		*		*		*		*		*
	Batteries, wet, filled with acid, *electric storage*	8	UN2794		8	A51	159	159	159	30 kg	400 kg	A	53, 58, 146
	Batteries, wet, filled with alkali, *electric storage*	8	UN2795		8	A51	159	159	159	30 kg	400 kg	A	52, 146
	*		*		*		*		*		*		*
	Butylene *see also* Petroleum gases, liquefied	2.1	UN1012		2.1	19, 398, T50	306	304	314, 315	Forbidden	150 kg	E	40
	*		*		*		*		*		*		*
	Batteries, containing sodium	4.3	UN3292		4.3		189	189	189	Forbidden	400 kg	A	13, 148
	*		*		*		*		*		*		*
G	Corrosive liquids, toxic, n.o.s.	8	UN2922	I	8, 6.1	A4, A7, B10, T14, TP2, TP13, TP27	None	201	243	0.5 L	2.5 L	B	40
G	Corrosive solids, toxic, n.o.s.	8	UN2923	I	8, 6.1	A5, IB7, T6, TP33	None	211	242	1 kg	25 kg	B	40
	*		*		*		*		*		*		*
	Detonators, *electronic programmable for blasting*	1.4B	UN0512		1.4B	148	63(f), 63(g)	62	None	Forbidden	75 kg	05	25

	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	None	212	None	1 kg	15 kg	D	12, 25, 28, 36
	Nitrocellulose, *with not more than 12.6 percent nitrogen, by dry mass* mixture with *or* without plasticizer, with *or* without pigment	4.1	UN2557	II	4.1	44, W31	None	212	None	1 kg	15 kg	D	28, 36
	Nitrocellulose with water *with not less than 25 percent water, by mass*	4.1	UN2555	II	4.1	W31	None	212	None	15 kg	50 kg	E	28, 36
*			*			*			*			*	*
G	Pesticides, liquid, flammable, toxic, *flash point less than 23 degrees C*	3	UN3021	I	3, 6.1	B5, T14, TP2, TP13, TP27	None	201	243	Forbidden	30 L	B	40
				II	3, 6.1	IB2, T11, TP2, TP13, TP27	150	202	243	1 L	60 L	B	40
*			*			*			*			*	*
G	Polymerizing substance, liquid, stabilized, n.o.s.	4.1	UN3532	III	4.1	387, IB3, IP19, N92, T7, TP4, TP6	None	203	241	10 L	25 L	D	25, 52, 53
G	Polymerizing substance, liquid, temperature controlled, n.o.s.	4.1	UN3534	III	4.1	387, IB3, IP19, N92, T7, TP4, TP6	None	203	241	Forbidden	Forbidden	D	2, 25, 52, 53
G	Polymerizing substance, solid, stabilized, n.o.s.	4.1	UN3531	III	4.1	387, IB7, IP19, N92, T7, TP4, TP6, TP33	None	213	240	10 kg	25 kg	D	25, 52, 53
G	Polymerizing substance, solid, temperature controlled, n.o.s.	4.1	UN3533	III	4.1	387, IB7, IP19, N92, T7, TP4, TP6, TP33	None	213	240	Forbidden	Forbidden	D	2, 25, 52, 53
*			*			*			*			*	*
G	Water-reactive liquid, corrosive, n.o.s.	4.3	UN3129	I	4.3, 8	T14, TP2, TP7, TP13	None	201	243	Forbidden	1 L	D	13, 148
G				II	4.3, 8	IB1, T11, TP2, TP7	151	202	243	1 L	5 L	E	13, 85, 148
G				III	4.3, 8	IB2, T7, TP2, TP7	151	203	242	5 L	60 L	E	13, 85, 148
	*			*			*			*			*
G	Water-reactive liquid, n.o.s.	4.3	UN3148	I	4.3	T13, TP2, TP7, W31	None	201	244	Forbidden	1 L	E	13, 40, 148
G				II	4.3	T13, TP2, TP7, W31	151	201	244	Forbidden	1 L	E	13, 40, 148
G				III	4.3	IB2, T7, TP2, TP7, W31	151	203	242	5 L	60 L	E	13, 40, 148
	*		*		*		*		*		*		*

BILLING CODE 4910–60–C

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■ 8. In § 172.102:

In paragraph (c)(1):

■ a. Revise special provisions 78, 156, and 387;

■ b. Add special provisions 396 and 398;

■ c. Remove and reserve special provision 421.

In paragraph (c)(2):

■ d. Revise special provision A54; and

■ e. Add special provisions A224 and A225.

In paragraph (c)(4):

■ f. In Table 2—IP Codes, revise special provision IP15 and add special provision IP22 in numerical order.

The additions and revisions read as follows:

§ 172.102 Special provisions.

* * * * *

(c) * * *

(1) * * *

78 Mixtures of nitrogen and oxygen containing not less than 19.5% and not more than 23.5% oxygen by volume may be transported under this entry when no other oxidizing gases are present. A Division 5.1 subsidiary hazard label is not required for any concentrations within this limit. Compressed air containing greater than 23.5% oxygen by volume must be shipped using the description

''Compressed gas, oxidizing, n.o.s., UN3156.''

* * * * *

156 Asbestos that is immersed or fixed in a natural or artificial binder material, such as cement, plastic, asphalt, resins, or mineral ore, or contained in manufactured products, is not subject to the requirements of this subchapter, except that when transported by air, an indication of compliance with this special provision must be provided by including the words ''not restricted'' on a shipping paper, such as an air waybill accompanying the shipment.

* * * * *

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 in which case transportation 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.

* * * * *

396 Large and robust articles may be transported with connected gas cylinders with the valves open regardless of § 173.24(b)(1), provided:

a. The gas cylinders contain nitrogen of UN 1066 or compressed gas of UN 1956 or compressed air of UN1002;

b. The gas cylinders are connected to the article through pressure regulators and fixed piping in such a way that the pressure of the gas (gauge pressure) in the article does not exceed 35 kPa (0.35 bar);

c. The gas cylinders are properly secured so that they cannot shift in relation to the article and are fitted with strong and pressure resistant hoses and pipes;

d. The gas cylinders, pressure regulators, piping, and other components are protected from damage and impacts during transport by wooden crates or other suitable means;

e. The shipping paper must include the following statement: ''Transport in accordance with special provision 396''; and

f. Cargo transport units containing articles transported with cylinders with open valves containing a gas presenting a risk of asphyxiation are well ventilated.

398 This entry applies to 1-butylene, cis-2-butylene and trans-2-butylene, and mixtures of butylenes. For isobutylene, see UN 1055.

* * * * *

421 [Reserved]

* * * * *

(2) * * *

A54 Irrespective of the quantity limits in Column 9B of the § 172.101 table, a lithium battery, including a lithium battery packed with, or contained in, equipment that otherwise meets the applicable requirements of § 173.185, may have a mass exceeding 35 kg if approved by the Associate Administrator prior to shipment. When approved by the Associate Administrator and shipped in accordance with this special provision, the special provision must be noted on the shipping paper.

* * * * *

A224 UN3548, Articles containing miscellaneous dangerous goods, n.o.s. may be transported on passenger and cargo-only aircraft, irrespective of the indication of ''forbidden'' in Columns (9A) and (9B) of the Hazardous Materials Table, provided: (a) with the exception of lithium cells or batteries that comply with § 173.185(c), as applicable, the only hazardous materials contained in the article is an environmentally hazardous substance; (b) the articles are packed in accordance with § 173.232; and (c) reference to Special Provision A224 is made on the shipping paper.

A225 UN3538, Articles containing non-flammable, non-toxic gas, n.o.s. may be transported on passenger and cargo-only aircraft irrespective of the indication of ''forbidden'' in Columns (9A) and (9B) of the Hazardous Materials Table, provided: (a) with the exception of lithium cells or batteries that comply with § 173.185(c), as applicable, the only dangerous good contained in the article is a Division 2.2 gas without a subsidiary hazard, but excluding refrigerated liquefied gases and gases forbidden for transport on passenger aircraft; (b) the articles are packed in accordance with § 173.232(h); and (c) reference to Special Provision A225 is made on the shipping paper.

* * * * *

(4) * * *

IP15 For UN2031 with more than 55% nitric acid, the permitted use of rigid plastic IBCs, and the inner receptacle of composite IBCs with rigid plastics, shall be two years from their date of manufacture.

* * * * *

IP22 UN3550 may be transported in flexible IBCs (13H3 or 13H4) with sift-proof liners to prevent any egress of dust during transport.

* * * * *

PART 173—SHIPPERS—GENERAL REQUIREMENTS FOR SHIPMENTS AND PACKAGINGS

■ 9. 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.

■ 10. In § 173.4b, revise paragraph (b)(1) to read as follows:

§ 173.4b De minimis exceptions.

* * * * *

(b) * * *

(1) The specimens are:

(i) Wrapped in a paper towel or cheesecloth moistened with alcohol, an alcohol solution, or a formaldehyde solution and placed in a plastic bag that is heat-sealed. Any free liquid in the bag must not exceed 30 mL; or

(ii) Placed in vials or other rigid containers with no more than 30 mL of alcohol, an alcohol solution, or a formaldehyde solution. The containers are placed in a plastic bag that is heat-sealed;

* * * * *

■ 11. In § 173.21, revise paragraphs (f) introductory text, (f)(1), and (f)(2) 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, or 45 °C (113 °F) or less when offered for transportation in portable tanks, 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.

For organic peroxides, see paragraph (f)(2) of this section. 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 Table 1 in this paragraph 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

Type of receptacle	SADT/SAPT [1]	Control temperatures	Emergency temperature
Single packagings and IBCs	SADT/SAPT ≤20 °C (68 °F)	20 °C (36 °F) below SADT/SAPT	10 °C (18 °F) below SADT/SAPT.
Single packagings and IBCs	20 °C (68 °F) <SADT/SAPT ≤35 °C (95 °F).	15 °C (27 °F) below SADT/SAPT	10 °C (18 °F) below SADT/SAPT.
Single packagings and IBCs	35 °C (95 °F) <SADT/SAPT ≤50 °C (122 °F).	10 °C (18 °F) below SADT/SAPT	5 °C (9 °F) below SADT/SAPT.
Single packagings and IBCs	50 °C (122 °F) <SADT/SAPT	(2)	(2)
Portable tanks	SADT/SAPT ≤45 °C (113 °F)	10 °C (18 °F) below SADT/SAPT	5 °C (9 °F) below SADT/SAPT.
Portable tanks	45 °C (113 °F) <SADT/SAPT	(2)	(2)

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

(2) For hazardous materials listed in the Self-Reactive Materials Table in § 173.224(b), control and emergency temperatures, where required, are shown in Columns 5 and 6, respectively. For hazardous materials listed in the Organic Peroxide Table in § 173.225, control and emergency temperatures, where required, are shown in Columns 7a and 7b of the table, respectively. In addition, the following organic peroxides shall be subjected to temperature control during transport:

(i) Organic peroxides type B and C with a SADT ≤50°C;

(ii) Organic peroxides type D showing a medium effect when heated under confinement, as determined by test series E in Part II of the UN Manual of Tests and Criteria (IBR, *see* § 171.7 of this subchapter), with a SADT ≤50 °C or showing a low or no effect when heated under confinement with a SADT ≤45 °C; and

(iii) Organic peroxides types E and F with a SADT ≤45 °C.

* * * * *

■ 12. In § 173.27, revise paragraph (f)(2)(i)(D) to read as follows:

§ 173.27 General requirements for transportation by aircraft.

* * * * *

(f) * * *

(2) * * *

(i) * * *

(D) Divisions 4.1 (self-reactive and UN2555, UN2556, UN2557, or UN2907), 4.2 (spontaneously combustible) (primary or subsidiary risk), and 4.3 (dangerous when wet) (liquids);

* * * * *

§ 173.124 [Amended]

■ 13. In § 173.124, remove paragraph (a)(4)(iv).

■ 14. In § 173.137, revise the introductory text 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 table to § 172.101 (of this subchapter). When the table to § 172.101 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, Test No. 435, ''*In Vitro* Membrane Barrier Test Method for Skin Corrosion'' (IBR, *see* § 171.7 of this subchapter); or Test No. 404, ''Acute Dermal Irritation/Corrosion'' (IBR, *see* § 171.7 of this subchapter). Alternatively, a substance or mixture may be considered not corrosive to human skin for the purposes of this subchapter following testing in accordance with OECD Guideline for the Testing of Chemicals Test No. 430, ''*In Vitro* Skin Corrosion: Transcutaneous Electrical Resistance test (TER)'' (IBR, *see* § 171.7 of this subchapter); Test No. 431, ''*In Vitro* Skin Corrosion: Reconstructed Human Epidermis (RHE) Test Method'' (IBR, *see* § 171.7 of this subchapter); or Test No. 439, ''*In Vitro* Skin Irritation: Reconstructed Human Epidermis Test Method'' (IBR, *see* § 171.7 of this subchapter). However, if the substance or mixture is determined to be corrosive in accordance with Test No. 430 or Test No. 439, the material may be assigned to Packing Group I, or must be further tested using Test No. 435 or Test No. 404 to determine the packaging group assignment. If the results of Test No. 431 indicate that the substance or mixture is corrosive, but the test method does not clearly distinguish between assignment of Packing Groups II and III, the material must be assigned to Packing Group II unless further testing is performed. The packing group assignment using data obtained from tests conducted in accordance with OECD Guideline Test No. 404 must be as follows:

* * * * *

■ 15. In 173.151, revise paragraph (d) introductory text to read as follows:

§ 173.151 Exceptions for Class 4.

* * * * *

(d) *Limited quantities of Division 4.3.* Limited quantities of dangerous when wet solids or liquids (Division 4.3) in Packing Groups II and III are excepted from labeling requirements, unless the material is offered for transportation or transported by aircraft, and are excepted from the specification packaging requirements of this subchapter when packaged in combination packagings according to this paragraph. For transportation by aircraft, the package must also conform to applicable requirements of § 173.27 of this part (*e.g.,* authorized materials, inner packaging quantity limits, and closure securement), and only hazardous material authorized aboard passenger-carrying aircraft may be transported as a limited quantity. A limited quantity package that conforms to the provisions of this section is not subject to the shipping paper requirements of subpart C of part 172 of this subchapter, unless the material meets the definition of a hazardous substance, hazardous waste, or marine pollutant, or is offered for

transportation and transported by aircraft or vessel. In addition, shipments of limited quantities are not subject to subpart F (Placarding) of part 172 of this subchapter. Each package must conform to the packaging requirements of subpart B of this part and may not exceed 30 kg (66 pounds) gross weight. Except for transportation by aircraft, the following combination packagings are authorized:

* * * * *

■ 16. Revise § 173.167 to read as follows:

§ 173.167 ID8000 consumer commodities.

Packages prepared under the requirements of this section may be offered for transportation and transported by all modes.

(a) *Applicability.* This section applies to limited quantities of ''consumer commodity'' material. (See § 171.8 of this subchapter.) Materials eligible for transportation in accordance with this section are articles or substances of Class 2 (non-toxic aerosols only), Class 3 (Packing Group II and III only), Division 6.1 (Packing Group III only), UN3077, UN3082, UN3175, UN3334, and UN3335, provided such materials do not have a subsidiary risk and are authorized aboard a passenger-carrying aircraft. The outer packaging for the consumer commodity is not subject to the specification packaging requirements of this subchapter. Except as indicated in § 173.24(i), each completed package must conform to §§ 173.24 and 173.24a of this subchapter. Additionally, except for the pressure differential requirements in § 173.27(c), the requirements of § 173.27 do not apply to packages prepared in accordance with this section. As applicable, the following apply:

(1) *Inner and outer packaging quantity limits.*

(i) Non-toxic aerosols, as defined in § 171.8 of this subchapter and constructed in accordance with § 173.306 of this part, in non-refillable, non-metal containers not exceeding 120 mL (4 fluid ounces) each, or in non-refillable metal containers not exceeding 820 mL (28 fluid ounces) each, except that flammable aerosols may not exceed 500 mL (16.9 fluid ounces) each;

(ii) Liquids, in inner packagings not exceeding 500 mL (16.9 fluid ounces) each. Liquids must not completely fill an inner packaging at 55 °C;

(iii) Solids, in inner packagings not exceeding 500 g (1.0 pounds) each; or

(iv) Any combination thereof not to exceed 30 kg (66 pounds) gross weight as prepared for shipment.

(2) *Closures.* Friction-type closures must be secured by positive means. The body and closure of any packaging must be constructed so as to be able to adequately resist the effects of temperature and vibration occurring in conditions normally incident to air transportation. The closure device must be so designed that it is unlikely it can be incorrectly or incompletely closed.

(3) *Absorbent material.* Inner packagings must be tightly packaged in strong outer packagings. Absorbent and cushioning material must not react dangerously with the contents of inner packagings. For glass or earthenware inner packagings containing liquids of Class 3 or Division 6.1, sufficient absorbent material must be provided to absorb the entire contents of the largest inner packaging contained in the outer packaging. Absorbent material is not required if the glass or earthenware inner packagings are sufficiently protected as packaged for transport that it is unlikely a failure would occur and, if a failure did occur, that it would be unlikely that the contents would leak from the outer packaging.

(4) *Drop test capability.* Breakable inner packagings (*e.g.,* glass, earthenware, or brittle plastic) must be packaged to prevent failure under conditions normally incident to transport. Packages of consumer commodities, as prepared for transport, must be capable of withstanding a 1.2 meter drop on solid concrete in the position most likely to cause damage. In order to pass the test, the outer packaging must not exhibit any damage liable to affect safety during transport and there must be no leakage from the inner packaging(s).

(5) *Stack test capability.* Packages of consumer commodities must be capable of withstanding, without failure or leakage of any inner packaging and without any significant reduction in effectiveness, a force applied to the top surface, for a duration of 24 hours, equivalent to the total weight of identical packages if stacked to a height of 3.0 meters (including the test sample).

(6) *Hazard communication.* Packages prepared under the requirements of this section are to be marked as a limited quantity, in accordance with § 172.315(b), and labeled as a Class 9 article or substance, as appropriate, in accordance with subpart E of part 172 of this subchapter; and

(7) *Pressure differential capability.* Except for UN3082, inner packagings intended to contain liquids must be capable of meeting the pressure differential requirements (75 kPa) prescribed in § 173.27(c) of this part. The capability of a packaging to withstand an internal pressure without leakage that produces the specified pressure differential should be determined by successfully testing design samples or prototypes.

(b) *Highway, rail, and vessel hazard communication exceptions.* Packages prepared in accordance with the requirements of this section:

(1) Are excepted from the labeling requirements in paragraph (a)(6) when transported by highway, rail, and vessel; and

(2) Are excepted from the shipping papers requirements in Part 172, Subpart C when transported by highway and rail.

■ 17. In § 173.185:

■ a. Revise paragraphs (a)(3) introductory text and (a)(3)(x);

■ b. Add paragraph (a)(5);

■ c. Revise paragraphs (b)(3)(iii)(A) and (B);

■ d. Add paragraph (b)(3)(iii)(C);

■ e. Revise paragraphs (b)(4)(ii) and (iii);

■ f. Add paragraph (b)(4)(iv);

■ g. Revise paragraphs (b)(5), (c)(3) through (5), and (e)(5) through (7).

The amendments read as follows:

§ 173.185 Lithium cell and batteries.

* * * * *

(a) * * *

(3) Each manufacturer and subsequent distributor of lithium cells or batteries, except for button cells installed in equipment (including circuit boards), manufactured on or after January 1, 2008, must make a test summary available. The test summary must include the following elements:

* * * * *

(x) Name and title of a responsible person as an indication of the validity of information provided.

* * * * *

(5) Beginning May 10, 2024, each lithium ion battery must be marked with the Watt-hour rating on the outside case.

* * * * *

(b) * * *

(3) * * *

(iii) * * *

(A) Be placed in inner packagings that completely enclose the cell or battery, then placed in a packaging of a type that meets the Packing Group II performance requirements as specified in paragraph (b)(3)(ii) of this section, and then placed with the equipment in a strong, rigid outer packaging; or

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

(C) For transportation by aircraft, the number of cells or batteries in each

package is limited to the minimum number required to power the piece of equipment, plus two spare sets. A set of cells or batteries is the number of individual cells or batteries that are required to power each piece of equipment.

(4) * * *

(ii) Equipment must be secured to prevent damage caused by shifting within the outer packaging and be packed so as to prevent accidental operation during transport;

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

(iv) For transportation by aircraft, where multiple pieces of equipment are packed in the same outer packaging, each piece of equipment must be packed to prevent contact with other equipment.

(5) Lithium cells or batteries that weigh 12 kg (26.5 pounds) or more and have a strong, impact-resistant outer casing, 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. Cells and batteries must be secured to prevent inadvertent shifting, and the terminals may not support the weight of other superimposed elements. Cells and batteries packaged in accordance with this paragraph may be transported by cargo-only aircraft if approved by the Associate Administrator.

* * * * *

(c) * * *

(3) *Lithium battery mark.* Each package must display the lithium battery mark except when a package contains only button cell batteries contained in equipment (including circuit boards), or when a consignment contains two packages or fewer where each package contains not more than four lithium cells or two lithium batteries contained in equipment.

(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) introductory text

(A) The mark must be in the form of a rectangle or a square with hatched edging. The mark must be not less than 100 mm (3.9 inches) wide by 100 mm (3.9 inches) high, and the minimum width of the hatching must be 5 mm (0.2 inches), except marks of 100 mm (3.9 inches) wide by 70 mm (2.8 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

(D) Where dimensions are not specified, all features shall be in approximate proportion to those shown.

(ii) The lithium battery mark, in conformance with the requirements of this paragraph, in effect on May 9, 2024, may continue to be used until December 31, 2026.

(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 for smaller lithium cells or batteries packed with, or contained in, equipment.*

(i) The number of cells or 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.

(ii) When packages are placed in an overpack, the packages must be secured within the overpack, and the intended function of each package must not be impaired by the overpack.

(iii) 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.

(iv) Each person who prepares a package for transport containing lithium 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.

(5) *Air transportation for smaller lithium cells and batteries.*

(i) A package prepared in accordance with the size limits in paragraph (c)(1) 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.

(ii) Each package must be capable of withstanding, without damage to the cells or batteries contained therein and without any reduction of effectiveness, a force applied to the top surface equivalent to the total weight of identical packages stacked to a height of 3 meters (including the test sample) for a duration of 24 hours.

* * * * *

(e) * * *

(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, 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 cell or battery must be secured to prevent inadvertent shifting, 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 cell or battery prepared for transport in accordance with this paragraph may have a mass exceeding 35 kg gross weight when transported by cargo-only aircraft;

(7) Cells or batteries packaged in accordance with this paragraph are not permitted for transportation by passenger-carrying aircraft, and may be transported by cargo-only aircraft only if approved by the Associate Administrator prior to transportation; and

* * * * *

■ 18. In § 173.224,

■ a. Revise paragraph (b)(4);

■ b. Designate the table immediately following paragraph (b)(7) as table 1 to paragraph (b); and

■ c. Revise newly designated table 1 to paragraph (b).

The revisions 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 that 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 organic peroxides are authorized by § 173.225(f) for IBCs and § 173.225(h) for bulk packagings other than IBCs. The formulations not listed in this section but listed in § 173.225(e) for IBCs and in § 173.225(g) for portable tanks may also be transported packed in accordance with packing method OP8, with the same control and emergency temperatures, if applicable. Additional bulk packagings are authorized if approved by the Associate Administrator.

* * * * *

TABLE 1 TO PARAGRAPH (b)—SELF-REACTIVE MATERIALS TABLE

Self-reactive substance	Identification No.	Concentration—(%)	Packing method	Control temperature—(°C)	Emergency temperature	Notes
(1)	(2)	(3)	(4)	(5)	(6)	(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
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	

TABLE 1 TO PARAGRAPH (b)—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)
2,5-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	
7-Methoxy-5-methyl-benzothiophen-2-yl boronic acid''	3230	88–100				6
2-(N,N-Methylaminoethylcarbonyl)-4-(3,4-dimethyl-phenylsulphonyl) benzenediazonium hydrogen sulphate.	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.
6. The technical compound with the specified concentration limits may contain up to 12% water and up to 1% organic impurities.

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■ 19. In § 173.225:
■ a. Revise table 1 to paragraph (c);
■ b. Designate the tables immediately following paragraph (d) and immediately following paragraph (g) as table 2 to paragraph (d) and table 4 to paragraph (g), respectively; and
■ c. Revise newly designated table 4 to paragraph (g).

§ 173.225 Packaging requirements and other provisions for organic peroxides.

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(c) * * *

TABLE 1 TO PARAGRAPH (c)—ORGANIC PEROXIDE TABLE

Technical name (1)	ID No. (2)	Concentration (mass %) (3)	Diluent (mass %) A (4a)	Diluent (mass %) B (4b)	Diluent (mass %) I (4c)	Water (mass %) (5)	Packing method (6)	Temperature (°C) Control (7a)	Temperature (°C) Emergency (7b)	Notes (8)
Acetyl acetone peroxide	UN3105	≤42	≥48			≥8	OP7			2
Acetyl acetone peroxide	UN3107	≤35				≥8	OP8			32
Acetyl acetone peroxide [as a paste]	UN3106	≤32					OP7			21
Acetyl cyclohexanesulfonyl peroxide	UN3112	≤82				≥12	OP4	−10	0	
Acetyl cyclohexanesulfonyl peroxide	UN3115	≤32		≥68			OP7	−10	0	
tert-Amyl hydroperoxide	UN3107	≤88	≥6			≥6	OP8			
tert-Amyl peroxyacetate	UN3105	≤62	≥38				OP7			
tert-Amyl peroxybenzoate	UN3103	≤100					OP5			
tert-Amyl peroxy-2-ethylhexanoate	UN3115	≤100					OP7	20	25	
tert-Amyl peroxy-2-ethylhexyl carbonate	UN3105	≤100					OP7			
tert-Amyl peroxy isopropyl carbonate	UN3103	≤77	≥23				OP5			
tert-Amyl peroxyneodecanoate	UN3115	≤77		≥23			OP7	0	10	
tert-Amyl peroxyneodecanoate	UN3119	≤47	≥53				OP8	0	10	

TABLE 1 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)
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			
tert-Butylperoxy isopropylcarbonate	UN3105	≤62		≥38			OP7			
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			
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

TABLE 1 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)
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].	UN3118	≤42					OP8	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			
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

TABLE 1 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)
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			
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	

TABLE 1 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)
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	
tert-Hexyl peroxypivalate	UN3117	≤52 as a stable dispersion in water.					OP8	+15	+20	
3-Hydroxy-1,1-dimethylbutyl peroxyneodecanoate.	UN3115	≤77	≥23				OP7	−5	5	
3-Hydroxy-1,1-dimethylbutyl peroxyneodecanoate [as a stable dispersion in water].	UN3119	≤52					OP8	−5	5	
3-Hydroxy-1,1-dimethylbutyl peroxyneodecanoate.	UN3117	≤52	≥48				OP8	−5	5	
Isopropyl sec-butyl peroxydicarbonat + Di-sec-butyl peroxydicarbonate + Di-isopropyl peroxydicarbonate.	UN3111	≤52 + ≤28 + ≤22 ..					OP5	−20	−10	
Isopropyl sec-butyl peroxydicarbonate + Di-sec-butyl peroxydicarbonate + Di-isopropyl peroxydicarbonate.	UN3115	≤32 + ≤15 −18 + ≤12 −15.	≥38				OP7	−20	−10	
Isopropylcumyl hydroperoxide	UN3109	≤72	≥28				OP8			13
p-Menthyl hydroperoxide	UN3105	>72–100					OP7			13
p-Menthyl hydroperoxide	UN3109	≤72	≥28				OP8			
Methylcyclohexanone peroxide(s)	UN3115	≤67		≥33			OP7	35	40	
Methyl ethyl ketone peroxide(s)	UN3101	≤52	≥48				OP5			5, 13
Methyl ethyl ketone peroxide(s)	UN3105	≤45	≥55				OP7			5
Methyl ethyl ketone peroxide(s)	UN3107	≤40	≥60				OP8			7
Methyl isobutyl ketone peroxide(s)	UN3105	≤62	≥19				OP7			5, 23
Methyl isopropyl ketone peroxide(s)	UN3109	(See remark 31)	≥70				OP8			31
Organic peroxide, liquid, sample	UN3103						OP2			12
Organic peroxide, liquid, sample, temperature controlled.	UN3113						OP2			12
Organic peroxide, solid, sample	UN3104						OP2			12
Organic peroxide, solid, sample, temperature controlled.	UN3114						OP2			12
3,3,5,7,7-Pentamethyl-1,2,4-Trioxepane	UN3107	≤100					OP8			
Peroxyacetic acid, type D, stabilized	UN3105	≤43					OP7			13, 20
Peroxyacetic acid, type E, stabilized	UN3107	≤43					OP8			13, 20
Peroxyacetic acid, type F, stabilized	UN3109	≤43					OP8			13, 20, 28
Peroxyacetic acid or peracetic acid [with not more than 7% hydrogen peroxide].	UN3107	≤36				≥15	OP8			13, 20, 28
Peroxyacetic acid or peracetic acid [with not more than 20% hydrogen peroxide].	Exempt	≤6				≥60	Exempt			28
Peroxyacetic acid or peracetic acid [with not more than 26% hydrogen peroxide].	UN3109	≤17					OP8			13, 20, 28
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			

TABLE 1 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)
3,6,9-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%.
32. Active oxygen concentration ≤4.15%.

* * * * * (g) * * *

TABLE 4 TO PARAGRAPH (g)—ORGANIC PEROXIDE PORTABLE TANK TABLE

UN No.	Hazardous material	Minimum test pressure (bar)	Minimum shell thickness (mm-reference steel) See . . .	Bottom opening requirements See . . .	Pressure-relief requirements See . . .	Filling limits	Control temperature	Emergency temperature
3109	ORGANIC PEROXIDE, TYPE F, LIQUID.							
	*	*	*	*	*	*	*	
	tert-Butyl hydroperoxide, not more than 56% with diluent type B [2].	4	§ 178.274(d)(2)	§ 178.275(d)(3)	§ 178.275(g)(1)	Not more than 90% at 59 °F (15 °C).		
	*	*	*	*	*	*	*	

Notes:
1. ''Corrosive'' subsidiary risk placard is required.
2. Diluent type B is tert-Butyl alcohol.

* * * * *

■ 20. In § 173.232, add paragraph (h) to read as follows:

§ 173.232 Articles containing hazardous materials, n.o.s.

* * * * *

(h) For transport by aircraft, the following additional requirements apply:

(1) Articles transported under UN3548, which do not have an existing proper shipping name, and which contain only environmentally hazardous substances where the quantity of the environmentally hazardous substance in the article exceeds 5 L or 5 kg, must be prepared for transport in accordance with this section for transport by air. In addition to the environmentally hazardous substance, the article may also contain lithium cells or batteries that comply with § 173.185(c)(4).

(2) Articles transported under UN3538, which do not have an existing proper shipping name, and which contain only gases of Division 2.2 without a subsidiary hazard, but excluding refrigerated liquefied gases and gases forbidden for transport on

passenger aircraft, where the quantity of the Division 2.2 gas exceeds the quantity limits for UN 3363, as prescribed in § 173.222 must be prepared for transport in accordance with this section. Articles transported under this provision are limited to a maximum net quantity of gas of 75 kg by passenger aircraft and 150 kg by cargo-only aircraft. In addition to the Division 2.2 gas, the article may also contain lithium cells or batteries that comply with § 173.185(c)(4).

■ 21. In § 173.301b, revise paragraphs (c)(1), (c)(2)(ii) through (iv), (d)(1), and (f) to read as follows:

§ 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) and ISO 10297:2014/Amd 1:2017 (IBR, see § 171.7 of this subchapter). Quick release cylinder valves for specification and type testing must conform to the requirements in ISO 17871:2020 or, until December 31, 2026, ISO 17871:2015(E) (IBR, see § 171.7 of this subchapter). Until December 31, 2026, a quick release valve conforming to the requirements in ISO 17871:2015(E) (IBR, see § 171.7 of this subchapter) continues to be authorized for use.

(2) * * *

(ii) By equipping the UN pressure receptacle with a valve cap conforming to the requirements of ISO 11117:1998(E), ISO 11117:2008(E) and Technical Corrigendum 1, or ISO 11117:2019(E) (IBR, see § 171.7 of this subchapter). Until December 31, 2026, the manufacture of a valve cap conforming to the requirements ISO 11117:2008(E) and Technical Corrigendum 1 (IBR, see § 171.7 of this subchapter) is authorized. Until December 31, 2014, the manufacture of a valve cap conforming to the requirements in ISO 11117:1998(E) (IBR, see § 171.7 of this subchapter) was authorized. The cap must have vent holes of sufficient cross-sectional area to evacuate the gas if leakage occurs at the valve.

(iii) By protecting the valves with shrouds or guards conforming to the requirements in ISO 11117:2019 (IBR, see § 171.7 of this subchapter). Until December 31, 2026, the valves may continue to be protected by shrouds or guards conforming to the requirements in ISO 11117:2008 and Technical Corrigendum 1 (IBR, see § 171.7 of this subchapter). For metal hydride storage systems, by protecting the valves in accordance with the requirements in ISO 16111:2018(E) or, until December 31, 2026, in accordance with ISO 16111:2008(E) (IBR, see § 171.7 of this subchapter).

(iv) By using valves designed and constructed with sufficient inherent strength to withstand damage, in accordance with Annex B of ISO 10297:2014(E)/Amd. 1:2017 (IBR, see § 171.7 of this subchapter);

* * * * *

(d) *Non-refillable UN pressure receptacles.* (1) When the use of a valve is prescribed, the valve must conform to the requirements in ISO 11118:2015(E) and ISO 11118:2015/Amd 1:2019 until further notice. Conformance with ISO 11118:2015 without the supplemental amendment is authorized until December 31, 2026 (IBR, *see* § 171.7 of this subchapter).

* * * * *

(f) *Hydrogen bearing gases.* A steel UN pressure receptacle or a UN composite pressure receptacle with a steel liner bearing an ''H'' mark must be used for hydrogen bearing gases or other embrittling gases that have the potential of causing hydrogen embrittlement.

* * * * *

■ 22. In § 173.302b, add paragraph (g) to read as follows:

§ 173.302b Additional requirements for shipment of non-liquefied (permanent) compressed gases in UN pressure receptacles.

* * * * *

(g) *Mixtures of Fluorine with Nitrogen.* Mixtures of fluorine and nitrogen with a fluorine concentration below 35% by volume may be filled in pressure receptacles up to a maximum allowable working pressure for which the partial pressure of fluorine does not exceed 31 bar (abs.).

$$\text{working pressure (bar)} < \frac{31}{x_f} - 1$$

in which X_f = fluorine concentration in % by volume/100.

Mixtures of fluorine and inert gases with a fluorine concentration below 35% by volume may be filled in pressure receptacles up to a maximum allowable working pressure for which the partial pressure of fluorine does not exceed 31 bar (abs.), additionally taking the coefficient of nitrogen equivalency in accordance with ISO 10156:2017 into account when calculating the partial pressure.

$$\text{working pressure (bar)} < \frac{31}{x_f}(x_f + k_k + x_k)$$

in which X_f = fluorine concentration in % by volume/100.

K_k = coefficient of equivalency of an inert gas relative to nitrogen (coefficient of nitrogen equivalency)

X_k = inert gas concentration in % by volume/100

However, the working pressure for mixtures of fluorine and inert gases shall not exceed 200 bar. The minimum test pressure of pressure receptacles for mixtures of fluorine and inert gases equals 1.5 times the working pressure or 200 bar, with the greater value to be applied.

* * * * *

■ 23. In § 173.302c, revise paragraph (k) to read as follows:

§ 173.302c Additional requirements for the shipment of adsorbed gases in UN pressure receptacles.

* * * * *

(k) The filling procedure must be in accordance with Annex A of ISO 11513:2019 (IBR, see § 171.7 of this subchapter). Until December 31, 2026, filling may instead be in accordance with Annex A of ISO 11513:2011(E) (IBR, see § 171.7 of this subchapter).

* * * * *

■ 24. Revise § 173.311 to read as follows:

§ 173.311 Metal Hydride Storage Systems.

The following packing instruction is applicable to transportable UN Metal hydride storage systems (UN3468) with pressure receptacles not exceeding 150 liters (40 gallons) in water capacity, and having a maximum developed pressure not exceeding 25 MPa. UN Metal hydride storage systems must be designed, constructed, initially inspected, and tested in accordance with ISO 16111:2018 (IBR, see § 171.7 of this subchapter), consistent with § 178.71(m) of this subchapter. Until December 31, 2026, UN Metal hydride storage systems may instead conform to ISO 16111:2008(E) (IBR, see § 171.7 of this subchapter). Steel pressure receptacles or composite pressure receptacles with steel liners must be marked in accordance with

§ 173.301b(f), which specifies that a steel UN pressure receptacle displaying an ''H'' mark must be used for hydrogen-bearing gases or other gases that may cause hydrogen embrittlement. Requalification intervals must be no more than every five years, as specified in § 180.207 of this subchapter, in accordance with the requalification procedures prescribed in ISO 16111:2018 or ISO 16111:2008.

* * * * *

PART 175—CARRIAGE BY AIRCRAFT

■ 25. 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.

■ 26. In § 175.1, add paragraph (e) to read as follows:

§ 175.1 Purpose, scope, and applicability.

* * * * *

(e) In addition to the requirements of this part, air carriers that are certificate holders authorized to conduct operations in accordance with 14 CFR part 121 are also required to have a Safety Management System that meets the conditions of 14 CFR part 5 and is acceptable to the Federal Aviation Administration (FAA) Administrator.

■ 27. In § 175.10, revise paragraph (a) introductory text, (a)(14) introductory text, (a)(15)(v)(A), (a)(15)(vi)(A), (a)(17)(ii)(C), (a)(18) introductory text, and (a)(26) introductory text to read as follows:

§ 175.10 Exceptions for passengers, crewmembers, and air operators.

* * * * *

(a) This subchapter does not apply to the following hazardous materials when carried by aircraft passengers or crewmembers provided the requirements of §§ 171.15 and 171.16 of this subchapter (see paragraph (c) of this section) and the requirements of this section are met. The most appropriate description of the hazardous material item or article must be selected and the associated conditions for exception must be followed:

* * * * *

(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 lithium battery must be of a type that 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), and each installed or spare lithium battery:

* * * * *

(15) * * *

(v) * * *

(A) Adequately protected against damage by design of the wheelchair or mobility aid and securely attached to the wheelchair or mobility aid; or

* * * * *

(vi) * * *

(A) Adequately protected against damage by design of the wheelchair or mobility aid and securely attached to the wheelchair or mobility aid; or

* * * * *

(17) * * *

(ii) * * *

(C) The battery is adequately protected against damage by design of the wheelchair or mobility aid and securely attached to the wheelchair or other mobility aid; and

* * * * *

(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 (*i.e.,* not in sleep or hibernation mode) and protected to prevent unintentional activation or damage, except portable electronic devices powered by lithium batteries with lithium content not exceeding 0.3 grams for lithium metal batteries and 2.7 Wh for lithium ion batteries are not required to be switched off. 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:

* * * * *

(26) Baggage equipped with lithium batteries must be carried as carry-on baggage unless the lithium batteries are removed from the baggage. 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 (IBR, *see* § 171.7 of this subchapter). Additionally, removed batteries must be carried in accordance with the provision for spare batteries prescribed in paragraph (a)(18) of this section. Baggage equipped with lithium batteries may be carried as checked baggage and electronic features may remain active if the batteries do not exceed:

* * * * *

■ 28. In § 175.33, revise paragraph (a)(13)(iii) to read as follows:

§ 175.33 Shipping paper and information to the pilot-in-command.

(a) * * *

(13) * * *

(iii) UN3481 and UN3091 are not required to appear on the information provided to the pilot-in-command when prepared in accordance with § 173.185(c).

* * * * *

PART 178—SPECIFICATIONS FOR PACKAGINGS

■ 29. 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.

■ 30. In § 178.37, revise paragraph (j) to read as follows:

§ 178.37 Specification 3AA and 3AAX seamless steel cylinders.

* * * * *

(j) *Flattening test.* A flattening test must be performed on one cylinder, taken at random out of each lot of 200 or fewer, by placing the cylinder between wedge shaped knife edges, having a 60-degree included angle, rounded to ½-inch radius. The longitudinal axis of the cylinder must be at a 90-degree angle to the knife edges during the test. For lots of 30 or fewer, flattening tests are authorized to be made on a ring at least eight (8) inches long, cut from each cylinder and subjected to the same heat treatment as the finished cylinder. Cylinders may be subjected to a bend test in lieu of the flattening test. Two bend test specimens must be taken in accordance with ISO 9809–1:2019(E) or ASTM E290 (IBR, see § 171.7 of this subchapter), and must be

subjected to the bend test specified therein.

* * * * *

■ 31. In § 178.71, revise paragraphs (f)(4), (g), (i), (k)(1)(i) and (ii), (m), and (n) to read as follows:

§ 178.71 Specifications for UN pressure receptacles.

* * * * *

(f) * * *

(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) in combination with ISO 21172–1:2015/Amd 1:2018(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—Amendment 1 (IBR, *see* § 171.7 of this subchapter). Until December 31, 2026, the use of ISO 21172–1:2015 (IBR, see § 171.7 of this subchapter) without the supplemental amendment is authorized.

* * * * *

(g) *Design and construction requirements for UN refillable seamless steel cylinders.* In addition to the general requirements of this section, UN refillable seamless steel cylinders must conform to the following ISO standards, as applicable:

(1) ISO 9809–1:2019(E), Gas cylinders—Refillable seamless steel gas cylinders—Design, construction, and testing—Part 1: Quenched and tempered steel cylinders with tensile strength less than 1100 MPa (IBR, see § 171.7 of this subchapter). Until December 31, 2026, the manufacture of a cylinder conforming to the requirements in ISO 9809–1:2010(E) (IBR, see § 171.7 of this subchapter) is authorized.

(2) ISO 9809–2:2019(E), Gas cylinders—Design, construction, and testing of refillable seamless steel gas cylinders and tubes—Part 2: Quenched and tempered steel cylinders and tubes with tensile strength greater than or equal to 1100 MPa (IBR, see § 171.7 of this subchapter). Until December 31, 2026, the manufacture of a cylinder conforming to the requirements in ISO 9809–2:2010 (IBR, see § 171.7 of this subchapter) is authorized.

(3) ISO 9809–3:2019(E), Gas cylinders—Design, construction, and testing of refillable seamless steel gas cylinders and tubes—Part 3: Normalized steel cylinders and tubes. (IBR, see § 171.7 of this subchapter). Until December 31, 2026, a cylinder may instead conform to ISO 9809–3:2010(E) (IBR, see § 171.7 of this subchapter).

(4) ISO 9809–4:2014(E), Gas cylinders—Refillable seamless steel gas cylinders—Design, construction, and testing—Part 4: Stainless steel cylinders with an Rm value of less than 1,100 MPa (IBR, see § 171.7 of this subchapter).

* * * * *

(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, in combination with ISO 11118:2015/Amd 1:2019 Gas cylinders—Non-refillable metallic gas cylinders—Specification and test methods—Amendment 1. (IBR, *see* § 171.7 of this subchapter). Until December 31, 2026, the use of ISO 11118:2015 (IBR, see § 171.7 of this subchapter) without the supplemental amendment is authorized.

* * * * *

(k) * * *

(1) * * *

(i) ISO 9809–1:2019(E) Gas cylinders—Refillable seamless steel gas cylinders—Design, construction, and testing—Part 1: Quenched and tempered steel cylinders with tensile strength less than 1100 MPa (IBR, see § 171.7 of this subchapter). Until December 31, 2026, the manufacture of a cylinder conforming to the requirements in ISO 9809–1:2010(E) (IBR, see § 171.7 of this subchapter) is authorized.

(ii) ISO 9809–3:2019(E) Gas cylinders—Design, construction, and testing of refillable seamless steel gas cylinders and tubes—Part 3: Normalized steel cylinders and tubes (IBR, see § 171.7 of this subchapter). Until December 31, 2026, the manufacture of a cylinder conforming to the requirements in ISO 9809–3:2010(E) (IBR, see § 171.7 of this subchapter) is authorized.

* * * * *

(m) *Design and construction requirements for UN metal hydride storage systems.* In addition to the general requirements of this section, metal hydride storage systems must conform to ISO 16111:2018(E) Transportable gas storage devices—Hydrogen absorbed in reversible metal hydride (IBR, *see* § 171.7 of this subchapter). Until December 31, 2026, the manufacture of a UN metal hydride storage system conforming to the requirements in ISO 16111:2008 (IBR, *see* § 171.7 of this subchapter) is authorized.

(n) *Design and construction requirements for UN cylinders for the transportation of adsorbed gases.* In addition to the general requirements of this section, UN cylinders for the transportation of adsorbed gases must conform to the following ISO standards, as applicable:

(1) ISO 11513:2019, Gas cylinders—Refillable welded steel cylinders containing materials for sub-atmospheric gas packaging (excluding acetylene)—Design, construction, testing, use and periodic inspection (IBR, *see* § 171.7 of this subchapter). Until December 31, 2026, the manufacture of a cylinder conforming to the requirements in ISO 11513:2011(E) (IBR, *see* § 171.7 of this subchapter) is authorized.

(2) ISO 9809–1:2019(E): Gas cylinders—Refillable seamless steel gas cylinders—Design, construction, and testing—Part 1: Quenched and tempered steel cylinders with tensile strength less than 1100 MPa (IBR, *see* § 171.7 of this subchapter). Until December 31, 2026, the manufacture of a cylinder conforming to the requirements in ISO 9809–1:2010(E) (IBR, *see* § 171.7 of this subchapter is authorized.

* * * * *

■ 32. In § 178.75, revise paragraph (d)(3) introductory text and paragraphs (d)(3)(i) through (iii) to read as follows:

§ 178.75 Specifications for MEGCs.

* * * * *

(d) * * *

(3) Each pressure receptacle of a MEGC must be of the same design type, seamless steel, or composite, and constructed and tested according to one of the following ISO standards:

(i) ISO 9809–1:2019(E), Gas cylinders—Refillable seamless steel gas cylinders—Design, construction, and testing—Part 1: Quenched and tempered steel cylinders with tensile strength less than 1100 MPa (IBR, see § 171.7 of this subchapter). Until December 31, 2026, the manufacture of a cylinder conforming to the requirements in ISO 9809–1:2010(E) (IBR, see § 171.7 of this subchapter) is authorized.

(ii) ISO 9809–2:2019(E), Gas cylinders—Design, construction and testing of refillable seamless steel gas cylinders and tubes—Part 2: Quenched and tempered steel cylinders and tubes with tensile strength greater than or equal to 1100 MPa (IBR, see § 171.7 of this subchapter). Until December 31, 2026, the manufacture of a cylinder conforming to the requirements in \ ISO 9809–2:2010(E) (IBR, see § 171.7 of this subchapter) is authorized.

(iii) ISO 9809–3:2019(E), Gas cylinders—Design, construction, and

testing of refillable seamless steel gas cylinders and tubes—Part 3: Normalized steel cylinders and tubes (IBR, see § 171.7 of this subchapter). Until December 31, 2026, the manufacture of a cylinder conforming to the requirements in ISO 9809–3:2010(E) (IBR, see § 171.7 of this subchapter) is authorized.

* * * * *

■ 33. In § 178.609, revise paragraph (d)(2) to read as follows:

§ 178.609 Test requirements for packagings for infectious substances.

* * * * *

(d) * * *

(2) Where the samples are in the shape of a drum or jerrican, three samples must be dropped, one in each of the following orientations:

(i) Diagonally on the top edge, with the center of gravity directly above the point of impact;

(ii) Diagonally on the base edge; and

(iii) Flat on the body or side.

* * * * *

■ 34. In § 178.706, revise paragraph (c)(3) to read as follows:

§ 178.706 Standards for rigid plastic IBCs.

* * * * *

(c) * * *

(3) No used material other than production residues or regrind from the same manufacturing process may be used in the manufacture of rigid plastic IBCs unless approved by the Associate Administrator.

* * * * *

■ 35. In § 178.707, revise paragraph (c)(3)(iii) to read as follows:

§ 178.707 Standards for composite IBCs.

* * * * *

(c) * * *

(3) * * *

(iii) No used material, other than production residues or regrind from the same manufacturing process, may be used in the manufacture of inner receptacles unless approved by the Associate Administrator.

* * * * *

PART 180—CONTINUING QUALIFICATION AND MAINTENANCE OF PACKAGINGS

■ 36. 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.

■ 37. In § 180.207, revise paragraphs (d)(3) and (5) and add paragraph (d)(8) to read as follows:

§ 180.207 Requirements for requalification of UN pressure receptacles.

* * * * *

(d) * * *

(3) Dissolved acetylene UN cylinders: Each dissolved acetylene cylinder must be requalified in accordance with ISO 10462:2013(E)/Amd 1:2019 (IBR, see § 171.7 of this subchapter). However, a cylinder may continue to be requalified in accordance with ISO 10462:2013(E) (IBR, see § 171.7 of this subchapter) without the supplemental amendment until December 31, 2024. Further, a cylinder requalified in accordance with ISO 10462:2013(E) until December 31, 2018, may continue to be used until its next required requalification. The porous mass and the shell must be requalified no sooner than three (3) years, six (6) months, from the date of manufacture. Thereafter, subsequent requalifications of the porous mass and shell must be performed at least once every 10 years.

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(5) UN cylinders for adsorbed gases: Each UN cylinder for adsorbed gases must be inspected and tested in accordance with § 173.302c of this subchapter and ISO 11513:2019(E) (IBR, see § 171.7 of this subchapter). However, a UN cylinder may continue to be requalified in accordance with ISO 11513:2011(E) (IBR, see § 171.7 of this subchapter) until December 31, 2024.

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(8) UN pressure drums: UN pressure drums must be inspected and tested in accordance with ISO 23088:2020 (IBR, see § 171.7 of this subchapter).

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Tristan H. Brown,

Deputy Administrator, Pipeline and Hazardous Materials Safety Administration.

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