

(2) The most recent training completion date of the hazmat employee's training;

(3) A description, copy or the location of the training materials used to meet the requirements in paragraph (a) of this section;

(4) The name and address of the person providing the training; and

(5) Certification that the hazmat employee has been trained and tested, as required by this subpart.

(e) *Limitation.* A hazmat employee who repairs, modifies, reconditions, or tests packagings as qualified for used in the transportation of hazardous materials, and who does not perform any other function subject to the requirements of this subchapter, is not subject to the safety training requirement of paragraph (a)(3) of this section.

### Subpart I — Radiation Protection Program

#### §172.801 Applicability of the radiation protection program.

(a) *Scope.* This subpart prescribes requirements for developing and maintaining a radiation protection program.

(b) *Applicability.* This subpart applies to persons who offer for transportation, accept for transportation, or transports Class 7 (radioactive) materials.

#### §172.803 Radiation protection program.

Each person who offers for transportation, accepts for transportation, or transports Class 7 (radioactive) materials must develop, implement and maintain a written radiation protection program in accordance with the following:

(a) Radiation exposures must be kept as low as reasonably achievable (ALARA), with economic and social factors being taken into account.

(b) Radiation exposures must be controlled such that:

(1) An occupationally exposed hazmat employee's annual effective dose equivalent for occupational radiation exposure will not exceed 12.5 mSv (1.25 rem) in any 3 month period or 50 mSv (5 rem) in any 12 month period. For workers under the age of eighteen, the radiation dose will not exceed 1.250 mSv (0.125 rem) in any 3 month period or 5.0 mSv (0.5 rem) in any 12 month period;

(2) Radiation exposures to members of the general public must be less than 0.02 mSv (2 mrem) per hour. This level will be measured as if an individual were present for an hour in any area where the general public could be exposed to radiation during the course of transportation, except that, if there is an occurrence where the dose to a member of the general public equals or exceeds 0.02 mSv (2 mrem) in one hour, the program must provide limits that will prevent an individual from receiving cumulative doses totaling 1.0 mSv (100 mrem) in any week or 5.0 mSv (500 mrem) in any twelve-month period;

(3) The radiation dose to an embryo-fetus in a pregnant female occupationally exposed hazmat employee, who has declared her pregnancy to her employer, must not exceed 5.0 mSv (500 mrem) during the pregnancy. This limit is to be achieved by limiting the radiation dose of the declared pregnant worker to not more than 5.0 mSv (500 mrem) during the nine months and not greater than 0.5 mSv (50 mrem) in any one month; and

(4) The radiation doses received by occupationally exposed hazmat employees must be monitored by radiation dosimetry devices.

(c) The Environmental Protection Agency report entitled "Radiation Protection Guidance to Federal Agencies for Occupational Exposure (January 1987)". This document is available from the US Environmental Protection Agency, Washington, DC 20460.

(d) *Exceptions.*

(1) The requirements of this subpart do not apply to:

(i) Persons who offer for transportation or transport less than 200 TI, not including TI calculated for criticality control purposes, of packages in a 12-month period; or

(ii) Those persons whose operations will not result in a hazmat employee receiving an exposure of 5 mSv (500 mrem) or more per year. This evaluation must consider the hazmat employers Class 7 (radioactive) materials transportation activities for a period of at least 12 months. An evaluation must be conducted by a person experienced with radiation protection programs and transportation regulations and programs. The evaluator's competency may be evidenced by being certified by the American Board of Health Physics, or by a letter of recommendation from a State Radiation Official listed in the most current issue of the "Directory of Personnel Responsible For Radiological Health Programs" published annually by the Conference of Radiation Control Program Directors, Frankfort, KY.

(2) The requirements of this subpart may be satisfied by any radiation protection program that has been approved by an appropriate federal or state agency.

(e) *Guidance.*

(1) Each hazmat employer should review and follow the guidance provided in the following documents when establishing and maintaining their radiation protection program:

(i) National Council on Radiation Protection and Measurements (NCRP) Report No. 59, "Operational Radiation Safety Program (1978)". The guidance in this report should be tailored to the practical needs and operations of the hazmat employer and their occupationally exposed hazmat employees.

(ii) NCRP Report No. 116, "Limitation of Exposure to Ionizing Radiation (1993)".

(2) The reports referenced in paragraph (e)(1) of this section are available from NCRP Publications, 7910 Woodmont Avenue, Bethesda, MD 20814.

#### §172.805 Recordkeeping and notifications.

(a) A hazmat employer must document their radiation protection program and maintain written records of the radiation protection program activities, including dosimetry records, described in this subpart. These records must be made available to the Associate Administrator for Hazardous Materials Safety or other authorized officials in written form within seven days of a written request.

(b) A hazmat employer must keep a record of the radiation dose that each hazmat employee has received and provide it to the employee in reasonable time following a request during employment and no more than three months after end of employment.

(c) Each hazmat employer must notify the Associate Administrator for Hazardous Materials Safety, in writing, if a hazmat employee receives a dose exceeding 12.5 mSv (1250 mrem) in any calendar quarter or 50 mSv (5,000 mrem) in one year, or if a member of the general public is likely to receive a dose exceeding 5 mSv (500 mrem) in one year as a result of the hazmat employer's transportation activities. Such a notification must be made as soon as practicable following awareness of the occurrence.

(d) If an offeror or carrier of Class 7 (radioactive) materials is not required to establish a radiation protection program, they must develop and keep records which demonstrate why a program is not required (i.e., either the total TI of packages transported in any 12 month period is less than 200, or that the current Class 7 (radioactive) materials transport activities are the same as the activities that were reviewed by a competent radiation protection specialist whose evaluation demonstrated that no worker will receive a dose exceeding 5 mSv (500 mrem) in one year).

#### §172.807 Transitional provisions.

Compliance with the requirements of this subpart is required after October 1, 1999.

### Appendix A — Office of Hazardous Materials Transportation Color Tolerance Charts and Tables

The following are Munsell notations and Commission Internationale de L'Eclairage (CIE) coordinates which describe the Office of Hazardous Materials Transportation Label and Placard Color Tolerance Charts in Tables 1 and 2, and the CIE coordinates for the color tolerances specified in Table 3. Central colors and tolerances described in Table 2 approximate those described in Table 1 while allowing for differences in production methods and materials used to manufacture labels and placards surfaced with printing inks. Primarily, the color charts based on Table 1 are for label or placard colors applied as opaque coatings such as paint, enamel or plastic, whereas color charts based on Table 2 are intended for use with labels and placards surfaced only with inks.

For labels printed directly on packaging surfaces, Table 3 may be used, although compliance with either Table 1 or Table 2 is sufficient. However, if visual reference indicates that the colors of labels printed directly on package surfaces are outside the Table 1 or 2 tolerances, a spectrophotometer or other instrumentation may be required to insure compliance with Table 3.

(see next page for tables)

**Table 1 — Specifications for Color Tolerance  
Charts for Use with Labels and Placards Surfaced  
with Paint, Lacquer, Enamel, Plastic,  
Other Opaque Coatings, or Ink<sup>1</sup>**

Color	Munsell notations	CIE data for source C		
		Y	x	y
Red:				
Central color	7.5R 4.0/14	12.00	.5959	.3269
Orange	8.5R 4.0/14	12.00	.6037	.3389
Purple and vivid	6.5R 4.0/14	12.00	.5869	.3184
Grayish	7.5R 4.0/12	12.00	.5603	.3321
Vivid	7.5R 4.0/16	12.00	.6260	.3192
Light	7.5R 4.5/14	15.57	.5775	.3320
Dark	7.5R 3.5/14	09.00	.6226	.3141
Orange:				
Central color	5.0YR 6.0/15	30.05	.5510	.4214
Yellow and Grayish	6.25YR 6.0/15	30.05	.5452	.4329
Red and vivid	3.75YR 6.0/15	30.05	.5552	.4091
Grayish	5.0YR 6.0/13	30.05	.5311	.4154
Vivid	5.0YR 6.0/16	30.05	.5597	.4239
Light	5.0YR 6.5/15	36.20	.5427	.4206
Dark	5.0YR 5.5/15	24.58	.5606	.4218
Yellow:				
Central color	5.0Y 8.0/12	59.10	.4562	.4788
Green	6.5Y 8.0/12	59.10	.4498	.4865
Orange and vivid	3.5Y 8.0/12	59.10	.4632	.4669
Grayish	5.0Y 8.0/10	59.10	.4376	.4601
Vivid	5.0Y 8.0/14	59.10	.4699	.4920
Light	5.0Y 8.5/12	68.40	.4508	.4754
Dark	5.0Y 7.5/12	50.68	.4620	.4823
Green:				
Central color	7.5G 4.0/9	12.00	.2111	.4121
Bluish	0.5BG 4.0/9	12.00	.1974	.3809
Green-yellow	5.0G 4.0/9	12.00	.2237	.4399
Grayish A	7.5G 4.0/7	12.00	.2350	.3922
Grayish B <sup>2</sup>	7.5G 4.0/6	12.00	.2467	.3822
Vivid	7.5G 4.0/11	12.00	.1848	.4319
Light	7.5G 4.5/9	15.57	.2204	.4060
Dark	7.5G 3.5/9	09.00	.2027	.4163
Blue:				
Central color	2.5PB 3.5/10	09.00	.1691	.1744
Purple	4.5PB 3.5/10	09.00	.1796	.1711
Green and vivid	10.0B 3.5/10	09.00	.1557	.1815
Grayish	2.5PB 3.5/8	09.00	.1888	.1964
Vivid	2.5PB 3.5/12	09.00	.1516	.1547
Light	2.5PB 4.0/10	12.00	.1805	.1888
Dark	2.5PB 3.0/10	06.55	.1576	.1600
Purple:				
Central color	10.0P 4.5/10	15.57	.3307	.2245
Reddish purple	2.5RP 4.5/10	15.57	.3584	.2377
Blue purple	7.5P 4.5/10	15.57	.3068	.2145
Reddish gray	10.0P 4.5/8	15.57	.3280	.2391
Gray <sup>2</sup>	10.0P 4.5/6.5	15.57	.3254	.2519
Vivid	10.0P 4.5/12	15.57	.3333	.2101
Light	10.0P 5.0/10	19.77	.3308	.2328
Dark	10.0P 4.0/10	12.00	.3306	.2162

<sup>1</sup> Maximum chroma is not limited.

<sup>2</sup> For the colors green and purple, the minimum saturation (chroma) limits for porcelain enamel on metal are lower than for most other surface coatings. Therefore, the minimum chroma limits of these two colors as displayed on the Charts for comparison to porcelain enamel on metal is low, as shown for green (grayish B) and purple (gray).

NOTE: CIE = Commission Internationale de L'Eclairage.

**Table 2 — Specifications for Color Tolerance  
Charts for Use with Labels and Placards  
Surfaced with Ink**

Color	Munsell notations	CIE data for source C		
		Y	x	y
Red:				
Central series:				
Central color	6.8R 4.47/12.8	15.34	.5510	.3286
Grayish	7.2R 4.72/12.2	17.37	.5368	.3348
Purple	6.4R 4.49/12.7	15.52	.5442	.3258
Purple and vivid	6.1R 4.33/13.1	14.25	.5529	.3209
Vivid	6.7R 4.29/13.2	13.99	.5617	.3253
Orange	7.3R 4.47/12.8	15.34	.5572	.3331
Orange and grayish	7.65R 4.70/12.4	17.20	.5438	.3382
Light series:				
Light	7.0R 4.72/13.2	17.32	.5511	.3322
Light and orange	7.4R 4.96/12.6	19.38	.5365	.3382
Light and purple	6.6R 4.79/12.9	17.94	.5397	.3289
Dark series:				
Dark A	6.7R 4.19/12.5	13.30	.5566	.3265
Dark B	7.0R 4.25/12.35	13.72	.5522	.3294
Dark and purple	7.5R 4.23/12.4	13.58	.5577	.3329
Orange:				
Central series:				
Central color	5.0YR 6.10/12.15	31.27	.5193	.4117
Yellow and grayish A	5.8YR 6.22/11.7	32.69	.5114	.4155
Yellow and grayish B	6.1YR 6.26/11.85	33.20	.5109	.4190
Vivid	5.1YR 6.07/12.3	30.86	.5226	.4134
Red and vivid A	3.9YR 5.87/12.75	28.53	.5318	.4038
Red and vivid B	3.6YR 5.91/12.6	29.05	.5291	.4021
Grayish	4.9YR 6.10/11.9	31.22	.5170	.4089
Light series:				
Light and vivid A	5.8YR 6.78/12.7	39.94	.5120	.4177
Light and yellow	6.0YR 6.80/12.8	40.20	.5135	.4198
Light and vivid B	4.9YR 6.60/12.9	37.47	.5216	.4126
Dark series:				
Dark and yellow	5.8YR 5.98/11.0	29.87	.5052	.4132
Dark A	5.1YR 5.80/11.1	27.80	.5127	.4094
Dark B	5.0YR 5.80/11.0	27.67	.5109	.4068
Yellow:				
Central series:				
Central color	4.3Y 7.87/10.3	56.81	.4445	.4589
Vivid A	4.5Y 7.82/10.8	55.92	.4503	.4658
Vivid B	3.3Y 7.72/11.35	54.24	.4612	.4624
Vivid and orange	3.2Y 7.72/10.8	54.25	.4576	.4572
Grayish A	4.1Y 7.95/9.7	58.18	.4380	.4516
Grayish B	5.1Y 8.06/9.05	60.12	.4272	.4508
Green-yellow	5.2Y 7.97/9.9	58.53	.4356	.4605
Light series:				
Light	5.4Y 8.59/10.5	70.19	.4351	.4628
Light and green-yellow	5.4Y 8.56/11.2	69.59	.4414	.4692
Light and vivid	4.4Y 8.45/11.4	67.42	.4490	.4662
Dark series:				
Dark and green-yellow	4.4Y 7.57/9.7	51.82	.4423	.4562
Dark and orange A	3.4Y 7.39/10.4	48.86	.4584	.4590
Dark and orange B	3.5Y 7.41/10.0	49.20	.4517	.4544
Green:				
Central series:				
Central color	9.75G 4.26/7.75	13.80	.2214	.3791
Grayish	10G 4.46/7.5	15.25	.2263	.3742
Blue A	1.4BG 4.20/7.4	13.36	.2151	.3625
Blue B	1.0BG 4.09/7.75	12.60	.2109	.3685
Vivid	8.4G 4.09/8.05	12.59	.2183	.3954
Vivid green-yellow	7.0G 4.23/8.0	13.54	.2292	.4045
Green-yellow	7.85G 4.46/7.7	15.23	.2313	.3914
Light series:				
Light and vivid	9.5G 4.45/8.8	15.21	.2141	.3863
Light and blue	0.2BG 4.31/8.8	14.12	.2069	.3814
Light and green-yellow	8.3G 4.29/9.05	14.01	.2119	.4006
Dark series:				
Dark and green-yellow	7.1G 4.08/7.1	12.55	.2354	.3972

Table 2 — continued

Color	Munsell notations	CIE data for source C		
		Y	x	y
Dark and grayish	9.5G 4.11/6.9	12.70	.2282	.3764
Dark	8.5G 3.97/7.2	11.78	.2269	.3874
Blue:				
Central series:				
Central color	3.5PB 3.94/9.7	11.58	.1885	.1911
Green and grayish A	2.0PB 4.35/8.7	14.41	.1962	.2099
Green and grayish B	1.7PB 4.22/9.0	13.50	.1898	.2053
Vivid	2.9PB 3.81/9.7	10.78	.1814	.1852
Purple and vivid A	4.7PB 3.53/10.0	9.15	.1817	.1727
Purple and vivid B	5.0PB 3.71/9.9	10.20	.1888	.1788
Grayish	3.75PB 4.03/9.1	12.17	.1943	.1961
Light series:				
Light and green A	1.7PB 4.32/9.2	14.22	.1904	.2056
Light and green B	1.5PB 4.11/9.6	12.72	.1815	.1971
Light and vivid	3.2PB 3.95/10.05	11.70	.1831	.1868
Dark series:				
Dark and grayish	3.9PB 4.01/8.7	12.04	.1982	.1992
Dark and purple A	4.8PB 3.67/9.3	9.95	.1918	.1831
Dark and purple B	5.2PB 3.80/9.05	10.76	.1985	.1885
Purple:				
Central series:				
Central color	9.5P 4.71/11.3	17.25	.3274	.2165
Red	1.0RP 5.31/10.8	22.70	.3404	.2354
Red and vivid A	1.4RP 5.00/11.9	19.78	.3500	.2274
Red and vivid B	0.2RP 4.39/12.5	14.70	.3365	.2059
Vivid	8.0P 4.04/12.0	12.23	.3098	.1916
Blue	7.0P 4.39/10.8	14.71	.3007	.2037
Grayish	8.8P 5.00/10.3	19.73	.3191	.2251
Light series:				
Light and red A	0.85RP 5.56/11.1	25.18	.3387	.2356
Light and red B	1.1RP 5.27/12.3	22.27	.3460	.2276
Light and vivid	9.2P 4.94/11.95	19.24	.3247	.2163
Dark series:				
Dark and grayish	9.6P 4.70/10.9	17.19	.3283	.2204
Dark and vivid	8.4P 4.05/11.6	12.35	.3144	.1970
Dark and blue	7.5P 4.32/10.5	14.19	.3059	.2078

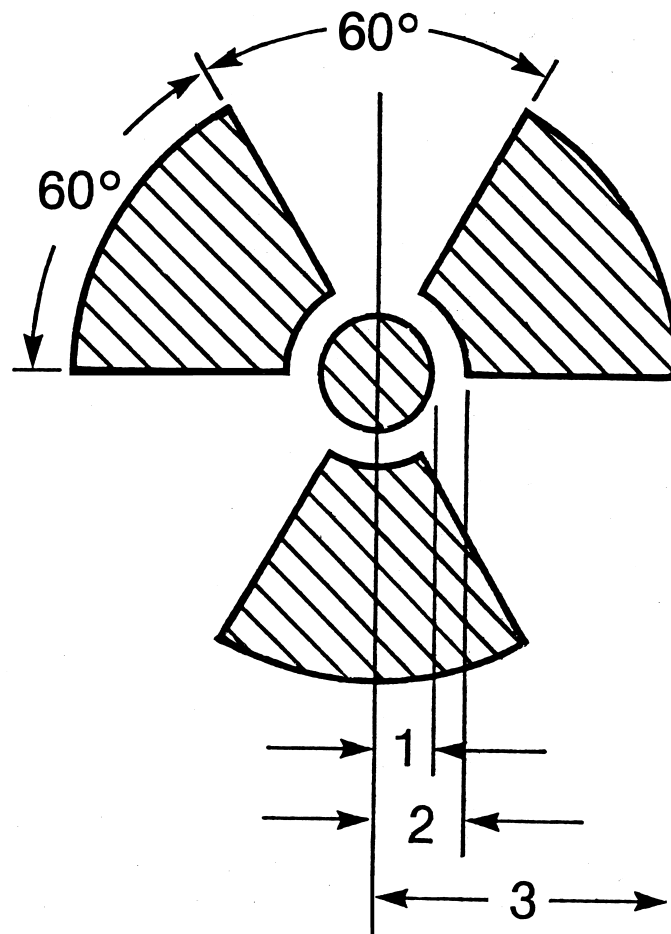
Table 3 — Specification for Colors for Use with Labels Printed on Packagings Surfaces

CIE data for source C	Red	Orange	Yellow	Green	Blue	Purple
x	.424	.460	.417	.228	.200	.377
y	.306	.370	.392	.354	.175	.205
x	.571	.543	.490	.310	.255	.377
y	.306	.400	.442	.354	.250	.284
x	.424	.445	.390	.228	.177	.342
y	.350	.395	.430	.403	.194	.205
x	.571	.504	.440	.310	.230	.342
y	.350	.430	.492	.403	.267	.284
Y (high)	23.0	41.6	72.6	20.6	15.9	21.2
Y (low)	7.7	19.5	29.1	7.4	6.5	8.2

## Appendix B to Part 172 — Trefoil Symbol

1. Except as provided in paragraph 2 of this appendix, the trefoil symbol required for RADIOACTIVE labels and placards and required to be marked on certain packages of Class 7 materials must conform to the design and size requirements of this appendix.

2. RADIOACTIVE labels and placards that were printed prior to April 1, 1996, in conformance with the requirements of this subchapter in effect on March 30, 1996, may continue to be used.



1=Radius of Circle —

Minimum dimensions

4 mm (0.16 inch) for markings and labels

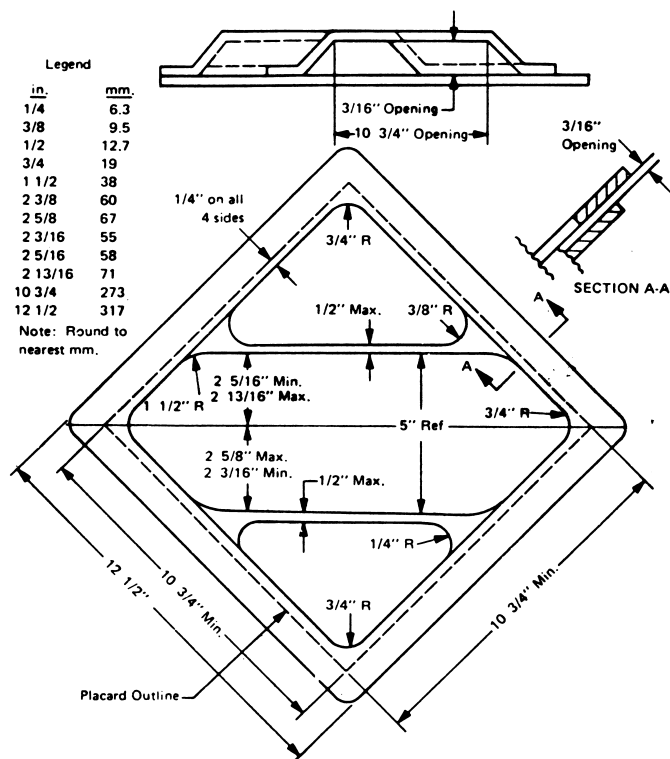
12.5 mm (0.5 inch) for placards

2=1-1/2 Radii

3=5 radii for markings and labels

4-1/2 radii for placards.

## Appendix C — Dimensional Specifications for Recommended Placard Holder



## PART 173 — SHIPPERS — GENERAL REQUIREMENTS FOR SHIPMENTS AND PACKAGINGS

### Subpart A — General

- Sec.
- 173.1 Purpose and scope.
  - 173.2 Hazardous materials classes and index to hazard class definitions.
  - 173.2a Classification of a material having more than one hazard.
  - 173.3 Packaging and exceptions.
  - 173.4 Small quantity exceptions.
  - 173.5 Agricultural operations.
  - 173.5a Oilfield service vehicles.
  - 173.6 [Removed]
  - 173.7 U.S. Government material.
  - 173.9 Cars, truck bodies, freight containers, or trailers containing lading which has been fumigated or treated with Class 3, Division 2.1, 2.3, or 6.1 materials.
  - 173.10 Tank car shipments.
  - 173.11 [Removed]
  - 173.12 Exceptions for shipment of waste material.
  - 173.13 Exceptions for Class 3, Divisions 4.1, 4.2, 4.3, 5.1, 6.1, and Classes 8 and 9 materials.

### Subpart B — Preparation of Hazardous Materials for Transportation

- Sec.
- 173.21 Forbidden materials and packages.
  - 173.22 Shipper's responsibility.
  - 173.22a Use of packagings authorized under exemptions.
  - 173.23 Previously authorized packaging.
  - 173.24 General requirements for packaging and packages.
  - 173.24a Additional general requirements for non-bulk packagings and packages.
  - 173.24b Additional general requirements for bulk packagings.
  - 173.25 Authorized packages and overpacks.
  - 173.26 Quantity limitations.
  - 173.27 General requirements for transportation by aircraft.
  - 173.28 Reuse, reconditioning and remanufacture of packagings.
  - 173.29 Empty packagings.
  - 173.30 Loading and unloading of transport vehicles.
  - 173.31 Use of tank cars.
  - 173.32 Qualification, maintenance and use of portable tanks other than

Specification IM portable tanks.

- 173.32a Approval of Specification IM portable tanks.
- 173.32b Periodic testing and inspection of Specification IM portable tanks.
- 173.32c Use of Specification IM portable tanks.
- 173.32d [Removed]
- 173.33 Hazardous materials in cargo tank motor vehicles.
- 173.34 Qualification, maintenance and use of cylinders.
- 173.35 Hazardous materials in intermediate bulk containers.
- 173.40 General packaging requirements for poisonous materials required to be packaged in cylinders.

### Subpart C — Definitions, Classifications and Packaging for Class 1 Sec.

- 173.50 Class 1—definitions.
- 173.51 Authorization to offer and transport explosives.
- 173.52 Classification codes and compatibility groups of explosives.
- 173.53 Provisions for using old classifications of explosives.
- 173.54 Forbidden explosives.
- 173.55 [Reserved]
- 173.56 New explosives—definition and procedures for classification and approval.
- 173.57 Acceptance criteria for new explosives.
- 173.58 Assignment of class and division for new explosives.
- 173.59 Description of terms for explosives.
- 173.60 General packaging requirements for explosives.
- 173.61 Mixed packaging requirements.
- 173.62 Specific packing requirements.
- 173.63 Packaging exceptions.

### Subpart D — Definitions Classification, Packing Group Assignments and Exceptions for Hazardous Materials Other Than Class 1 and Class 7 Sec.

- 173.115 Class 2, Divisions 2.1, 2.2, and 2.3—Definitions.
- 173.116 Class 2—Assignment of hazard zone.
- 173.117- [Reserved]
- 173.119 Class 3—Definitions.
- 173.120 Class 3—Assignment of packing group.
- 173.121 Class 4, Divisions 4.1, 4.2 and 4.3—Definitions.
- 173.122 Class C—Assignment of packing group.
- 173.127 Class 5, Division 5.1—Definition and assignment of packing groups.
- 173.128 Class 5, Division 5.2—Definitions and types.
- 173.129 Class 5, Division 5.2—Assignment of packing group.
- 173.132 Class 6, Division 6.1—Definitions.
- 173.133 Assignment of packing group and hazard zones for Division 6.1 materials.
- 173.134 Class 6, Division 6.2—Definitions.
- 173.136 Class 8—Definitions.
- 173.137 Class 8—Assignment of packing group.
- 173.140 Class 9—Definitions.
- 173.141 Class 9—Assignment of packing group.
- 173.144 Other Regulated Materials (ORM)—Definitions.
- 173.145 Other Regulated Materials—Assignment of packing group.
- 173.150 Exceptions for Class 3 (flammable) and combustible liquids.
- 173.151 Exceptions for Division 4.1 (flammable solids).
- 173.152 Exceptions for Division 5.1 (oxidizers) and Division 5.2 (organic peroxides).
- 173.153 Exceptions for Division 6.1 (poisonous materials).
- 173.154 Exceptions for Class 8 (corrosive materials).
- 173.155 Exceptions for Class 9 (miscellaneous hazardous materials).
- 173.156 Exceptions for ORM materials.

### Subpart E — Non-Bulk Packaging for Hazardous Materials Other Than Class 1 and Class 7 Sec.

- 173.158 Nitric acid.
- 173.159 Batteries, wet.
- 173.160 Bombs, smoke, non-explosive (corrosive).
- 173.161 Chemical kits.
- 173.162 Gallium.
- 173.163 Hydrogen fluoride.
- 173.164 Mercury (metallic and articles containing mercury).
- 173.166 Air bag inflators, air bag modules, seat-belt pre-tensioner, and seat-belt modules.
- 173.171 Smokeless powder for small arms.
- 173.172 Aircraft hydraulic power unit fuel tank.