

UNIT 1

INTRODUCTION

HAZARDOUS MATERIAL REGULATIONS



U.S. Nuclear Regulatory Commission and Agreement States

“Transportation of Radioactive Material”

NRC Course H-308



INSTRUCTORS

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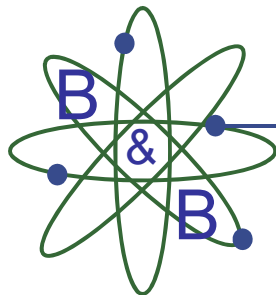
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Awareness, response, solutions



HAZARDOUS MATERIALS REGULATIONS

- The Hazardous Materials Regulations (HMR; 49 CFR Parts 100-185)
 - Issued by the Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) [§171.1]
 - Establish requirements governing the commercial transportation of hazmat by highway, rail, vessel, and air.



HAZARDOUS MATERIALS REGULATORY REQUIREMENTS

The HMR:

- Specify appropriate packaging and handling requirements for hazardous materials
- Requires shippers to communicate hazards:
 - shipping papers
 - package marking and labeling
 - vehicle placarding.
- Requires shippers to provide emergency response information applicable to the specific hazard.



H M R APPLICABILITY

- Packaging - manufacturers, fabricates of packaging for hazmat [49 §171.1(a)]
- Pre-transport functions [49 §171.1(b)]:
 - preparation of hazmat for transport
- In-Transport [49 §171.1(c)]:
 - loading, unloading, storage
 - applies to shipper & carrier
- Functions not subject to HMRs [49 §171.1(d)]



FOUR GENERAL AREAS OF THE HMR

- Hazardous materials identification and classification;
- Hazard communication (shipping papers, markings, labels, and placards);
- Packaging requirements; and
- Operational rules.



RULES OF CONSTRUCTION

49 CFR§171.9

Unless specifically stated otherwise, singular words include the plural;

- plural words include the singular;
- masculine words include the feminine;
- “must” means *required*;
- “shall” means *required*;
- “should” means *recommended, but not required*;
- “may” means *permitted, but not required*;
- “includes” means *includes, but not limited to*; and
- “no person may ” means *no person is required, authorized, or permitted to*; and
- “may not” means *not allowed ...*



DEFINITIONS

- Order of Precedence
 - Specific regulatory section
 - General regulatory definitions
 - Dictionary
- DOT
 - 49 CFR 171.8 (General)
 - 49 CFR 173.403 (Class 7 specific)
- NRC
 - 10 CFR 71.4



STRUCTURE

TITLE: TITLE 49 – TRANSPORTATION

SUBTITLE: SUBTITLE B – OTHER REGULATIONS RELATING TO TRANSPORTATION:

**CHAPTER: CHAPTER I – Pipeline and Hazardous Materials Safety Administration,
Department of Transportation (PHMSA)**

SUBCHAPTER: SUBCHAPTER C – HAZARDOUS MATERIALS REGULATIONS

**Part: Part 172 – Hazardous materials tables and hazardous materials communications
regulations, emergency response information, and training requirements.**

Subpart D – Marking

Section 172.301

Paragraph 172.301(a)

Subparagraph 172.301(a)(1)

Sub-subparagraph 172.301(a)(1)(i)



SUGGESTED TABBING

SUBJECT	REFERENCE
Subpart A - Definitions/Abbreviations	§171.8
Subpart B - Hazardous Materials Table (HMT)	§172.101
Hazardous Substances Table 1 to Appendix A: Hazardous Sub. other than Rad Table 2 to Appendix A: RQ - Radionuclides	§172.101
Appendix B – Marine Pollutants	§172.101
Shipping Papers	§172.200
Shipper’s Certification	§172.204
Hazardous Waste Manifest	§172.205
Marking	§172.300
General labeling requirements	§172.400
Labeling, Class 7 (radioactive) material	§172.403
Placarding	§172.500
Emergency Response Information	§172.600



SUGGESTED TABBING

SUBJECT	REFERENCE
Training	§172.700
Hazard Materials Classes/Classification Hazard Precedence	§173.2 §173.2a
Preparation of Hazmat for transport	§173.21
General Req'ts for Packagings & Packages	§173.24
Add'l req'ts for non-bulk packagings Add'l req'ts for bulk packagings	§173.24a §173.24b
Empty Packagings	§173.29
Subpart I – Class 7 RAM, Definitions	§173.403
General package design requirements	§173.410
Table 4 – Activity Limits for LQ/I&A	§173.425
Table of A ₁ and A ₂ Values	§173.435



SUGGESTED TABBING

SUBJECT	REFERENCE
Exempt material/consignment activity limits	§173.436
Radiation level limitations & excl. use provisions	§173.441
Contamination Control	§173.443
General transportation requirements	§173.448
Fissile material	§173.453 - §173.459
Requirements for NRC approved packages	§173.471
Requirements for foreign made packages	§173.473
Quality control for construction of packaging	§173.474
Quality control prior to shipment	§173.475
Transport requirements for LSA & SCO	§173.427

Also see “NRC/DOT Interface” in SH-3



UNITS & CONVERSIONS

- System International (“SI” or metric) units are the regulatory standard (49 §171.10).
 - U.S. standard (customary units) are in parenthesis
 - For information use only (not regulatory standard)

Measurement	SI to US standard	US standard to SI
Activity	1 TBq = 27 Ci	1 Ci = 0.037 TBq
Mass (weight)	1 kg = 2.204622 lb 1 g = 0.03527397 oz	1 lb = 0.4535924 kg 1 oz = 28.34952 g
Radiation level	1 mSv/hr = 100 mrem/hr	1 mrem/hr = 0.01 mSv/hr

Based on values provided in ASTM E 380 “Standard for Metric Practice”



UNITS & CONVERSIONS

Exponential Notation

When moving up the exponential scale, move the decimal point to the LEFT by the number of powers being increased (i.e. MBq to GBq is an increase of 3 powers, therefore move the decimal to the left 3 places).

$$T = 10^{12}$$

$$G = 10^9$$

$$M = 10^6$$

$$k = 10^3$$

$$Bq = 10^0$$

When moving down the exponential scale, move the decimal point to the RIGHT by the number of powers being decreased (i.e. from TBQ to MBq is a decrease of 6 powers, therefore, move the decimal to the right 6 places).



MATHEMATICAL FUNCTIONS

DIVISION

- Perform indicated function
- Subtract exponents

EXAMPLE:

$$\frac{3.67 \times 10^{10}}{1.2 \times 10^4}$$

$$\frac{3.67}{1.2} = 3.058$$

Subtract exponents = 6

Answer: 3.058×10^6

MULTIPLICATION

- Perform indicated function
- Add exponents

EXAMPLE:

$$(3.67 \times 10^3) (1.2 \times 10^4)$$

$$3.67 \times 1.2 = 4.404$$

Add exponents = 7

Answer: 4.404×10^7



SUMMARY

- Hazardous Materials Regulations (HMR), 49 CFR 100-185
- General areas of the HMR
 - Identification and Classification
 - Hazard Communication
 - Packaging Requirements
 - Operational rules
- Regulations specific to Class 7 – found in §173
- Tabbing