

# International Performance-Oriented Packaging Standards Adopted in the United States - Status and Impact Report

Dennis L. McCall

Westinghouse Hanford Company, Richland, Washington, United States of America

## ABSTRACT

On January 1, 1991, the U.S. Department of Transportation (DOT) initiated a transition to adopting a modified version of current international standards for packaging and transporting hazardous materials and hazardous wastes. This transition permits a 5-year phase-in period that will impact all phases of hazardous material transportation including material classification and description, packaging for shipment, and hazard communication standards. These changes are being enacted through the DOT Federal Docket HM-181, "Performance-Oriented Packaging Standards." These regulatory standards will have dramatic impact on nearly 5 billion tons of hazardous materials transported within the United States each year. This paper summarizes the principal elements of the new DOT regulations, the latest implementation schedule and impacts on U.S. shipping activities, and discusses outstanding issues that remain to be solved through the next 5 years.

## BACKGROUND

For decades, both in the United States and throughout the world, there has been a wide variation of rules and regulations established by government entities to achieve safe and uniform transportation of hazardous materials. Many of these regulations were formulated around the unique needs of air, sea, and land transport. In the United States, these regulations evolved from different Federal, state, and local agencies associated with each mode of transport. This created an extremely complex, expensive, and almost impossible maze of regulations to be met by the shippers and carriers of these materials, and in turn impacted activities necessary to sustain industrial growth. In an effort to remedy this, the U.S. Congress in 1974 issued the *Hazardous Material Transportation Act* (HMTA). This act gave the U.S. Department of Transportation (DOT) authority to establish uniform hazardous materials transportation regulations for all modes of transport and preemption authority over inconsistent state and local regulations, and gave the DOT a mandate to adopt regulations consistent with applicable international rules to the extent practical and necessary to ensure safe transportation within the United States.

Between 1975 and 1987, many DOT regulations were adopted and changed to enhance safety and to establish uniformity in the United States, but little was accomplished to bring the U.S. domestic regulations into alignment with international standards. This created a set of U.S. regulations that were difficult to use, inflexible to changing technologies, deficient in terms of safety and classification of materials, and which had an identifiable impact on international trade. To correct these problems, the DOT initiated a major rulemaking effort in 1987. The DOT's regulatory standard, Docket HM-181, "Performance-Oriented Packaging Standards," took over 3 years to reach the final rule stage. The final rule, dated December 21, 1990, and amended December 20, 1991, essentially adopted a modified version of the current international standards covering the classification, packaging, and transportation of hazardous materials. The goals of this rulemaking, as identified by the DOT, are to simplify the regulations, reduce their size to facilitate use, provide greater flexibility in selecting packaging, achieve safer and more efficient packages using new packaging technology, reduce the need for exemptions, and facilitate international commerce.

### SUMMARY OF CHANGES IN THE UNITED STATES

The DOT final rulemaking, effective December 20, 1991, has a 5-year phase-in period to reduce the impact on U.S. industries that are heavily dependant on the packaging and transportation of nearly 5 billion tons of hazardous materials annually. The modified international standards, as adopted in the United States, will impact hazardous material shippers and carriers in the following three principal areas: (1) classification and description of materials for transport, (2) package selection and preparation, and (3) hazard communication standards (e.g., marking, labels, shipping papers, etc.) for each shipment.

Classification and Description: The new U.S. regulations will classify hazardous materials into 9 international hazard classes and 2 domestic classes instead of the 22 different U.S. DOT hazard classes previously used. Some of the hazard classes will be further separated by divisions. For example, gases will be Class 2, with flammable gases being Division 2.1, nonflammable compressed gases being Division 2.2, and poisonous gases being Division 2.3. Many hazardous materials will be described on the Hazardous Materials Table (HMT) [49 *Code of Federal Regulations* (CFR) 172.101] using new proper shipping names and identification numbers that are a blend of domestic and international descriptions previously used. The HMT will also identify many of the materials by packing group (PG) (e.g., PG-I, PG-II, PG-III) based on the degree of hazard associated with each material and may identify special provisions for handling and packaging. Domestic use of Consumer Commodity/Other Regulated Material (ORM-D) and Combustible Liquid classes are maintained.

Package Selection and Preparation: The new regulations will phase out the use of DOT specification packagings (e.g., DOT 17C, DOT 12B) and replace them with performance-oriented packagings [e.g., United Nations (UN) 1A1, UN 4G]. Specification packagings from the old DOT regulations listed detailed construction, engineering, and testing criteria for each authorized packaging. Manufacturers had to meet these criteria before certifying that the packaging meets DOT specifications. Under new performance-oriented packaging standards, new packaging materials, technology enhancements, and innovative designs can be developed and used if the new package passes applicable performance tests [e.g., drop test, leak-proof test, hydrostatic test, stack test, and vibration tests (domestic only)]. Some of these tests require testing the packaging with simulated payloads that represent the physical and chemical characteristics of the material being packaged. Test reports and packaging procedures must be provided to all package users and must define authorized payloads based on test results. Packaging procedures must give the user detailed instructions for preparing the package for shipment such that the tested configuration can be maintained for each use. Construction of DOT specification packaging for domestic use will end in 1994 with total phase out of use in 1996.

**Hazard Communication:** The new regulations will require significant changes to hazard communication standards that are applicable to hazardous material shipments. Shipping paper descriptions and package markings will reflect new proper shipping names, numerical hazard classes, packing group designations, and identification numbers where required. For materials that meet poison inhalation hazard criteria, a hazard zone designation also must be entered on the shipping documents. Some DOT hazard class labels will change to reflect the numerical numbering system and change in hazard class and division designations (e.g., new Class 9 label). Likewise, placarding will show similar change in 1994.

#### **IMPLEMENTATION SCHEDULE**

For shipments made by air or water transport carriers, the new regulations already apply because these carriers have previously adopted the international rules already in place and delineated in International Air Transport Association/International Civil Aviation Organization (IATA/ICAO) Dangerous Goods Regulations and International Maritime Dangerous Goods (IMDG) Regulations. For domestic shipments by highway and rail transportation, new changes will be adopted during the 5-year phase-in period.

Although voluntary compliance with the new provisions is permissible, on January 1, 1991, or thereafter, domestic shippers must meet the following mandatory compliance schedule and dates.

- Effective October 1, 1991, the classification criteria for new explosives and for gases that are poisonous by inhalation were implemented.
- Effective October 1, 1992, all poison inhalation materials must meet revised hazard communication standards including changes to shipping paper descriptions, package marking and labeling, and vehicle placarding. Revised hazard classification and communications requirements must also be met for infectious substances.
- Effective October 1, 1993, except for placarding, compliance with the new classification and hazard communication standards must be met for all hazardous materials not previously covered. New packaging requirements for poison inhalation materials must be in place. Revised loading and segregation requirements are adopted for rail and highway transport.
- Effective October 1, 1994, new placarding requirements must be implemented for all hazardous materials, and manufacturers must stop making nonbulk packagings identified as DOT specification containers.
- Effective October 1, 1996, use of DOT specification nonbulk packagings is prohibited. All hazardous material and wastes must be packaged to meet UN performance-oriented packaging standards.

During the phase-in period, U.S. shippers will be allowed to commingle some of the old and new shipping requirements as long as the mandatory compliance dates are met. For example, a package of corrosive material prepared for shipment in January 1993, could be packaged in a new UN performance-oriented packaging system (e.g., UN 4G) even if marked and labelled in accordance with the guidelines authorized under the old regulations. The shipping paper for the same shipment could describe the materials using the new hazard communication standards permissible even though not required until October 1, 1993. Although commingling is permissible, it is not recommended because it may confuse personnel handling the package during transport.

## PRINCIPAL AREAS OF IMPACT ON DOMESTIC SHIPPERS

A principal impact area involves increased product costs associated with more expensive packaging for chemicals, chemical products, and chemical waste materials. This is a result of changes in container availability, container testing requirements, documentation, and enhanced need for a strong quality assurance program by the package manufacturer, the testing labs, and the package users. Packaging costs from the manufacturer are expected to double or triple for certain combination packages because of new testing and quality assurance requirements. For example, fiberboard boxes, such as the DOT 12B65 at \$2 - \$4 per box, are being replaced by UN 4G combination packagings (e.g., fiberboard outer containers with inner packaging components) at \$6 - \$20 per unit. Single packagings, however, like DOT 17E metal drums, will experience little price increase. Currently, the DOT 17E drum at \$25 - \$40 per unit, will be replaced with UN 1A1 steel drums at no price increase from the manufacturer. In both examples, the user of these packagings will experience greater costs for container procurement and control, configuration management, and packaging use.

Personnel safety and compliance training for several million transportation and emergency response personnel will have to be changed to reflect the new packaging and communication requirements. This training will be a significantly difficult activity because of the protracted phase-in period where a dual system must be taught and where a commingling of old and new regulation compliance is authorized. Effective training must be developed and delivered to several million workers across the United States. Training cost per student can exceed \$1,000 per year depending on their job assignment.

There is also increased emphasis on materials, both liquids and gases, that meet poison inhalation hazard criteria. Although many of these materials are identified on the HMT by notation in the special provisions column, different concentrations, mixtures of chemicals, and new products may require extensive testing. This is necessary because toxicity and vapor pressure data are not readily available for many material combinations or if available, it is not reported in the required units necessary for comparison to inhalation hazard criteria for identification of the applicable hazard zone. These required tests are known to be moderately expensive because toxicity tests sometimes involve use of live animals.

## STATUS OF IMPLEMENTATION

The impact of implementing the new hazard classification system, performance-oriented packaging, and the other provisions of DOT rulemaking HM-181 have not yet been fully realized. In mid 1992, less than 1 year into implementation, major impacts on U.S. packaging and transportation operations are only now starting to be felt.

Container availability: The U.S. container industry is making significant progress retooling to produce UN performance-oriented packaging. Many companies have been producing UN packagings for several years to support U.S. import/export shipments by air using IATA/ICAO regulations and by sea under IMDG standards.

With the issuance of HM-181 in December 1991, many new manufacturers have entered the market. United States shippers can readily identify these packaging manufacturers by accessing information from several sources including DOT and the U.S. Federal Emergency Management Agency's (FEMA) Hazardous Material Information Exchange (HMIX). This electronic bulletin board identifies

manufacturers by name, address, and telephone number and identifies a listing of performance-oriented packagings available from each vendor. The IATA/ICAO regulations are another good information source. Appendix F of IATA/ICAO identifies manufacturers and packagings available. These two sources also identify laboratories where regulatory tests can be performed and documented.

Many packaging manufacturers also belong to trade associations like the Steel Shipping Container Institute, which provides information on members producing UN performance packagings.

Personnel training: Some sectors of U.S. industry have been very slow to react. There appears to be a lack of effective training materials to reflect the new regulations and a shortage of qualified instructors with sufficient knowledge of the new requirements to train the large target audience needing instruction. The reasons for this lack of response are complex. The 5-year phase-in period has given industry a false sense of security. Many companies still do not see the changes coming and do not understand their impact. The DOT has further complicated the training issue with another separate rulemaking covering training of transportation workers. This rulemaking was rewritten to reflect Federal legislation mandating specific training elements for transportation workers and emergency responders. The rulemaking DOT Docket HM-126F, "Training for Safe Transportation of Hazardous Materials," initially delayed by a presidential moratorium on new legislation, was issued as a final rule on May 15, 1992. Many companies have postponed updating training programs awaiting this Federal action. Meanwhile, millions of U.S. workers who may not have adequate training must continue to handle hazardous material packages.

Hazardous materials classification: There is still much confusion over requirements for classification, packaging, and shipment of hazardous materials in accordance with the new regulations. The phase-in period and mandatory dates for classifying new explosives and poison inhalation materials, as well as the new hazard class and division structure and the resultant hierarchy of hazards, is still misunderstood by many. Some persons have voluntarily begun using the new classification and shipment system, while others still don't recognize that these rule changes are in place. The commingling authorizations make the system appear more complex than it is. All result in materials being improperly classed for shipment and the potential for improper packaging and hazard communication.

## SUMMARY OF OUTSTANDING ISSUES

Rule Change and Phase-In Period Recognition: Many persons in the United States involved with packaging and transporting hazardous materials still do not recognize that the final rule changes are in place. Others do not understand the mandatory phase-in period or the impacts these changes will have on their domestic shipping activities.

Lack of Effective Training: There is a training deficiency across the United States in hazardous materials packaging and transportation. Training programs need to be developed and delivered to transportation workers and emergency response personnel. The following training elements require emphasis.

- Classification of materials and the hierarchy of hazards.
- Identification and packaging of poison inhalation hazard materials.
- Procurement, storage, and use of UN performance-oriented packagings.
- Use of new segregation and separation charts and procedures.

Commingling: The DOT may have to rethink the current policy to allow commingling of old and new packaging and communication standards because of the confusion it may cause to domestic transportation of hazardous materials.

Continued Concern Over Shipper Responsibility/Liability: Packaging manufacturers, testing laboratories, package users, and those who prepare hazardous materials for shipment must have a clear understanding of the responsibilities and liabilities associated with meeting the new regulations. Much confusion still exists over who is responsible and liable for each part of the regulations.

Concern Over Ability of Small Businesses to Comply: Many small U.S. businesses are not staffed with qualified personnel to keep abreast of complex regulatory changes, to conduct adequate training, or to ensure correct implementation. This existing problem will become more difficult with the implementation of these new rules.

United States Shippers Continuing to Face a Dual Regulatory System: Although the new DOT regulations are similar to international standards, there remain many distinct differences that U.S. shippers must deal with. This is especially true for hazardous material shippers using land, sea, and air modes of transportation. There will continue to be unique differences between the modified international standards adopted in DOT's Title 49 CFR Parts 171-179, and requirements found in IATA/ICAO and IMDG international standards for air and sea transport, respectively.

## CONCLUSION

The United States is just beginning the long road to adopting modified international standards for packaging and transporting hazardous materials domestically. For the most part, the new regulations have been finalized for adoption in the United States. This is to the extent that finalization of regulations is practical in our ever-changing regulatory environment. The United States is moving forward in design, development, and manufacturing of packaging systems meeting UN performance standards, and transportation personnel are beginning to be trained in the new classification system and associated communication regulations. Much, however, remains to be done because many people still do not recognize that changes are in place, what the changes mean, or their impact. Therefore, the adoption of these new regulations will be slow, expensive, and extremely difficult for many U.S. businesses.

## REFERENCES

*DOT Docket HM-126F, Training for Safe Transportation of Hazardous Materials*, U.S. Department of Transportation, Washington, D.C., 95 FR 20944 (1992).

*DOT Docket HM-181, Performance-Oriented Packaging Standards*, U.S. Department of Transportation, Washington, D.C., 55 FR 52402 (1990).

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*Hazardous Material Transportation Uniform Safety Act of 1990*, 49 App. USC 1801 et. seq., as amended.

*International Air Transport Association/International Civil Aviation Organization (IATA/ICAO) Dangerous Goods Regulations*, ISBN 92-9035-355-4/DOC 9284-AN/905, as amended.

*International Maritime Dangerous Goods (IMDG) Regulations*, ISBN 92-801-1201-6, as amended.

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