**DEPARTMENT OF TRANSPORTATION**

**Research and Special Programs Administration**

**49 CFR Parts 171, 172, 173, and 174**

**[Docket No. HM-198A; Amdt. Nos. 171-13, 172-125, 173-227, and 174-69]**

**RIN 2137-AB31**

## Elevated Temperature Materials

**AGENCY:** Research and Special Programs Administration (RSPA), Department of Transportation (DOT).

**ACTION:** Final rule.

**SUMMARY:** RSPA is amending the Hazardous Materials Regulations (HMR; 49 CFR parts 171–180) to regulate materials which pose a hazard due to their being offered for transportation or transported at elevated temperatures. Included are materials in a liquid phase having temperatures at or above 100 °C (212 °F) and materials in a solid phase having temperatures at or above 240 °C (464 °F). RSPA is also regulating, as flammable liquids, materials in a liquid phase with flash points at or above 37.8 °C (100 °F) which are intentionally heated and offered for transportation or transported in bulk quantities at or above their flash points. The intended effects of these regulatory changes are to communicate the hazards of these elevated temperature materials by means of marking, shipping papers and placarding, and to prescribe packaging requirements for these materials. The changes are necessary to alert the public and emergency response personnel to the risks posed by these materials and to specify minimum levels of packaging for them in order to minimize the possibility of their unintentional release.

**DATES:** These amendments are effective March 30, 1992. However, compliance with the regulations as amended herein is authorized as of October 30, 1991.

**FOR FURTHER INFORMATION CONTACT:** Beth Romo, Office of Hazardous Materials Standards, (202) 366–4488, or James K. O'Steen, Office of Hazardous Materials Technology, (202) 366–4545, U.S. Department of Transportation, 400 Seventh Street SW., Washington, DC 20590–0001.

**SUPPLEMENTARY INFORMATION:**

### I. Background

In several previous rulemaking actions, RSPA has endeavored to develop appropriate definitions and regulatory controls for flammable solids, including materials offered for transportation or transported at elevated temperatures. In an Advance Notice of Proposed Rulemaking (ANPRM) published under Docket HM-178 on May 7, 1981 (46 FR 25492), RSPA requested comments on making the definition of a flammable solid more specific and proposed methods for testing which would enable shippers to determine if their products were flammable solids for purposes of transportation. The ANPRM addressed solids or molten materials shipped at temperatures exceeding 315 °C (600 °F) because of the potential of these materials to ignite combustible materials. The ANPRM also solicited comments on types of packaging controls for these materials.

In a subsequent rulemaking action, RSPA incorporated criteria for distinguishing between "liquid" and "solid" materials. A final rule published April 20, 1987 (Docket HM-166U; 52 FR 13634), added definitions for "liquid" and "solid" to § 171.8 of the Hazardous Materials Regulations (HMR; 49 CFR parts 171–180). The definitions are based on American Society for Testing and Materials (ASTM) D 4359–84 entitled, "Standard Test Method for Determining whether a Material is a Liquid or Solid."

On January 19, 1985, a tractor with two tank trailers filled with molten sulfur collided with the concrete median barrier on the southbound lanes of Interstate 680 on the Benecia-Martinez Bridge in Benecia, California. The molten sulfur ignited and sprayed onto other vehicles traveling in the northbound lanes. As a result of the fire and smoke from the burning sulfur, two persons died, 26 persons were taken to local hospitals, surrounding areas were evacuated, and the roadway was closed for 15 hours. Because molten sulfur was not subject to the HMR, the hazards of the material were not communicated to emergency responders, thereby hampering emergency response efforts. As a result of its investigation into this accident, the National Transportation Safety Board (NTSB) on August 12, 1985 issued Safety Recommendation I–85–19, which recommended that RSPA (1) regulate molten materials, as appropriate, as hazardous materials; (2) prescribe packaging and handling standards; and (3) incorporate information relating to the hazards of these materials into warning devices and publications available to emergency responders and others involved in the transportation of molten materials. The NTSB expressed concern that unregulated molten materials in the transportation system pose a substantial risk to persons and property, and could cause major disruptions to communities.

In a subsequent comment, the NTSB referenced an October 21, 1986, accident that occurred near Berrien Springs, Michigan, which involved a load of molten aluminum and resulted in two fatalities. The driver of a tractor trailer hauling a crucible of molten aluminum failed to negotiate a right-hand curve. The vehicle crossed the center line and overturned in the oncoming lanes. The tractor collided with an automobile and pushed it off the road and into a gully. Despite the overturn, the molten aluminum crucible remained chained to the trailer, and the lid of the vat remained bolted in place. However, one of the hinges on the top lid broke upon impact, allowing the molten aluminum to leak into the gully. The molten aluminum flowed underneath the automobile, igniting gasoline in the fuel tank. Subsequent autopsies indicated that the two passengers died of smoke inhalation before extensive tissue damage caused by the hot metal and before injuries due to the accident or explosion could cause death. As a result of this accident, the NTSB recommended that DOT consider the hazards posed by molten materials in the various transportation modes.

There appeared to be a need for hazard communication requirements for elevated temperature materials to alert emergency response personnel and the general public to the potential hazards posed by the release of these materials. There also appeared to be a need to impose minimal packaging standards on packagings used in the transportation of elevated temperature materials.

On November 21, 1986, therefore, RSPA published an NPRM in the **Federal Register** (Docket HM-198; Notice No. 86–6; 51 FR 42114), proposing to regulate molten sulfur as a hazardous material and soliciting information concerning other molten materials. A final rulemaking on molten sulfur was published on May 13, 1988 (51 FR 42114), and included the announcement that RSPA would address other molten materials in a future rulemaking action.

*Historical Summary of Docket HM-198A*

The current HMR do not adequately address elevated temperature materials. Most elevated temperature materials are not currently regulated. Therefore, RSPA has limited information concerning numbers of incidents and accidents involving these materials.

On September 21, 1989, RSPA published notice of proposed rulemaking (54 FR 38930) under Docket HM-198A, concerning elevated temperature materials. The notice proposed to regulate all materials offered for transportation which pose a thermal

hazard: i.e. liquids and solids hot enough to damage human tissue; liquids and solids which would ignite combustible materials; and liquids transported at or above their flash points that are not currently regulated as flammable liquids. RSPA proposed to regulate, in the ORM–C hazard class (see § 173.500), all liquids offered for transportation or transported at temperatures above 212 °F (100 °C), as well as solid materials offered for transportation or transported at temperatures greater than 464 °F (240 °C). RSPA proposed to require that liquid elevated temperature materials and solid materials capable of igniting combustible materials be subject to specific packaging standards, because packaging quality is the only way to prevent a spill or release if an accident occurs. RSPA further proposed that liquids offered for transportation at or above their flash points be classified and packaged as flammable liquids since there is a greater tendency for those materials to burn in the presence of an ignition source.

This notice was consistent with the regulation of molten sulfur. By requiring specific packaging for liquids offered for transportation or transported at temperatures greater than 212 °F (100 °C), the greater hazard of liquid materials was recognized and controlled. The notice addressed the flow characteristics of liquids, the ignitability characteristics of the hotter solid materials, and the regulation of liquid materials transported at or above their flash points.

The NPRM proposed to regulate a number of materials not currently addressed by the HMR, particularly those materials offered for transportation or transported at temperatures at or above their flash points. In addition to compliance with the proposed packaging requirements, shippers of newly-regulated materials would be required to prepare shipping papers, mark packages, and, for materials transported at or above their flash points, affix placards. Shippers of currently-regulated materials meeting the definition of an elevated temperature material or a flammable liquid would be required to indicate the thermal hazard of the material through additional shipping paper and marking requirements. Other requirements proposed for shippers and carriers of previously unregulated materials would include incident reporting (for carriers) and, for flammable liquids, unloading/loading and attendance requirements, coupler vertical restraint systems on tank cars, and train placement of placarded rail cars.

*Discussion of Comments*

RSPA received over 50 written comments to Docket HM–198A. The City and County of Denver and the Ohio Public Utilities Commission (PUC) expressed complete support for the proposals. The Ohio PUC believed the proposal would provide needed hazard communication and packaging specifications. Denver stated that the new requirements would ensure elevated temperature materials and materials transported at or above their flash points are adequately described and packaged. Denver did not anticipate any need for significant investments for training or equipment.

The majority of comments were provided by trade associations or individual companies involved in the transport of asphalt, molten sulfur, or molten aluminum. Other types of materials identified by commenters as meeting the proposed definitions for elevated temperature materials or flammable liquids included dimethyl terephthalate, phthalic anhydride, steel slabs and coils, molten iron and steel, hot cinders, amorphous polypropylenes, ortho-toluenediamine and meta-toluenediamine.

*Proposed hazard communication requirements.* Several commenters believed that annotating the word "hot" on shipping papers and packages would be confusing because some shippers use the word "hot" to indicate a shipment that needs to be expedited. Some commenters stated that the imposition of emergency response communication standards would be an unnecessary burden on transporters of a material whose only hazardous characteristic is its temperature. Other commenters, such as the International Association of Fire Chiefs, stated that elevated temperature materials must be placarded and a bill of lading available to prevent death and disabling injuries to firefighters and first responders. The National Tank Truck Carriers (NTTC) supported efforts to better inform emergency response personnel, and believed the proposed addition of the word "HOT" to shipping papers for affected products is appropriate.

*Materials offered for transportation or transported at or above their flash points.* The NPRM proposed that materials offered for transportation or transported at or above their flash points (flash point materials) be classified (or reclassified) as flammable liquids, and that all HMR requirements for flammable liquids apply to them.

RSPA received nine comments that offered in-depth discussion of this issue; four additional commenters also addressed the other categories of materials proposed for regulation under Docket HM–198A. Commenters listed products that would fall into the category of materials offered for transportation or transported at or above their flash points to include asphalts, oils, beverage concentrates, dimethyl terephthalate (DMT), and phthalic anhydride (PA). Packaging identified by commenters as being used to transport materials at or above their flash points were split about evenly between bulk and non-bulk packagings. DMT is transported in dedicated AAR tank cars, specially designed insulated stainless steel non-specification tanks, or in DOT specification containers. A commenter believed the tank cars would require substantial modification to meet the proposed packaging requirements. Safety vents would need to be replaced with valves, and each would need to be equipped with double shelf-couplers. Commenters maintained that DMT and PA cargo tanks are non-specification tanks similar to MC–307 cargo tanks, but they do not comply with MC–307 venting or outlet valve requirements. There are no known vents or outlet valves which would provide satisfactory service for DMT or PA. These tanks may not comply with accident damage protection or circumferential reinforcement requirements. The Truck Trailer Manufacturers Association (TTMA) stated that requiring DMT and PA to be transported in specification packagings would render a large fleet obsolete and unusable. TTMA asserted that the fleet is in dedicated service for which there is little other use. TTMA further stated that replacement of the DMT and PA fleet would create an enormous financial burden on owners, many of whom are small, independent business operators.

As proposed in the NPRM, RSPA believes that hazard communication and classification requirements for Class 3 (flammable liquid) materials should apply to materials offered for transportation or transported at or above their flash points. However, after further review, RSPA agrees that requiring packaging suitable for flammable liquids may be too stringent for these materials. RSPA believes that a balance is needed between the specification packaging requirements for Class 3 materials and the non-specification requirements authorized for a material offered for transportation or transported above its flash point are similar to those for Class 3 materials, except provisions have been made to account for the unique solidification

properties of these materials and their lower level of hazard.

Another major concern, identified by nine commenters, is the difficulty they foresee in shipping a material having a flash point between 100 °–130 °F under conditions which might cause the temperature of the material to rise to a point that the material would become subject to regulation as a flammable liquid. Factors identified by the commenters that could impact the temperature of the material include: (1) Weather and seasonal conditions; (2) different geographical locations (e.g., transport through the desert); (3) shipping time; (4) driver's route; (5) any mechanical difficulties encountered; (6) ventilation in the trailer; (7) color of the trailer; and (8) traffic conditions. The hazard classification may change several times during transport and could be "contingent upon climatic conditions . . . over which shippers have no control" asserted 3M Corporation. The Conference on Safe Transportation of Hazardous Articles (COSTHA) maintained that the shipper would have "no way of predicting the temperature to which a material may be subjected within a vehicle, rail car or freight container in the course of transportation." The National Soft Drink Association predicted that this could create "considerable confusion" and a "significant potential for non-compliance." Two commenters indicated that computerized classification systems could not be utilized, thus "increasing the risk of human error." Several commenters indicated that a packed and labeled product might be placed in a tank car storage yard, cargo tank staging area, or in a warehouse for months before transport. These commenters maintained that the only way to know the actual temperature of a product is to open the package and place a thermometer in the product, which could raise environmental, health and product quality issues. Commenters also asked who would assume responsibility for monitoring product temperatures in transit. In summary, the commenters were of the opinion that, if this proposal were adopted in a final rule, compliance would be "practically unmanageable," "difficult, if not impossible," and violated "on a regular basis." RSPA agrees with the commenters that it would be very difficult to correctly classify a material which is environmentally heated to a temperature at or above its flash point. Data indicates that environmental heating of bulk packagings very rarely exceeds 105 °F for insulated packagings and 115 °F for uninsulated packagings and the frequency of environmentally-heated shipments in this temperature range is small. It appears that the economic impact of regulating these occurrences may be significant, whereas the benefits are minimal. Therefore, in this final rule, RSPA is excepting from regulation as an elevated temperature material or flammable liquid all materials with flash points at or above 37.8 °C (100 °F) which are offered for transportation or transported at or above their flash points when they are in non-bulk packagings or in bulk packagings when the lading is not intentionally heated prior to or during transportation.

*Asphalt.* Commenters addressing proposals for regulating asphalt as a flammable liquid or an elevated temperature material included shippers, cargo tank manufacturers, carriers, asphalt pavement and roofing associations, and one state. Asphalt materials consist of various grades of asphalts and asphalt products. Grades include asphalt cement (AC), slow curing, cut back asphalt (SC), medium curing cut back asphalt (MC), and rapid curing cut back asphalt (RC). Many RC asphalts are classed as "flammable" under current regulations. MC and some SC asphalts would be subject to regulation because they are transported at or above their flash points or are transported above the threshold 212 °F. Bitumen (asphalt or coal tar) is used in roofing operations and is normally transported at 300 °–500 °F. Bitumen would never be transported at or above its flash point. One commenter explained that materials are shipped at elevated temperatures so the materials can be unloaded without additional heating; reheating is potentially dangerous and could result in severe burns to employees from steam or products. Another commenter noted that most major oil companies do not maintain private fleets for asphalt service, but depend on the availability of contract or common carriers. Several commenters cited the generally good safety record for the transportation of asphalts, and noted that most incidents occurred during the loading and unloading process.

No non-bulk packagings were identified by the commenters. Commenters reported shipments of AC in insulated tank trucks and tank cars with electric or steam heater coils. RC asphalts, classed as flammable, are transported in MC–306 cargo tanks, with certain exceptions as allowed in current 49 CFR 173.131. MC and SC asphalts are being transported in non-specification atmospheric pressure tanks having open vents, which are protected from product loss while the tank is upright by various baffling arrangements. The vents have no moving parts. Bitumen is transported in kettles ranging in size from 100–1,500 gallons and tankers which hold 2,000–5,000 gallons. The tankers house a heating system to maintain the temperature of the bitumen in transit. To make a kettle or tanker leak-tight would create the potential for an explosion. There are currently no existing venting systems or internal valves available that would comply with the proposed requirements without risking explosions. Commenters alleged that current cargo tanks used for RC asphalts do not meet proposed venting, manhole, or certification requirements, and stated that replacement of many asphalt tanks and all asphalt spray applicators would be required. The State of Texas requested clarification as to whether vehicles such as asphalt distributors would be affected. Commenters believed it would make far more sense to require proposed equipment modifications on newly manufactured vehicles, while allowing existing equipment to be utilized for its normal service life without retrofit. They stated that the proposed requirement for MC–306 venting or alternative venting would necessitate the development of technologies not presently available. Commenters further stated that conventional low pressure vents will not work because exposed vents in tops of tanks are not fully heated by the product; they stick shut and become plugged by the product. The commenters alleged that the only venting system possible would be a large pressure vent (6 inches set at 25–35 psi) constructed of seals of non-sticking material such as teflon. This concept would not meet requirements of HM–183, and the 1994 "Smart Vent" would be impossible. Several commenters noted that use of a pressure tank would introduce a new burn hazard to the operator because asphalt would boil and expand as the manhole is opened. One commenter asserted that if an MC–306/406 or MC–307/407 tank vent plugs due to heavy viscous liquids, the cargo tank could overpressurize, threatening the integrity of the tank. Also, if the vent were plugged, cooling of the product could result in a vacuum being created within the tank. Commenters alleged that replacement of currently authorized cargo tanks would place an enormous financial burden on owners, many of whom are small, independent business operators.

One commenter maintained that the proposals would have a significant cost impact if measured as a percent of total cost for handling asphalts, as well as affecting small governmental jurisdictions. Another commenter reported that over 90 percent of the pavement in the U.S. is hot mix asphalt and nearly all road construction is funded with tax monies by governmental agencies at all levels. The commenter stated that small governmental jurisdictions would pay more because of the increased cost of transporting asphalt cement. The commenter also stated that these small governmental jurisdictions would be further affected as spraying equipment would have to be replaced. According to the commenter, many or most independent road oil applicators are small businesses who would be impacted by the regulation. One commenter believed the financial burden on the not-for-profit government jurisdictions could reduce the overall safe operation of asphalt tanks, but did not elaborate on how overall safety might be reduced.

Numerous commenters maintained that all equipment now in service should be allowed to operate to the end of normal service life, and the effective date should be tied to a period related to development of equipment required to meet the new requirements. After further deliberation, RSPA partially agrees and has provided for the continued use of existing equipment not fully conforming to applicable requirements for 20 years from the date of manufacture provided such equipment meets the performance requirements for closures and, for bitumen and asphalt, also meets the accident damage protection and package marking requirements. In addition, a delayed compliance period has been provided to allow for an orderly transition for manufacturers to conform to the new requirements.

*Molten sulfur.* Shippers, carriers, The Fertilizer Institute, The Sulphur Institute and the U.S. Department of the Interior (DOI) furnished comments and general statistics on molten sulfur. Molten sulfur is transported at temperatures of 250°–290°F in rail cars, trucks, and barges. Shipment net weight varies from 10 long tons in trucks to 8,000 tons in unit trains; no non-bulk packaging was cited. Transportation equipment is in dedicated service using special rail tank cars, trucks, and barges. Some specialized molten sulfur trailers are equipped with dry material hoppers for dry fertilizer backhaul, in addition to combination tank trailers for molten sulfur/phosphatic fertilizer solutions. Accident statistics reported are company accident statistics, except for the DOI, which stated that in addition to incidents cited in the Notice, two minor accidents occurred involving spills with no injuries or loss of life.

In general, commenters did not believe that equipment now in use would meet proposed packaging requirements. One commenter believed a rule requiring manhole covers to be closed is warranted, although changing tank specifications would not prevent a recurrence of the type of accident which occurred in Benecia, California. The Sulphur Institute was concerned that ASTM D 4359–64, "Standard Test Method for Determining Whether a Material is a Liquid or a Solid", may be inappropriate if used at the maximum temperature of a material. Several commenters were particularly concerned that the proposed rule is not clear whether tank trucks must have pressure and vacuum control equipment and suggested that DOT clarify this section. One commenter stated that vacuum and pressure controls would depend on loading temperature, length of haul, time elapsed between loading and unloading, trailer capacity, quantity of lading, and temperature at unloading. According to commenters, the current manhole cover on a molten sulfur tank truck consists of a ½ inch-thick stainless steel plate with EPDM sheet gasket covering the area where the cover sits on the manhole collar. The cover is fastened with hold-down bolts. Commenters reported that, during transit, sulfur splashes on the cover and the joint between the cover and the collar and then hardens after cooling. This seals the collar to the cover. The Sulphur Institute noted that the duration of a tank truck shipment of molten sulfur is usually less than a few hours; therefore, based on existing experience, it is unlikely that either pressure buildup or a vacuum develops. The Sulphur Institute also stated that the duration of a rail tank car shipment is usually several days. During the shipment, sulfur solidifies and forms a thick crust on the upper surface and interior walls, adding thickness to the tank and eliminates the need for additional pressure or vacuum controls.

Commenters addressing equipment modification or replacement alleged the impracticality or impossibility of using a rupture disk, creating a leak test, or using an MC 307-type manhole cover. One commenter believed RSPA has not provided criteria for evaluating a lading's potential for pressure deviation, and maintained that the standard safety vent is adequate to prevent rupture or collapse of a tank car from heating or cooling and to prevent release of material in the event of an overturn. Several commenters asserted that pressure and vacuum controls should not be required for tanks currently in service. Commenters asserted that replacement or modification costs of existing equipment would be significant. The Fertilizer Institute requested that DOT rewrite the section to allow existing tank trucks with proven performance records to operate for the remainder of their service lives. The Sulphur Institute requested that the continued use of existing rail cars be allowed throughout their useful service lives. RSPA agrees and is revising the packaging requirements to allow the continued use of existing equipment not in conformance with the general requirements for 20 years from the date of manufacture, provided closures meet minimum performance requirements. A one-year transition period is provided after which construction of new equipment must be in conformance with the new packaging requirements.

*Molten aluminum.* Commenters addressing molten aluminum included two shippers, the Aluminum Association, the Aluminum Recycling Association (ARA) and the U.S. Department of the Interior. They reported that molten aluminum is shipped in custom-designed dedicated crucibles by highway. None of the commenters was aware of any non-bulk or rail shipments. Commenters reported that shipping temperatures range between 1200° and 1600°F. According to commenters, during the past three years there have been one spill involving a fatality and two spills involving only damage to the road and the transport vehicle. In addition, commenters noted seven collisions with no spillage and minimal injuries and vehicle damage. ARA member companies reported 19 accidents with four fatalities over 17 years. These fatalities occurred during four different years; in each incident, only the driver died and the deaths may have been cardiac-related.

Most commenters addressing molten aluminum stressed that incident reporting should not apply to loading, unloading or maintenance on shippers' or customers' plant sites where "small" spills may be unavoidable. They stated that small spills occur on a regular basis and that incident reporting should apply only to significant incidents which: (1) occur outside the property of a shipper or receiver; (2) occur on public thoroughfares; (3) cause injury or damage; and (4) are over a certain

weight (e.g., 50 pounds). These commenters believed it is very important that transporters and customers should not be subjected to any reporting burden involving loading or unloading off public highways. They said that incident reporting of all spills during loading, unloading, or transport would impose an unnecessary burden. RSPA, through prior interpretation, has stated that a small amount of unavoidable spillage of hazardous materials during loading and/or unloading is excepted from the reporting requirements. This interpretation does not encompass major spills, ruptured piping, or catastrophic failures which occur during loading or unloading, but rather the small, inadvertent spills which are not the result of package failure, occur at the facility where there are provisions to contain the release, and pose no significant risk to personnel or the environment.

Several commenters reported that custom-designed crucibles are in dedicated service, have a steel plate shell, are refractory lined and insulated, have a steel plate cover bolted or chained to the frame to create an integral unit, and are sealed with special gasketing material. These commenters said they could not furnish data to indicate whether the current packagings would meet the proposed standards, but claimed that the proposed requirement for closures implies verification by demonstration of leaktightness in any orientation. According to commenters, crucibles used to transport molten aluminum may not be leak-tight and are never turned upside down to verify they are leak-tight. The commenters believed this requirement should be revised to read "substantially leak tight in any orientation by design." RSPA agrees and has rewritten the requirements for closures to require substantial leak-tightness in design, but RSPA will allow, in the event of an incident, dripping or trickling from closures.

*Other molten materials.* Other molten materials identified by commenters included molten iron, molten steel, and molten glass. Several commenters reported that submarine ladles are used to transport molten metals by rail.

They reported that the ladles are bottle-shaped in design with an opening located at the top center of the ladle. Commenters asserted that maintenance procedures on thermos iron ladles contribute to accident-free transport, and the torpedo-type body is lined with 12" thick refractory brick, which is periodically inspected for thin spots and repaired with gunnite or relined by trained employees. Commenters report that, while the torpedo car is approximately 56' long overall, the cylinder is approx 29' long and mounted in the center of the car, which is equipped with double trucks at each end and two independent brake systems on each car. Gross weight when loaded can be 800,000–850,000 pounds. Molten iron is loaded between 2400°–2700°F; the skin of the car is approximately 550°F. The car attains a maximum speed of 15 mph, which greatly reduces any potential of harm or injury to the public. One company has transported molten iron by rail for over 60 years without incident.

All commenters stated that to completely encapsulate a submarine ladle car would involve designing a lid or cork-like device to be placed in or over the opening. They maintained that there would be three critical flaws to enclose the cars: (1) The procedure necessary to remove and replace the lid each time metal is loaded and poured would require utilization of an overhead crane and an operator positioned above the ladle to remove and replace the lid. This would be dangerous as well as costly and time-consuming; (2) the continual routine of pouring hot metal would cause the car's lip to wear with each pour, making it impossible to enclose the car with an air-tight lid; and (3) no such lid or cork device is currently being manufactured or available. In view of the unique packaging and transportation conditions, at the present time RSPA believes that molten metals and molten glass should be excepted from liquid elevated temperature material packaging requirements if transported by rail at speeds no greater than 15 miles per hour, and has provided a regulatory exception to this effect.

*Other liquid elevated temperature materials.* Commenters identified Amorphous Polypropylene Copolymer and Amorphous Polypropylene Homopolymer as two materials which would become subject to the HMR. Two other materials, Ortho-Toluenediamine, and Meta-Toluenediamine, are currently regulated in the ORM-A hazard class. Commenters reported that the temperature range of these materials is 240 °–375 °F when offered for transportation, but these materials are not transported at temperatures above their flash points. Commenters stated that specialized, dedicated cargo tanks are used to transport Amorphous Polypropylene, as well as an occasional shipment in DOT 111A100W tank cars. They stated that cargo tanks have been modified to add exterior heating elements, insulation, and jacketing as a means to maintain temperature. According to several commenters, actual transportation experience indicates cargo tanks and tank cars currently transporting this type of material will meet proposed packaging requirements.

*Solid elevated temperature materials.* RSPA received five in-depth comments addressing solid materials are offered for transportation or transported at temperatures exceeding 464 °F. The five commenters (three steel companies and two rail carriers) furnished comments on the rail transport of solid elevated temperature materials. Materials identified by the commenters included hot steel slabs, not rolled steel coils, hot cinder, ingots, and solid iron and steel shipped in various forms including rolls of rough sheets referred to as "hot bands." Commenters cited different loading temperatures by commenters ranging from 400 °F–2800 °F.

Commenters reported that most of the shipments of these hot solid materials are over short distances, both intrastate and interstate by rail.

The trains are in dedicated or unit train service. One company indicated that it owns the cars, and uses engines and crews provided by various railroads. One rail carrier group asserted that they have been involved in the transport of elevated temperature materials for over 100 years, and none of their carriers transporting elevated temperatures materials has ever been involved in an accident where the public's safety was in any way threatened. The other rail carrier maintained that solid iron and steel transported at elevated temperatures has been transported over portions of their lines for over 30 years without any problems. The steel companies reported no accidents or incidents while in transit.

Commenters identified types of equipment used for these rail shipments as gondola cars, some specially designed with steel floor and V bottom troughs, steel floor gondolas with special pipe racks for loading coils, and specially designed flatcars with steel V bottom troughs. They stated that cinder ladles are used to transport hot cinder. These ladles are pot-shaped, approximately 28 feet long, and have a large open top. Slab racks used to transport hot slabs were described by commenters as large heavy-duty flat cars with end bulkheads and risers.

The major concern of three commenters was the proposed packaging requirements for solid elevated temperature materials. These commenters cited the difficulty of encapsulating or enclosing the rail cars. They maintained that it would be extremely costly and impractical, and

that there is currently no technology available to enclose this type of car. They asserted that encapsulating the cars would be counter-productive because the intent is to dissipate the heat through the use of open cars. The additional weight necessary for encapsulation, according to all three commenters, would reduce the amount of product that could be transported in each car, thus resulting in the need for more equipment and higher costs.

All five commenters contended that materials such as hot ingots, hot slabs, and other forms of hot metals should not be classified as "bulk" and therefore not subject to the regulations. RSPA stated in the NPRM that the hazards posed by solid elevated temperature materials are considerably less than for liquid elevated temperature materials because solid materials do not flow away from a release site. After further review, RSPA agrees with commenters that the level of regulation proposed for these solid elevated temperature materials may be too stringent. However, RSPA believes that a hazard communication marking requirement is necessary to warn of the thermal danger of the product and its packaging. Therefore, RSPA is only requiring the marking of the word "HOT" on each side and each end of a bulk packaging containing a solid elevated temperature material.

## II. Summary

Under this final rule, materials offered for transportation or transported at or above their flash points are classified as Class 3 (flammable liquid) materials if they are in bulk packagings and intentionally heated before or during transportation. New entries, "Flammable liquid, elevated temperature material, n.o.s." and "Aluminum, molten" are added to the § 172.101 Table. Liquid elevated temperature materials are regulated in the Class 9 (miscellaneous) hazard class. Hazard communication requirements (shipping papers, marking, labeling, placarding, and emergency response communications) are being imposed. The intent of these changes from those proposed in the NPRM is to ensure adequate communication of the hazards posed by these materials, but with appropriate exceptions for environmentally-heated materials and materials in non-bulk packagings. A new performance-based packaging section is provided for these materials. In addition, this section authorizes existing equipment to be used for significant periods of time, provided closures meet minimum performance standards. Based upon rigid operational controls, an exception from packaging requirements has been provided for molten metals and molten glass transported in rail cars.

The proposed § 172.101 Table entry for "Elevated temperature material, solid, n.o.s." has been revised. Solid elevated temperature materials are not subject to any requirements of the HMR except for marking the word "HOT" on the package.

The following is a section-by-section review of this final rule:

*A. Part 171: General Information, Regulations, and Definitions*

*Section 171.8.* Two new definitions, "Elevated temperature material" and "Liquid phase," are added. Both definitions have been clarified from those proposed in the NPRM. Temperatures are indicated in centigrade as the metric standard, in conformance with the December 21, 1990 final rule under HM-181, with Fahrenheit temperatures in parentheses for information purposes only.

*B. Part 172: Hazardous Materials Table, Special Provisions and Hazardous Materials Communication Regulations*

*Section 172.101.* In new paragraph (i)(3)(iii), for consistency with the December 21, 1990 final rule under HM-181, the proposed reference to ORM materials is replaced by a reference to a Class 9 material and the proposed packaging reference changed from § 173.990 to § 173.247.

*Section 172.101 Hazardous Materials Table.* The proposed revision of the entry for "asphalt, at or above its flashpoint," classed as a flammable liquid, was modified under the Docket HM-181 final rule published December 21, 1990. However, the bulk packaging section (§ 173.242) authorized in that final rule is now revised to § 173.247. Entries for molten sulfur, for both domestic and international transportation, have been revised to change the bulk packaging authorization to § 173.247. The proposed entry for "Elevated temperature material, solid, n.o.s., ORM-C, NA9260" has been revised to reference § 173.247, which provides exceptions for these materials. The entry for "Elevated temperature material, liquid, n.o.s." is revised to clarify that this entry applies only to a material that is transported at or above 100 °C and below its flash point. In addition, the proposed hazard class for "Elevated temperature material, liquid, n.o.s." is changed from ORM-C to Class 9, for consistency with the HM-181 final rule. The entry for "Elevated temperature material at or above its flash point" is revised to reference a new entry "Flammable liquid, elevated temperature material, n.o.s." which authorizes § 173.247 as the bulk packaging section. A new entry has been added for "Aluminum, molten" with its own unique identification number.

*Section 172.203.* Paragraph (g)(3) is added to alert rail carriers to additional operating requirements for elevated temperature materials excepted under § 173.247. Paragraph (n) is added to require the word "HOT" to precede the proper shipping name of an elevated temperature material if the shipping name does not indicate that it is an elevated temperature material. Exceptions for the proper shipping names "Molten aluminum" and "Molten sulfur" are also added.

*Section 172.325.* This section is added to require the word "HOT" to be marked on each side and each end of a bulk packaging containing an elevated temperature material. The size, style and method of marking is specified, and an exception is included for molten aluminum and molten sulfur.

*C. Part 173: Shippers, General Requirements for Shipments and Packagings*

*Section 173.24.* Paragraph (b)(2) is adopted as proposed in the NPRM to require package effectiveness to be maintained for the entire range of temperatures encountered during transportation.

*Section 173.29.* This section is adopted essentially as proposed in the NPRM. Proposed paragraph (d) is amended as new paragraph (g) and permits a package containing a residue of an elevated temperature material to remain marked as if it contained a greater quantity of the material.

*Section 173.120.* Proposed paragraph (a) has been revised for consistency with the final rule issued under Docket HM-181. It is further amended by adding a definition for flammable liquid as a liquid with a flash point at or above 37.8 °C (100°F) which is intentionally heated and offered for transportation or transported at or above its flash point in a bulk packaging. This definition has been revised from the definition proposed in the NPRM to except these materials if they are in non-bulk packagings or not intentionally heated. Examples of intentionally-heated materials include: materials retaining heat as a result of a manufacturing process and which still may be hot when loaded into a packaging; materials which are heated prior to transportation for ease of loading; or materials which are heated while in transportation to maintain their desired physical state.

*Section 173.140.* A new paragraph is added to this section, as adopted under the Docket HM-181 final rule, to clarify that a material which meets the definition of an elevated temperature material in § 171.8 is classed as a Class 9 material only if it does not meet any other hazard class. In addition to meeting the definition of an elevated temperature material, any material which meets the definition of another hazard class would remain in that hazard class, with the addition of "HOT" on the shipping paper and package marking to convey the subsidiary hazard posed by elevated temperature materials. For example, a Class 8 (corrosive) material, which also meets the definition of an elevated temperature material, would continue to be described, classed and packaged as a Class 8 material, with the additional shipping paper and package marking requirements to indicate the material is also an elevated temperature material.

*Section 173.247.* Paragraph (a) is adopted as proposed in the NPRM. The general requirements in proposed paragraphs (b)(1) through (b)(6) have been clarified, based on comments indicating difficulties which would be encountered in attempting to conform with the requirements as proposed in the NPRM. Concerning proposed paragraph (b)(1), commenters noted that the use of self-closing pressure and vacuum control devices might prove impractical or impossible to safely implement for packagings containing certain hazardous materials. These materials would, because of their unique physical properties, prevent pressure and vacuum control devices currently in use from operating properly and safely. RSPA acknowledges that, although packagings utilizing open pressure and vacuum controls would not meet the proposed requirements, these materials have been safely transported in such packagings for many years. Therefore, proposed paragraph (b)(1) is revised to allow such devices.

Proposed paragraphs (b)(1) (i) and (ii) have been revised in response to several commenters' contention that conformance to these paragraphs would be difficult due to the diverse use and nature of the various ladings and packagings addressed in this rulemaking. According to commenters, in both paragraphs the term "normal operating condition" cannot be interpreted in the same manner for all situations. RSPA agrees, and proposed paragraphs (b)(1)(i) and (b)(1)(ii) have been rewritten to include, as the baseline, the lowest designed operating temperature and highest permitted loading temperature, respectively. Proposed paragraph (b)(1)(ii) is also revised to include the provision that vacuum controls are not required for packagings that have been designed to withstand a vacuum of 14.7 psi.

Commenters addressing leak-tight closures in proposed paragraph (b)(2) indicated that, due to physical properties of the lading, temperature, and method of loading, absolute leakproofness of the closures may prove to be an unnecessary financial burden and might actually be a safety hazard during loading in some instances. Additionally, commenters stated that the testing of leaktightness in any orientation could prove impractical or impossible. Accordingly, RSPA has rewritten proposed paragraph (b)(2) to allow for leaktightness in design and to allow for some leakage from closures, in the event of an incident, in any orientation.

Paragraphs (b)(3) and (b)(4) are adopted as proposed in the NPRM. A requirement to mark the date of manufacture on the package is added to proposed paragraph (b)(5). Because RSPA is permitting equipment currently in service to remain in use for up to 20 years from the date of manufacture, some standard method is needed to distinguish between old and new packagings. Concerning proposed paragraph (b)(6), RSPA acknowledges that the proposed accident damage protection requirements for spray equipment and oil applicators are burdensome and believes the risk associated with such equipment does not justify the additional cost. Therefore, proposed paragraph (b)(6) is revised to provide an exception from accident damage protection requirements for spray equipment and oil applicators.

The provisions in paragraph (c)(1) and (c)(2) are adopted as proposed in the NPRM. Proposed paragraph (c)(3) is revised to reference paragraphs (b)(1)(i) and (b)(1)(ii). Paragraphs (c)(4) and (c)(5) are adopted as proposed in the NPRM. Paragraph (c)(6), as proposed in the NPRM, has been replaced. After extensive review, RSPA believes that conformance with the proposed packaging requirements would require much more extensive modification or replacement of existing equipment than originally perceived. Therefore, RSPA is permitting continued use of all packagings which were manufactured up to 20 years prior to the effective date of this rule.

New paragraph (d) is added to provide a series of conformance dates. With the exception of a three-year transition period for all packagings to conform with closure requirements in paragraph (b)(2), RSPA is permitting continued use of all packagings which were manufactured up to 20 years prior to the effective date of this rule. In paragraph (d)(2), similar provisions for asphalt and bitumen packagings are added, but with the additional requirements in paragraphs (b)(5) and (b)(6) for package marking and accident damage provisions to be met within a one-year period. Paragraph (d)(3) allows a one-year, phase-in period for the manufacture of new packagings conforming to the standards of this rule. RSPA believes that one year is adequate, concurrent with the "grandfathering" of existing equipment. A one-year phase-in period will require all packagings either not in service prior to one year after issuance of the final rule or having their construction completed after the one-year phase-in period, to conform to the new standards beginning one year after the issuance of the final rule.

Exceptions to the new requirements have been added in paragraphs (e)(1) and (e)(2). Paragraph (e)(1) allows molten metals and molten glass to be excepted from all other requirements of the section if the mode of transport is by rail at operating speeds less than 15 miles per hour. Paragraph (e)(2) excepts solid elevated temperature materials from all requirements of the HMR except the requirement to mark the packaging "HOT", as stipulated in § 172.325.

*D. Part 174: Carriage by Rail*

*Section 174.86.* This section was removed under the HM-181 final rule. A new § 174.86 is added to restrict the maximum operating speed to 15 mph for packagings containing molten metal or molten glass which do not conform with § 173.247.

## III. Regulatory Analyses

*A. Executive Order 12291 and DOT Regulatory Policies and Procedures*

This final rule has been reviewed under the criteria specified in section 1(b) of Executive Order 12291 and (1) is determined not to be a major rule under Executive Order 12291; (2) does not require a Regulatory Impact Analysis; and (3) is not "significant" under DOT's regulatory policies and procedures [44 FR 11034]. A regulatory evaluation is available for review in the Docket.

*B. Executive Order 12612*

This final rule has been reviewed in accordance with Executive Order 12612 ("Federalism"). It has no substantial direct effect on the States, on the current

Federal-State relationship, or the current distribution of power and responsibilities among levels of government. Thus, this final rule contains no policies that have Federalism implications, as defined in Executive Order 12612, and no Federalism Assessment is required.

*C. Regulatory Flexibility Act*

The provisions of this final rule impact shippers and carriers of elevated temperature materials, some of whom may be small entities. Information available to RSPA is insufficient to determine the numbers of entities affected.

As addressed in the regulatory evaluation, which is available for review in the Docket, minor costs would be incurred with respect to new hazard communication requirements (i.e., shipping paper descriptions and package markings), training of personnel, and equipment modification. "Grandfather" provisions for use of existing equipment and a lengthy transition period have been provided to further minimize cost impacts.

Based on available information, I certify that this final rule will not have a significant economic impact on a substantial number of small entities.

*D. Paperwork Reduction Act*

Information collection requirements contained in this final rule for §§ 172.201 and 172.203 have been approved by the Office of Management and Budget (OMB) under the provisions of the Paperwork Reduction Act of 1980 (Pub. L. 96–511) under OMB control number 2137–0034 (expiration date: June 30, 1992).

*E. Regulatory Information Number (RIN)*

A regulatory information number (RIN) is assigned to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. The RIN number contained in the heading of this document can be used to cross-reference this action with the Unified Agenda.

*F. National Environmental Policy Act*

This final rule has been reviewed under the National Environmental Policy Act (42 U.S.C. 4321 et seq.) and does not require an environmental impact statement.

**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*

Hazardous materials transportation, Hazardous waste, Labeling, Packaging and containers, Reporting and recordkeeping requirements.

*49 CFR Part 173*

Hazardous materials transportation, Packaging and containers, Radioactive materials, Reporting and recordkeeping requirements, Uranium.

*49 CFR Part 174*

Hazardous materials transportation, Radioactive materials, Railroad safety.

In consideration of the foregoing, 49 CFR parts 171, 172, 173 and 174 are amended as follows:

## PART 171—GENERAL INFORMATION, REGULATIONS AND DEFINITIONS

1. The authority citation for part 171 continues to read as follows:

**Authority.** 49 App. U.S.C. 1802, 1803, 1804, 1805, 1808, 1818; 49 CFR part 1.

2. Section 171.8 is amended by adding the following definitions in appropriate alphabetical sequence:

**§ 171.8 Definitions and abbreviations.**

* * * * *

*Elevated temperature material* means a material which, when offered for transportation or transported in a bulk packaging:

(1) Is in a liquid phase and at a temperature at or above 100°C (212°F);

(2) Is in a liquid phase with a flash point at or above 37.8°C (100°F) that is intentionally heated and offered for transportation or transported at or above its flash point; or

(3) Is in a solid phase and at a temperature at or above 240°C (464°F).

* * * * *

*Liquid phase* means a material that meets the definition of "liquid" when evaluated at the higher of the temperature at which it is offered for transportation or at which it is transported, not at the 37.8°C (100°F) temperature specified in ASTM D 4359–84.

* * * * *

## PART 172—HAZARDOUS MATERIALS TABLE, SPECIAL PROVISIONS, HAZARDOUS MATERIALS COMMUNICATION REQUIREMENTS AND EMERGENCY RESPONSE INFORMATION REQUIREMENTS

3. The authority citation for part 172 continues to read as follows:

**Authority:** 49 App. U.S.C. 1803, 1804, 1805, 1808; 49 CFR part 1.

4. Section 172.101 is amended by adding a new paragraph (i)(3)(iii) to read as follows:

**§ 172.101 Purpose and use of hazardous materials table.**

* * * * *

(i) * * *

(3) * * *

(iii) For a Class 9 material which meets the definition of an elevated temperature material, the column reference is § 173.247.

* * * * *

5. Section 172.101, the Hazardous Materials Table, is amended by adding or revising, as indicated, the following entries in appropriate alphabetical sequence:

**§ 172.101 Purpose and use of hazardous materials table.**

* * * * *

## § 172.101 HAZARDOUS MATERIALS TABLE

| Symbols | Hazardous materials descriptions and proper shipping names | Hazard class or division | Identification numbers | Packing group | Label(s) required (if not excepted) | Special provisions | (8) Packaging authorizations (§ 173.***) | | | (9) Quantity limitations | | (10) Vessel stowage requirements | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Exceptions | Nonbulk packaging | Bulk packaging | Passenger aircraft or rail car | Cargo aircraft only | Vessel stowage | Other stowage provisions |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8A) | (8B) | (8C) | (9A) | (9B) | (10A) | (10B) |
| | ADD | | | | | | | | | | | | |
| D | Aluminum, molten | 9 | NA9260 | III | Class 9 | | None | None | 247 | Forbidden | Forbidden | D | |
| D | Elevated temperature material, liquid, n.o.s (*at or above 100°C (212°F) and below its flash point*). | 9 | NA9259 | III | Class 9 | | None | None | 247 | Forbidden | Forbidden | D | M4 |
| D | *Elevated temperature material at or above its flash point, see* Flammable liquid, elevated temperature material, n.o.s. (*see § 173.247(d)(2)*). | | | | | | | | | | | | |
| D | *Elevated temperature material, solid, n.o.s* (*see § 173.247(d)(2)*). | | | | | | | | | | | | |
| | Flammable liquid, elevated temperature material, n.o.s. | 3 | NA9275 | III | Flammable liquid. | | None | None | 247 | Forbidden | Forbidden | D | M4 |
| | REVISE | | | | | | | | | | | | |
| D | Asphalt, *at or above its flashpoint* | 3 | NA1999 | III | Flammable liquid. | | 150 | 203 | 247 | Forbidden | Forbidden | D | M4 |
| I | Sulfur, molten | 4.1 | UN2448 | III | Flammable solid. | T9, T38 | None | 213 | 247 | Forbidden | Forbidden | C | 61 |
| D | Sulfur, molten | 9 | NA2448 | III | Class 9 | T9, T38 | None | 213 | 247 | Forbidden | Forbidden | C | 61 |

6. Section 172.203 is amended by adding new paragraphs (g)(3) and (n) to read as follows:

**§ 172.203 Additional description requirements.**

* * * * *

(g) * * *

(3) When shipments of elevated temperature materials are transported under the exception permitted in § 173.247(d) of this subchapter, the shipping paper must contain an appropriate notation, such as "Maximum Operating Speed 15 mph."

* * * * *

(n) *Elevated temperature materials.* Except for molten sulfur or molten aluminum, if a liquid material in a package meets the definition of an elevated temperature material in § 171.8 of this subchapter, and the fact that it is an elevated temperature material is not disclosed in the shipping name, the word "HOT" must immediately precede the proper shipping name of the material on the shipping paper.

7. Subpart D of part 172 is amended by adding a new § 172.325 to read as follows:

**§ 172.325 Elevated temperature materials.**

Except for bulk packaging containing molten aluminum or molten sulfur, which must be marked "MOLTEN ALUMINUM" or "MOLTEN SULFUR" respectively, a bulk packaging containing an elevated temperature material must be marked on each side and each end with the word "HOT" in black or white Gothic lettering on a contrasting background. The letters in the marking must be at least 100 mm (3.9 inches) in height for rail cars and at least 50 mm (2 inches) in height for all other bulk packagings. The marking must be displayed on the bulk packaging itself or in black lettering on a white square-on-point configuration having the same outside dimensions as a placard

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

8. The authority citation for part 173 continues to read as follows:

Authority: 49 App. U.S.C. 1803, 1804, 1805, 1806, 1807, 1808; 49 CFR part 1, unless otherwise noted.

9. Section 173.24 is amended by revising paragraph (b)(2) to read as follows:

**§ 173.24 General requirements for packagings and packages.**

* * * * *

(b) * * *

(2) The effectiveness of the package will not be substantially reduced; for example, impact resistance, strength, packaging compatibility, etc. must be maintained for the minimum and maximum temperatures encountered during transportation;

* * * * *

10. Section 173.29 is amended by adding a new paragraph (g) to read as follows:

**§ 173.29 Empty packagings.**

* * * * *

(g) A package which contains a residue of an elevated temperature material may remain marked in the same manner as when it contained a greater quantity of the material even though it no longer meets the definition in § 171.8 of this subchapter for an elevated temperature material.

11. Section 173.120 is amended by revising paragraph (a) to read as follows:

**§ 173.120 Class 3—Definitions.**

(a) *Flammable liquid.* (1) For the purpose of this subchapter, a "flammable liquid" (Class 3) means a liquid having a flash point of not more than 60.5 °C (141 °F), or any material in a liquid phase with a flash point at or above 37.8 °C (100 °F) that is intentionally heated and offered for transportation or transported at or above its flash point in a bulk packaging, with the following exceptions:

(i) Any liquid meeting one of the definitions specified in § 173.115 of this part;

(ii) Any mixture having one or more components with a flash point of 60.5 °C (141 °F) or higher, that makes up at least 99 percent of the total volume of the mixture, if the mixture is not offered for transportation or transported at or above its flash point.

(2) For the purposes of this subchapter, a distilled spirit of 140 proof or lower is considered to have a flash point of no lower than 23 °C (73 °F).

* * * * *

12. Section 173.140 is amended by adding paragraph (c) to read as follows:

**§ 173.140 Class 9—Definitions.**

* * * * *

(c) Meets the definition in § 171.8 of this subchapter for an elevated temperature material.

13. In addition, § 173.140 is amended by removing the word "and" at the end of paragraph (a), and removing the period and adding "; and" at the end of paragraph (b).

14. Subpart F of part 173 is amended by adding § 173.247 to read as follows:

**§ 173.247 Elevated temperature material.**

(a) When § 172.101 of this subchapter specifies that an elevated temperature material (see § 171.8 of this subchapter) must be packaged under this section, only bulk packagings which conform to the requirements of this section are authorized.

(b) *General requirements.* Bulk packagings must conform to the following requirements:

(1) *Pressure and vacuum control equipment.* When required as indicated in this section, pressure and vacuum control equipment must prevent the rupture or collapse of the package from heating, including fire engulfment, or cooling, and prevent any significant release of lading in the event the package is overturned. Pressure relief devices used on packagings transporting ladings that will not cause significant clogging, freezing, or fouling of such a device must be of a self-reclosing design. The pressure relief devices utilized for packages with lading that will render the device inoperable due to severe clogging, freezing, or fouling of the device, may have a permanent opening with a maximum diameter of 38 mm (1.5 inches). The pressure and vacuum controls may be external to the packaging and must be in conformance with paragraph (b)(6) of this section. Pressure and vacuum controls are required as follows:

(i) Provision for pressure control must be provided on packagings where the lading can develop pressure increases of greater than 10 percent as a result of heating from the pressure at the lowest designed operating temperature.

(ii) Provision for vacuum control must be provided on packages where the lading can develop pressure decreases of greater than 10 percent as a result of cooling from the pressure at the highest permitted loading temperature of the lading. Vacuum control is not required on packages designed to withstand a vacuum of 101 kPa (14.7 psig).

(2) *Closures.* All openings must be securely closed during transportation. Packages must be substantially leak tight in design as to allow no more than dripping or trickling of a non-continuous type flow in any orientation. Closures must be designed and constructed to withstand, at all operating temperatures, without substantial deformation twice the static loading produced by the lading in any orientation.

(3) *Strength.* Each package must be designed and constructed to withstand, at all operating temperatures, without substantial deformation twice the static loading produced by the lading in any orientation.

(4) *Compatibility.* The packaging and lading must be compatible over the entire operating temperature range.

(5) *Markings.* In addition to any other markings required by this subchapter, each package must be marked in characters at least 9.5 mm (0.375 inches) with the manufacturer's name, date of manufacture, nominal capacity, design temperature range, and maximum product weight.

(6) *Accident damage protection.* For transportation by highway, external loading and unloading valves, if any, and closures must be protected from impact damage resulting from collision or overturn. Spraying equipment and road oil applicators are excepted from this requirement.

(c) *Authorized packagings.* The following bulk packagings are authorized:

(1) DOT specification cargo tanks, tank cars, and intermodal portable tanks;

(2) AAR Specification 203W, 206A, and 211A tank cars;

(3) Nonspecification cargo tanks, tank cars and portable tanks which are equivalent in structural design and accident damage resistance to the packagings prescribed in paragraph (c)(l) of this section, except for alternative pressure and vacuum control equipment as defined in paragraphs (b)(1) (i) and (ii) of this section;

(4) Nonspecification crucibles designed and constructed such that the stress in the packaging does not exceed one fourth (0.25) of the strength of the packaging at any temperature within the design temperature range. Stress is determined under a load equal to the sum of the static or working pressure in combination with the loads developed from accelerations and decelerations incident to normal transportation. For highway transportation, these forces are assumed to be "1.7g" vertical, "0.75g" longitudinal, and "0.4g" transverse, in reference to the axes of the transport vehicle. Each accelerative or decelerative load may be considered separately; and

(5) All other packagings which were manufactured for the transportation of elevated temperature materials prior to March 30, 1993.

(d) *Dates of Conformance.* (1) All packagings authorized in paragraph (c) of this section must be in conformance with paragraph (b)(2) of this section no later than March 30, 1995.

(2) Packagings used for the transportation of bitumen and asphalt must also be in conformance with paragraphs (b)(5) and (b)(6) of this section no later than March 30, 1993.

(3) All packagings manufactured after March 30, 1993, must comply with the provisions of paragraph (b) of this section.

(4) Packagings authorized in paragraph (c) of this section which were in service prior to March 30, 1993, and not in full compliance with paragraph (b) of this section may continue to be used for up to 20 years from their date of manufacture.

(e) *Exceptions.* (1) This section does not apply to packagings used for molten metals and molten glass by rail when the movement is restricted to operating speeds less than 15 miles per hour. (See § 172.203(g)(3) of this subchapter for shipping paper requirements.)

(2) A material which meets the definition of a solid elevated temperature material is excepted from all requirements of this subchapter except § 172.325.

## PART 174—CARRIAGE BY RAIL

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

**Authority:** 49 App. U.S.C. 1803, 1804, 1808; 49 CFR part 1.

16. Section 174.86 is added to subpart D to read as follows:

### § 174.86 Maximum allowable operating speed.

For molten metals and molten glass shipped in packagings other than those prescribed in § 173.247 of this subchapter, the maximum allowable operating speed may not exceed 15 mph for shipments by rail.

Issued in Washington, DC on September 25, 1991, under authority delegated in 49 CFR part 106, appendix A.

**Travis P. Dungan,**

*Administrator, Research and Special Programs Administration.*

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