DEPARTMENT OF TRANSPORTATION

Pipeline and Hazardous Materials Safety Administration

49 CFR Parts 171, 173, 174 and 179

[Docket No. FRA–2006–25169]

RIN 2130–AB69

Hazardous Materials: Improving the Safety of Railroad Tank Car Transportation of Hazardous Materials

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

ACTION: Notice of proposed rulemaking (NPRM).

SUMMARY: The Pipeline and Hazardous Materials Safety Administration and the Federal Railroad Administration are proposing revisions to the Federal Hazardous Materials Regulations to improve the crashworthiness protection of railroad tank cars designed to transport poison inhalation hazard materials. Specifically, we are proposing enhanced tank car performance standards for head and shell impacts; operational restrictions for trains hauling tank cars containing PIH materials; interim operational restrictions for trains hauling tank cars not meeting the enhanced performance standards; and an allowance to increase the gross weight of tank cars that meet the enhanced tank-head and shell puncture-resistance systems.

DATES: Submit comments by June 2, 2008. To the extent possible, late-filed comments will be considered as we develop a final rule.

ADDRESSES: You may submit comments identified by the docket number FRA–2006–25169 by any of the following methods:

- *Federal eRulemaking Portal: http://www.regulations.gov.* Follow the instructions for submitting comments.
- *Fax:* 1–202–493–2251.
- *Mail:* U.S. Department of Transportation, Docket Operations, M–30, West Building Ground Floor, Room W12–140, 1200 New Jersey Avenue, SE., Washington, DC 20590.
- *Hand Delivery:* U.S. Department of Transportation, Docket Operations, M–30, West Building Ground Floor, Room W12–140, 1200 New Jersey Avenue, SE., Washington, DC 20590.

Instructions: All submissions must include the agency name and docket number (FRA–2006–25169) for this rulemaking. Note that all comments received will be posted without change to *http://www.regulations.gov* including any personal information. Please see the Privacy Act heading in the ''Regulatory Analyses and Notices'' section of this document for Privacy Act information related to any submitted comments or materials. Internet users may access comments received by DOT at *http://www.regulations.gov.*

FOR FURTHER INFORMATION CONTACT: William Schoonover, (202) 493–6229, Office of Safety Assurance and Compliance, Federal Railroad Administration; Lucinda Henriksen, (202) 493–1345, Office of Chief Counsel, Federal Railroad Administration; or Michael Stevens, (202) 366–8553, Office of Hazardous Materials Standards, Pipeline and Hazardous Materials Safety Administration.

SUPPLEMENTARY INFORMATION:

Abbreviations and Terms Used in This Document

AAR—Association of American Railroads
ABS—Automatic Block Signal
Action Plan—National Rail Safety Action Plan
ADAMS—Automated Dynamic Analysis of Mechanical Systems
ARI—American Railway Car Institute
ATIP—Automated Track Geometry Program
BNSF—BNSF Railway Company
BTS—Bureau of Transportation Statistics
C_3RS—Confidential Close Call Reporting System
CEQ—Council on Environmental Quality
CPC—Casualty Prevention Circular
CI—Chlorine Institute
CP—Canadian Pacific
CPR—Conditional Probability of Release
CSXT—CSX Transportation
Department—U.S. Department of Transportation
DOW—Dow Chemical Company
DOT—U.S. Department of Transportation
ECP—Electronically Controlled Pneumatic Brake Systems
ETMS—Electronic Train Management System
Federal hazmat law—Federal hazardous materials transportation law (40 U.S.C. 5101 *et seq.*)
FRA—Federal Railroad Administration
HMR—Hazardous Materials Regulations
NGRTCP—Next Generation Rail Tank Car Project
NPRM—Notice of Proposed Rulemaking
NTSB—National Transportation Safety Board
OMB—Office of Management and Budget
PHMSA—Pipeline and Hazardous Materials Safety Administration
PIH—Poison Inhalation Hazard
PTC—Positive Train Control
PV—Present Value
QA—Quality Assurance
R&D—Research and Development
RSAC—Railroad Safety Advisory Committee
RSI—Railway Supply Institute
SAFETEA–LU—Safe, Accountable, Flexible, Efficient, Transportation Equity Act: A Legacy for Users, Pub. L. 109–59
SBA—Small Business Administration
SOMC—Association of American Railroads Safety and Operations Management Committee
SRT—Structural Reliability Technologies
Tank Car Manual—Association of American Railroads Tank Car Committee Tank Car Manual
TCC—Association of American Railroads Tank Car Committee
TFI—The Fertilizer Institute
TIH—Toxic Inhalation Hazard
TRANSCAER®—Transportation Community Awareness and Emergency Response
TSA—Department of Homeland Security, Transportation Security Administration
Trinity—Trinity Industries, Inc.
Union Tank—Union Tank Car Company
UP—Union Pacific Railroad Company
Volpe—Volpe National Transportation Systems Center

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I. Background

Hazardous materials are essential to the economy of the United States and to the well being of its people. These materials are used in water purification, farming, manufacturing, and other industrial applications. Railroads carry over 1.7 million shipments of hazardous materials annually, including millions of tons of explosive, poisonous, corrosive, flammable, and radioactive materials. The need for hazardous materials to support essential services means that the transportation of highly hazardous materials is unavoidable.

Rail transportation of hazardous materials is a safe method for moving large quantities of hazardous materials over long distances. The vast majority of hazardous materials shipped by railroad tank car each year arrive at their destinations safely and without incident. In the year 2004 (most recent data available), for example, out of the approximately 1.7 million shipments of hazardous materials transported by rail, there were 29 accidents in which a hazardous material was released. In these accidents, a total of 47 hazardous material cars released some amount of product; thus, the risk of a release was a tiny fraction of a percent (0.0028 percent or 47/1,700,000). The DOT Hazardous Materials Information System's ten-year incident data for 1997 through 2006 identifies a total of 17 fatalities resulting from rail hazardous materials incidents. While even one death is too many, these statistics show that train accidents involving a release of hazardous materials that causes death are rare. We recognize, however, that rail shipments of hazardous materials frequently move through densely populated or environmentally-sensitive areas where the consequences of an incident could be loss of life, serious injury, or significant environmental damage.

Historically, the Pipeline and Hazardous Materials Safety Administration (PHMSA), working closely with the Federal Railroad Administration (FRA), has issued a number of regulations to improve the survivability of rail tank cars in accidents.[1] Among other things, these regulations require hazardous material tank cars to be equipped with tank-head puncture resistance systems (head protection), coupler vertical restraint systems (shelf couplers), insulation, and for certain high-hazard materials, thermal protection systems. The historical safety record of railroad tank car hazardous material transportation demonstrates that these systems, working in combination, have been successful in greatly reducing the potential harm to human health and the environment when tank cars are involved in accidents.

In the last several years, however, there have been a number of rail tank car accidents in which the car was breached and product lost on the ground or into the atmosphere. Of particular concern have been accidents involving materials that are poisonous, or toxic, by inhalation (referred to as PIH or TIH materials). For example, on January 18, 2002, a Canadian Pacific Railway Company (CP) train derailed in Minot, North Dakota, resulting in one death and 11 serious injuries due to the release of anhydrous ammonia when five tank cars carrying the product catastrophically ruptured, and a vapor plume covered the derailment site and surrounding area. On June 28, 2004, a Union Pacific Railroad Company (UP) train collided with a Burlington Northern and Santa Fe Railway Company (now known as BNSF Railway Company) (BNSF) train in Macdona, Texas, breaching a loaded tank car containing chlorine and causing the deaths of three people and seriously injuring 30 others. On January 6, 2005, a Norfolk Southern Railway Company train collided with a standing train on a siding in Graniteville, South Carolina. The accident resulted in the breach of a tank car containing chlorine, and nine people died from the inhalation of chlorine vapors. Although none of these accidents was caused by hazardous material tank cars, the failure of the tank cars involved led to fatalities, injuries, evacuations, property and environmental damage.

On August 10, 2005, Congress passed the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users, Pub. L. 109–59 (SAFETEA–LU). SAFETEA–LU added section 20155 to the Federal hazmat law. 49 U.S.C. § 20155. As discussed below, section 20155, in part, required FRA to (1) validate a predictive model quantifying the relevant dynamic forces acting on railroad tank cars under accident conditions, and (2) initiate a rulemaking to develop and implement appropriate design standards for pressurized tank cars.

In response to these recent accidents and in light of Congress's mandate in SAFETEA–LU to develop and implement appropriate design standards for pressurized tank cars, PHMSA and FRA, the two operating administrations within DOT responsible for overseeing the safe transportation of hazardous materials by rail, initiated a comprehensive review of design and operational factors that affect rail tank car safety. DOT's approach to enhancing the safety of rail tank cars and transportation of hazardous materials by rail tank cars is on-going and multi-faceted. For example, DOT is utilizing a risk management approach to identify ways to enhance the safe transportation of hazardous materials in tank cars, including: (1) Tank car design, manufacture, and requalification; (2) railroad operational issues such as human factors, track conditions and maintenance, wayside hazard detectors, signals and train control systems; and (3) improved planning and training for emergency response.

Recognizing the need for public input into this review of hazardous material tank car safety, on May 31 and June 1, 2006, PHMSA and FRA hosted a public meeting to discuss the initiation of this comprehensive review and to invite interested parties to participate in the agencies' efforts to surface and prioritize issues relating to the safe transportation of hazardous materials by railroad tank car. Subsequent to the meeting, FRA established a public docket (Docket No. FRA–2006–25169) to provide interested parties with a central location to both send and review relevant information concerning the safety of railroad tank car transportation of hazardous materials and a venue to gather and disseminate information and views on the issues. *See* 71 FR 37974 (July 3, 2006).

Building on the initial public meeting, FRA and PHMSA held a second public meeting on December 14, 2006. At this second meeting, FRA announced DOT's commitment to develop an enhanced tank car standard by 2008. In addition,

[1] *Crashworthiness Protection Requirements for Tank Cars; Detection and Repair of Cracks, Pits, Corrosion, Lining Flaws, Thermal Protection Flaws and Other Defects of Tank Car Tanks,* 60 FR 49048 (Sept. 21, 1995); *Performance-Oriented Packaging Standards; Miscellaneous Amendments*, 58 FR 50224 (Sept. 24, 1993); *Performance Oriented Packaging: Changes to Classification, Hazard Communication, Packaging and Handling Requirements Based on UN Standards and Agency Initiative,* 55 FR 52402 (Dec. 21, 1990); *Transportation of Hazardous Materials, Miscellaneous Amendments,* 54 FR 38790 (Sept. 20, 1989); *Specifications for Railroad Tank Cars Used to Transport Hazardous Materials,* 49 FR 3468 (Jan. 27, 1984); *Shippers, Specifications for Tank Cars,* 49 FR 3473 (Jan. 27, 1984); Interlocking *Couplers and Restrictions of Capacity of Tank Cars,* 35 FR 14215 (Sept. 9, 1970); *Shippers; Specifications for Pressure Tank Cars,* 42 FR 46306 (Sept. 15, 1977); *Tank Car Tank-head Protection,* 41 FR 21475 (May 26, 1976).

at this meeting, the agencies solicited input and comments in response to nine specific questions pertaining to potential methods and goals of tank car improvements. On March 30, 2007, PHMSA and FRA held a third public meeting at which FRA shared the preliminary results of its research related to tank car survivability and provided an update on DOT's progress towards developing enhanced tank car safety standards.

As discussed in Section XI below, meeting participants from both the railroad and shipping industries expressed agreement on the need for continuous improvement in the safe transportation of hazardous materials by railroad tank car, particularly in light of the Minot, Macdona, and Graniteville accidents. Accordingly, after careful review and consideration of all of the relevant research and data, oral comments at the public meetings, and comments submitted to the docket, PHMSA and FRA are proposing enhanced tank car performance standards and operating limitations designed to minimize the loss of lading from tank cars transporting PIH materials in the event of an accident.

Issuance of this NPRM does not mean that FRA and PHMSA's efforts to improve tank car safety will end. Improving the safety and security of hazardous materials transportation via railroad tank car is an on-going process. Going forward, FRA's hazardous materials research and development (R&D) program will continue to focus on reducing the rate and severity of hazardous materials releases by optimizing the manufacture, operation, inspection, and maintenance procedures for the hazardous materials tank car fleet. FRA's overall R&D program will also continue to examine railroad operating practices and the use of technologies designed to increase overall railroad safety.

II. Summary of Proposals in this NPRM

As discussed in detail in Section X below, DOT's tank car research has shown that the rupture of tank cars and loss of lading are principally associated with the car-to-car impacts that occur as a result of derailments and train-to-train collisions. Conditions during an accident can be such that a coupler of one car impacts the head or the shell of a tank car. With sufficient speed, such impacts can lead to rupture and loss of lading. When a tank car is transporting PIH materials, the consequences of that loss of lading can be significant. Based on the information currently available, DOT believes that a significant opportunity exists to enhance the safe transportation of PIH materials by railroad tank car. Accordingly, in order to enhance the safety of hazardous materials transportation, and in direct response to the Congressional directive of 49 U.S.C. 20155, DOT is proposing revisions to the Hazardous Materials Regulations (HMR; 49 CFR Parts 171–180) that would improve the accident survivability of railroad tank cars used to transport PIH materials. Specifically, in this NPRM, we are proposing to require:

- A maximum speed limit of 50 mph for all railroad tank cars used to transport PIH materials;
- A maximum speed limit of 30 mph in non-signaled (i.e., dark) territory for all railroad tank cars transporting PIH materials, unless the material is transported in a tank car meeting the enhanced tank-head and shell puncture-resistance systems performance standards of this proposal;
- As an alternative to the maximum speed limit of 30 mph in dark territory, submission for FRA approval of a complete risk assessment and risk mitigation strategy establishing that operating conditions over the subject track provide at least an equivalent level of safety as that provided by signaled track;
- Railroad tank cars used to transport PIH materials to be manufactured to meet enhanced performance standards for tank-head and shell puncture-resistance systems;
- The expedited replacement of tank cars used for the transportation of PIH materials manufactured before 1989 with non-normalized steel [2] head or shell construction; and
- An allowance to increase the gross weight on rail for tank cars designed to meet the proposed enhanced tank-head and shell puncture-resistance systems performance standards.

In drafting this proposed rule, DOT has carefully considered the results of all of its research regarding tank car accident survivability, all comments received through the series of public meetings held in the course of DOT's comprehensive review of tank car safety, as well as all written comments submitted to the docket of this proceeding. DOT believes that its two-pronged approach to enhancing the accident survivability of tank cars—that is, limiting the operating conditions of the tank cars transporting PIH materials and enhancing the tank-head and shell puncture-resistance performance—represents the most efficient and cost-effective method of improving the accident survivability of these cars. DOT invites comments on all aspects of this proposed rule.

First, with regard to the proposed speed and operating restrictions, we have reviewed the results of research on the current tank car fleet used for the transportation of PIH materials. We have also reviewed recent accidents and subsequent recommendations of the National Transportation Safety Board (NTSB). As discussed in Section X below, FRA's research demonstrates that the speed at which a train is traveling has the greatest effect on the closing velocity between cars involved in a derailment or other accident situation. Specifically, the research indicates that, in general, the secondary car-to-car impact speed is approximately one-half that of the initial train speed—the speed of the train at the time of the collision or derailment. Limiting the operating speed of tank cars transporting PIH materials is one method to impose a control on the forces experienced by these tank cars.

The rail industry, through the Association of American Railroads (AAR), has developed a detailed protocol on recommended operating practices for the transportation of hazardous materials. These recommended practices were originally implemented in 1990 by all of the Class 1 rail carriers operating in the United States. In 2006, AAR issued a revised version of this protocol, known as Circular OT–55–I, with short-line railroads also participating in the implementation. Among other requirements, OT–55–I restricts the operating speeds to a maximum of 50 mph for key trains, which are defined to include trains containing five or more tank car loads of PIH materials. Pursuant to OT–55–I, most trains with tank cars containing PIH materials are transported under this speed restriction. The period in which these tank cars are picked up or delivered is the most likely time when a train might not contain a sufficient quantity of hazardous materials to meet the definition of a key train and thus not operate under the 50 mph speed restriction. However, it is likely that the class of track into the facility may already limit the speed below 50 mph. Under FRA's Track Safety Standards,[3] there are minimum safety requirements that a track must meet, and the condition of the track is directly tied to the maximum allowable operating speed for the track. Only the two highest categories of track typically used for freight service, Classes 4 and 5,

[2] Non-normalized steel is steel that has not been subjected to a specific heat treatment procedure that improves the steel's ability to resist fracture.

[3] *See* 49 CFR part 213.

have a maximum allowable operating speed above 50 mph. In addition, 50% of track in the United States is non-signaled and restricted by the Track Safety Standards to a speed limit of 49 mph. We therefore believe that the proposed restrictions in this NPRM represent an effective way to control the forces experienced by the tank car during most derailment or accident conditions without imposing an undue burden on the industry. We invite commenters to address whether our assumption that most tank cars transporting PIH materials are transported in accordance with the speed restrictions in OT–55–I is accurate, particularly for smaller and short-line carriers. In addition, we invite commenters to address whether there are alternative approaches to reduce the consequences of a train derailment or accident involving PIH materials, including data and information in support of suggested alternative approaches or strategies.

FRA analyzed data from chlorine incidents between 1965 and 2005, and anhydrous ammonia incidents between 1981 and 2005, to study those incidents resulting in loss of product from head and shell punctures, cracks, and tears.[4] This analysis suggests that a disproportionate number of those incidents occurred in non-signaled (dark) territory, as compared to the percentage of total train miles in dark territory. Additionally, this analysis showed that at the time of these accidents, the median train speed was 40 mph and the average speed was 38 mph. This analysis also demonstrates that approximately 80% of the losses occurred at speeds greater than 30 mph. Notably, no catastrophic losses of chlorine occurred at speeds below 30 mph. Based on this data, we are proposing an interim measure to limit the speed of the existing fleet of tank cars used to transport PIH materials when traversing non-signaled territory. Specifically, we propose to limit the maximum allowable operating speed to 30 mph for tank cars transporting PIH materials over non-signaled territory unless the tank cars meet the enhanced tank-head and shell puncture-resistance systems performance standards of this proposal. We are also proposing alternate provisions that a railroad may choose to follow in lieu of the speed restriction.

Second, we are proposing enhanced tank-head and shell puncture-resistance performance standards that are designed to enhance the accident survivability of tank cars. One critical aspect of this enhancement is improved tank-head and shell puncture-resistance standards. The enhanced standards would require tank cars that transport PIH materials in the United States to be designed and manufactured with a shell puncture-resistance system capable of withstanding impact at 25 mph and with a tank-head puncture-resistance system capable of withstanding impact at 30 mph. As noted above, we are proposing these enhanced performance standards in tandem with an operational speed restriction of 50 mph. Because the secondary car-to-car impact speed in a derailment or collision scenario is approximately one-half of the initial train speed, designing and constructing tank cars to withstand shell impacts of at least 25 mph and limiting the speed of those tank cars to 50 mph will ensure that in most instances, the car will not be breached if it is involved in a derailment or other type of accident. Designing and constructing tank cars to withstand tank-head impacts of at least 30 mph would take advantage of the greater available space for impact-attenuating structures in front of the tank-head and would help mitigate possible differences between the generalized tank-head impact scenarios and the actual tank-head impacts that occur in collisions or derailments.

Empirical evidence from recent accidents and the derailment dynamics research prepared by the Volpe National Transportation Systems Center (Volpe) show that impacts happen to both tank car heads and shells. Tank car heads have historically been provided more protection than tank shells because the majority of tank car punctures occurred in rail yards to the heads of tank cars as a result of overspeed impacts. However, given the recent PIH releases in train accidents, we believe that it is time to enhance the accident survivability of the tank car, increasing the level of protection to both the tank-head and the shell.

To support the enhanced tank-head and shell puncture-resistance standards, we are proposing performance criteria, including impact test requirements. The proposed tests reflect generalized impact scenarios as a means to evaluate the performance of alternative designs. In the shell impact scenario, a rigid ram car with a punch impacts the shell of the tank car. Similarly, in the head impact scenario, a rigid ram car with a punch impacts the head of the tank car. The test procedures are based on the modeling developed by Volpe and the baseline tank car testing performed in cooperation with the Next Generation Rail Tank Car Project (NGRTCP), as discussed in Section IX below.

As proposed in this NPRM, compliance with the proposed standards can be shown by computer simulation, by simulation in conjunction with substructure testing, by full-scale impact testing, or a combination thereof. The highest level of confidence, although at the greatest cost, is provided by full-scale impact testing. The least costly and lowest level of confidence is provided by simulation alone. Substructure testing significantly increases the confidence in simulation modeling, potentially with relatively modest costs, depending on the details of the substructure test. Economic analysis indicates that freight rail industry economics should allow the development of several new tank car designs, through compliance shown with simulations and substructure testing. The performance criteria proposed in this NPRM provide for full-scale testing, scale model or component testing, simulation, or comparative analysis to an approved design. We are proposing to require designs for which no full-scale testing is performed to be submitted to FRA for review. FRA's review is necessary to ensure that modeling parameters and scale or substructure testing are sufficient to ensure that the necessary level of safety has been achieved. In evaluating a design, FRA will consider appropriate data and analysis showing how the proposed design meets the enhanced performance standards for head and shell impacts. FRA will consider proper documentation of competent engineering analysis or practical demonstrations, or both, which may include validated computer modeling, structural crush analysis, component testing, or any combination thereof. This approach is consistent with FRA's practice in determining compliance with equipment performance standards promulgated in other areas of railroad safety. *See, e.g.*, 49 CFR 229.211 (Locomotive Crashworthiness). We request comments on this proposal.

Third, to ensure timely replacement of the PIH tank car fleet, we are proposing an implementation schedule that allows for design development and manufacturing ramp-up in the first two years after the final rule becomes effective. We are also proposing that in the next three years, one-half of the existing fleet will be replaced, with the remaining fleet replacement taking place in the following three years. This schedule will allow for replacement of the current PIH tank car fleet within eight years from the effective date of the final rule.

[4] *See* document no. 30 in docket no. FRA–2006–25169, "Loss of TIH Product in Head and Shell Punctures, Cracks & Tears."

One of the factors we have taken into consideration in developing this proposal is the NTSB's recommendations related to pre-1989 tank cars manufactured with non-normalized steel. The NTSB, in its report on the Minot, North Dakota accident,[5] concluded that low fracture toughness of non-normalized steels used for tank shells contributed to the complete fracture and separation of the derailed cars. While we believe that low fracture toughness of non-normalized steels is only one of many material and design characteristics that can contribute to tank car releases, the pre-1989 tank cars are reaching the upper limits of their useful life. Therefore, we believe that these pre-1989 cars, which were manufactured with non-normalized steel, should be replaced in an expedited fashion. To accomplish this safety goal, we propose to prohibit the use of tank cars manufactured with non-normalized steel heads or shells beginning five years after the effective date of the final rule. We want to emphasize that this requirement is focused on the expedited removal of the pre-1989 tank cars that were manufactured using non-normalized steel. We recognize the efforts of the AAR to incorporate requirements for normalized steel for cars manufactured after 1988. We also recognize that some tank car manufacturers began using normalized steel prior to 1988; those tank cars would not be affected by this proposal.

Finally, we are proposing to allow an increase in the gross weight of tank cars allowed on rail. Improvements in tank car performance have historically relied in large part on thicker and/or stronger steel, which brings with it a corresponding addition to the empty weight of the tank car. Therefore, a potential consequence of the proposed enhanced tank-head and shell puncture-resistance performance standards in this NPRM could be a measurable increase in the total number of PIH rail shipments to convey the same quantity of product to the customer since a heavier tank car means must contain less lading to keep within the gross weight limit. As noted above, however, there is a long history of safe shipment of hazardous materials via railroad tank car, and the enhancements proposed in this NPRM will further increase the accident survivability of the tank cars used to transport PIH materials. Accordingly, we are proposing to allow an increase in the gross weight allowed on rail (up to 286,000 pounds) for tank cars that transport PIH materials to offset the potentially increased weight of the enhanced tank car.

This measure should enable shippers to continue meeting customer demands without significantly increasing the total number of PIH shipments. In proposing to allow tank cars meeting the enhanced tank-head and shell puncture-resistance system requirements to weigh up to 286,000 pounds gross weight on rail, we recognize that there are mechanical and structural concerns that must be addressed to ensure the safety of these cars during transportation. To ensure that tank cars exceeding the existing 263,000 pound limitation and weighing up to 286,000 pounds gross weight on rail are mechanically and structurally sound, we propose to require that such cars conform to AAR Standard S–286–2002, SPECIFICATION FOR 286,000 LBS. GROSS RAIL LOAD CARS FOR FREE/UNRESTRICTED INTERCHANGE SERVICE (adopted November 2002 and revised September 1, 2005), which we propose to incorporate by reference into the HMR. AAR Standard S–286–2002 is the existing industry standard for designing, building, and operating rail cars at gross weights between 263,000 pounds and 286,000 pounds. A copy of AAR Standard S–286–2002 has been placed in the docket.

We recognize that some facilities and railroads do not currently have infrastructure sufficient to support the use of a 286,000 pound tank car. We anticipate tank car designers, working with the end users, will develop tank cars that will meet the enhanced tank-head and shell performance standards while minimizing the addition of weight to the empty car. The existing tank car specifications provide flexibility that will allow some use of new technologies and materials to provide the improved accident survivability required by this proposal. DOT encourages the development of innovative engineering design changes to meet the proposed enhanced accident survivability standard while minimizing added weight to the empty tank car. We also anticipate that the growing use of rail cars with gross weight on rail exceeding 263,000 lbs. for non-hazardous commodities, such as coal and grain, will minimize the track infrastructure barriers to the use of the heavier cars over time. For these reasons, we believe that the number of PIH shipments will not be significantly increased by the proposed enhanced accident survivability standards. As in all aspects of this proposed rule, we request comments on this proposal. We are particularly interested in data and information concerning the extent to which track infrastructure has already been modified to accommodate heavier rail cars, including how those modifications were accomplished and at what cost. We also invite comments concerning additional infrastructure modifications that may be required to accommodate the heavier cars that would be permitted in accordance with the proposals in this NPRM and the extent to which PIH shipments along certain rail lines may increase because existing infrastructure may not accommodate heavier cars.

The specific proposals in this rule are explained in more detail in Section XIII, the Section-by-Section Analysis, which is set forth below.

III. Statutory Authority, Congressional Mandate, and NTSB Recommendations

The Federal hazardous material transportation law (Federal hazmat law, 49 U.S.C. 5101 *et seq.*) authorizes the Secretary of DOT (Secretary) to ''prescribe regulations for the safe transportation, including security, of hazardous material in intrastate, interstate, and foreign commerce.'' The Secretary has delegated this authority to PHMSA. 49 CFR 1.53(b). The HMR, promulgated by PHMSA, are designed to achieve three goals: (1) To ensure that hazardous materials are packaged and handled safely and securely during transportation; (2) to provide effective communication to transportation workers and emergency responders of the hazards of the materials being transported; and (3) to minimize the consequences of an incident should one occur. The hazardous material regulatory system is a risk management system that is prevention-oriented and focused on identifying a safety or security hazard and reducing the probability and quantity of a hazardous material release.

Under the HMR, hazardous materials are categorized by analysis and experience into hazard classes and packing groups based upon the risks that they present during transportation. The HMR specify appropriate packaging and handling requirements for hazardous materials, and require a shipper to communicate the material's hazards through the use of shipping papers, package marking and labeling, and vehicle placarding. The HMR also require shippers to provide emergency response information applicable to the specific hazard or hazards of the material being transported. Finally, the HMR mandate training requirements for persons who prepare hazardous materials for shipment or who transport hazardous materials in commerce. The HMR also include operational

[5] *See infra* Section VI for a detailed discussion of the Minot, North Dakota accident.

requirements applicable to each mode of transportation.

The Secretary also has authority over all areas of railroad transportation safety (Federal railroad safety laws, 49 U.S.C. 20101 *et seq.*), and has delegated this authority to FRA. 49 CFR 1.49. Pursuant to its statutory authority, FRA promulgates and enforces a comprehensive regulatory program (49 CFR parts 200–244) to address railroad track, signal systems, railroad communications, rolling stock, rear-end marking devices, safety glazing, railroad accident/incident reporting, locational requirements for the dispatch of U.S. rail operations, safety integration plans governing railroad consolidations, merger and acquisitions of control, operating practices, passenger train emergency preparedness, alcohol and drug testing, locomotive engineer certification, and workplace safety. FRA inspects railroads and shippers for compliance with both FRA and PHMSA regulations. FRA also conducts research and development to enhance railroad safety. In addition, both PHMSA and FRA are working with the emergency response community to enhance its ability to respond quickly and effectively to rail transportation accidents involving hazardous materials.

As noted above, on August 10, 2005, Congress passed SAFETEA–LU, which added section 20155 to the Federal hazmat law. 49 U.S.C. 20155. In part, section 20155 required FRA to (1) validate a predictive model quantifying the relevant dynamic forces acting on railroad tank cars under accident conditions, and (2) initiate a rulemaking to develop and implement appropriate design standards for pressurized tank cars.

Prior to the Minot accident and the enactment of SAFETEA–LU, FRA had initiated tank car structural integrity research. In response to the Minot accident, the NTSB made four safety recommendations to FRA specific to the structural integrity of hazardous material tank cars. The NTSB recommended that FRA analyze the impact resistance of steels in the shells of pressure tank cars constructed before 1989 and establish a program to rank those cars according to their risk of catastrophic failure and implement measures to eliminate or mitigate this risk. The NTSB also recommended that FRA validate the predictive model being developed to quantify the maximum dynamic forces acting on railroad tank cars under accident conditions and develop and implement tank car design-specific fracture toughness standards for tank cars used for the transportation of materials designated as Class 2 hazardous materials under the HMR. In response to the Graniteville accident, the NTSB recommended, in part, that FRA ''require railroads to implement operating measures such as * * * reducing speeds through populated areas to minimize impact forces from accidents and reduce the vulnerability of tank cars transporting'' certain highly-hazardous materials. Each of these NTSB recommendations is discussed in more detail in Section VI below.

The Department considers this NPRM responsive to section 20155's mandate, as well as to the NTSB recommendations.

IV. Brief Overview of FRA Programs To Continuously Improve Rail Safety Outside of Tank Car-Specific Efforts

FRA implements a broad and extensive safety program directed at reducing accidents, casualties, loss of property and threats to the human environment. Through the Railroad Accident/Incident Reporting System, FRA gathers data that are employed in crafting responsive measures. *See* 49 CFR part 225. FRA safety standards address track, equipment, signal and train control systems, motive power and equipment, and operating practices. These regulations set out detailed requirements for design or system performance, inspection and testing, and training. With respect to rail equipment accident/incidents (''train accidents''), the regulations seek to reduce the risk of derailments, collisions, and other losses such as fires involving on-track equipment. FRA employs the Railroad Safety Advisory Committee (RSAC), a group comprised of all of FRA's stakeholders, to help identify safety needs and to fashion responsive regulations.

FRA also conducts R&D, both independently and in concert with the railroad industry, to identify new ways to enhance safety. R&D products are as diverse as the Track Quality Index, which can help guide investments in program maintenance before safety limits are encountered, and a human-machine interface evaluation tool that can help evaluate control systems and display designs.

On May 16, 2005, DOT and FRA launched the National Rail Safety Action Plan (Action Plan) to address further the safety issues that face the nation's rail industry. The Action Plan targeted the most frequent, highest risk causes of accidents; focused federal oversight and inspection resources; and accelerated research into new technologies that can improve safety.

The Action Plan elements focused heavily on preventing train accidents caused by human factors and track—the two major categories of train accident causes. In the area of human factors, FRA has issued a proposed rule that seeks to ensure better management of railroad operational tests and inspections. The proposed rule is also intended to establish greater accountability for compliance with operating rules, particularly those that are involved in human factors train accidents, such as the handling of switches. FRA is now completing consultations within the RSAC regarding resolution of public comments on the proposed rule, and a final rule will be issued this year.

In November 2006, FRA fulfilled an Action Plan objective by releasing a study report entitled *Validation and Calibration of a Fatigue Assessment Tool for Railroad Work Schedules.* That report, and an accompanying White Paper, confirmed the impact of fatigue on human factor train accidents and announced the availability of an analytical model that can be used to evaluate crew scheduling. On February 13, 2007, DOT delivered proposed railroad safety reauthorization legislation to the Congress (introduced by request as H.R. 1516 and S. 918) that would replace the 100-year-old Hours of Service Law with science-based regulations addressing fatigue.

Because the genesis of human factors accidents is often unclear, FRA joined with a national coalition of employee organizations and railroads to launch the Confidential Close Call Reporting System (C_3RS). The Bureau of Transportation Statistics (BTS) supports this effort by collecting the data and ensuring the anonymity of the persons providing reports. Local labor/management/FRA teams use the data to identify safety needs before a serious accident occurs. An initial C_3RS project is presently underway at a major UP facility, and additional pilots are being planned. Other human factors initiatives include projects on ''behavior-based safety'' that seek peer involvement in workplace safety, initiatives to promote crew resource management, and extensive research to support further program development. In FY 2008, FRA will be seeking to integrate many of these efforts into a larger Risk Reduction Program intended to advance safety beyond what can be accomplished with traditional command and control approaches.

Recognizing that the best answer to human factor risks is sometimes technology that can ''backstop'' the person in cases when errors have high consequences, FRA continues to work actively to promote Positive Train Control (PTC) systems and similar technology. For instance, FRA R&D provided funding and technical support for the BNSF's deployment of a new Switch Position Monitoring System on the railroad's Avard Subdivision. This system can detect a misaligned main track switch in non-signal territory and provide notification to the dispatcher for appropriate action. BNSF is also demonstrating track integrity circuit technology that can help identify broken rails without the full expense of a signal system. These technologies, which are forward compatible with the railroad's PTC system, known as the Electronic Train Management System (ETMS), are already being installed on additional rail lines. FRA approved the Product Safety Plan for ETMS Configuration I in December 2006, under a performance-based regulation issued with RSAC input in March of 2005. The Product Safety Plan was submitted under subpart H of 49 CFR part 236 and described in detail the train control technology, concept of operations, and results of safety analysis for the system (which in this configuration is designed for single track territory either with a traffic control system or without any signal system).

In the field of track safety, FRA is taking concrete steps in both research and enforcement. FRA research has provided a new tool to detect cracks in joint bars. This optical recognition technology can capture and analyze images for very small cracks while mounted on a hi-rail truck or other on-track vehicle. The system is already in initial use by two major railroads.

In order to ensure compliance with track geometry limits under load, FRA acquired two additional Automated Track Geometry Program (ATIP) cars instrumented for measurement of geometry at track speed, supplementing an existing Office of Safety car (and use of FRA's research cars for geometry surveys when available). This expanded ATIP capability will permit FRA to survey the core of the national rail system on an annual basis, returning to problem areas, as appropriate, without sacrificing coverage. These two additional cars were in service as of April 30, 2007.

One of the most vexing areas of track safety work is rail integrity. The concentration of rail traffic on a smaller, post-merger system together with growth in traffic, increasing gross weight of cars, and a slow pace of rail replacement has led to heavy reliance on internal rail inspections to detect rail flaws before they become service failures and pose the imminent risk of an accident. The President's Budget for the current fiscal year requested nine positions for rail integrity specialists to build a better organized and aggressive approach to oversight of railroad rail integrity programs. The Congress authorized funding sufficient to support this staffing in February, and FRA is recruiting for these positions.

Over time, strengthened oversight of compliance with railroad safety regulations, introduction of new technology such as PTC, better management of fatigue affecting safety critical employees, and other steps should yield a reduction in the risk of train accidents that could affect the transportation of hazardous materials. FRA is encouraged that, after over a decade of gradual increases in train accidents associated with the growth of rail traffic and other factors, both the train accident rate and total train accidents declined in 2006. This decline likely reflects improved compliance with regulatory requirements, reduced stress from fatigue associated with service disruptions, and other factors. However, history suggests that the underlying factors that create safety challenges, such as growing rail service demands that strain capacity, aging infrastructure, and factors beyond the effective control of the railroads (e.g., natural disasters, impacts with heavy vehicles at highway-rail crossings) will continue to introduce substantial risk even as train accident rates decline. Accordingly, it is necessary for PHMSA and FRA to take the additional actions proposed in this NPRM to reduce the probability that future train accidents will involve catastrophic releases of PIH materials. Thus, the Action Plan provided for acceleration of the research underlying this proposed rule, which is intended to make tank cars used for PIH service more resistant to product loss when a train accident occurs.

The Action Plan also noted with approval the action of major railroads to make available to emergency responders information concerning the top 25 commodities transported through their jurisdictions and called on the railroads to make additional efforts to provide emergency responders with hazardous materials information, including the location of cars hauling hazardous materials on specific trains. CSX Transportation and CHEMTREC—the 24-hour emergency assistance hotline provided as a service by chemical manufacturers—have partnered to provide a demonstration of technology that can readily provide consistent information to emergency responders. PHMSA and FRA encourage other railroads to join in this effort.

V. Relevant Regulatory Framework

Today railroad tank cars in the United States are designed, built, maintained, and operated under four primary sets of regulations and guidelines: (1) Regulations and orders issued under the Federal railroad safety laws; (2) regulations and orders issued under the Federal hazmat law; (3) the AAR's Interchange Rules; [6] and (4) the AAR Tank Car Committee's Tank Car Manual (Tank Car Manual).[7]

FRA's freight car, safety appliance, and power brake regulations in 49 CFR parts 215, 231, and 232 apply to tank cars as they do every other type of railroad freight car. Parts 215 and 232 establish minimum safety standards; railroads are free to supplement these standards with additional or more stringent safety standards that are not inconsistent with the Federal standards. 49 CFR 215.1 and 232.1.

The HMR treat the tank car as a packaging and mandate safety features, permissible materials and methods of construction, as well as inspection and maintenance standards. A material identified as a hazardous material by the HMR may not be shipped by railroad tank car unless the tank car meets the requirements of the HMR. 49 CFR 173.31(a).

A separate set of standards—the AAR Interchange Rules, issued by AAR's standing Tank Car Committee (TCC) [8]—govern the tender and acceptance of rail cars among carriers within the general system of railroad transportation. The AAR Interchange Rules address a range of design and operational requirements intended to promote uniformity and reciprocity in car handling, including the obligation of rail carriers to perform running repairs on equipment received in interchange. Historically, the AAR Interchange Rules also have addressed certain subjects, such as rail tank car standards, now covered comprehensively by the HMR. Most recently, as discussed below, the TCC has issued an interchange requirement (Casualty Prevention Circular 1175, as

[6] AAR, *Interchange Rules*, Washington, DC, published annually in a ''Field Manual'' and an ''Office Manual.''

[7] AAR, Operations and Maintenance Dep't, Mechanical Div., *Manual of Standards and Recommended Practices; Section C-Part III*, ''Specifications for Tank Cars, Specification M–1002'' (revised annually).

[8] The Mechanical Division of AAR's Operations and Maintenance Department is responsible for industry freight car standards and for administering the Interchange Rules, a body of private law that governs the acceptance and use by railroads of equipment which they do not own. *See* fn. 8, *supra.*

amended by Casualty Prevention Circular 1178) that would require tank cars transporting anhydrous ammonia and chlorine to meet tank car design standards that are more stringent than those specified in the HMR.

Railroads, as common carriers, are generally required to provide transportation services in a reasonable manner, and they may not impose unreasonable requirements as a condition precedent to providing rail transportation services. Accordingly, interchange requirements, such as Casualty Prevention Circular 1178, that restrict the movement of railroad tank cars that meet DOT standards must be reasonable, and, if challenged, the burden is on the railroad to establish the reasonableness of the restriction. *See Akron, Canton & Youngstown R.R.* v. *ICC,* 611 F.2d 1162, 1169 (6th Cir. 1979); *see also Consolidated Rail Corp.* v. *ICC,* 646 F.2d 642, 650 (D.C. Cir. 1981), *cert denied,* 454 U.S. 1047 (1981). Two of the factors that the Surface Transportation Board and the courts consider in determining the reasonableness of interchange requirements are whether there are Federal safety standards on point and whether a railroad has the ability to seek changes to these standards to meet the safety concerns of the railroad. *See Consolidated Rail,* 646 F.2d at 651. In fact, DOT has established safety standards for tank cars carrying PIH commodities and, pursuant to this rulemaking, is proposing enhanced standards for tank-head and shell puncture resistance systems for these cars. Through participation in this rulemaking, railroads and other interested parties have the ability to influence the enhanced safety standards ultimately adopted by DOT. As discussed below, DOT has concluded that it is inappropriate at this time to establish new standards for top fittings protection, but DOT will continue to work with interested parties on research and ongoing discussions aimed at establishing enhanced consensus standards. There is, therefore, no reasonable basis for the railroads to implement Casualty Prevention Circular 1178 at this time. Railroads are free at any time to seek stricter tank car safety standards through a DOT rulemaking (49 CFR 106.95); to date, no rail carrier has petitioned PHMSA to adopt the tank car standards embodied in Casualty Prevention Circular 1178. FRA has notified the AAR that before the TCC can implement the proposed requirements in Circular 1178, the proposal must be submitted to DOT for approval.

The AAR TCC is a standing committee of the Mechanical Division of AAR's Operations and Maintenance Department. Voting members of the TCC include representatives of AAR member railroads, as well as tank car shipper and owner organizations, tank car builders, and chemical and industry associations. In addition, the Bureau of Explosives and the Railway Supply Institute have non-voting membership on the TCC. FRA and PHMSA, as the Federal agencies responsible for oversight of the safety of hazardous materials transportation by railroad, also participate in the TCC as nonvoting members.

Under the HMR, certain functions related to hazardous material tank cars are delegated to the TCC, including: (1) Approvals for construction of tank cars meeting DOT specifications; (2) procedures for repairs or alterations; and (3) recommending changes in tank car specifications.[9] First, the HMR require tank car manufacturers to obtain TCC approval for specific tank car designs and construction methods and materials and procedures for repairs and alterations to tank cars. The HMR authorize the TCC to make the determination that the proposed design, construction, or repair procedures conform to the applicable DOT specification requirements and to issue the approval. 49 CFR 179.3. This authority is primarily a ministerial function, designed to ensure that plans to construct, alter, or convert tank car tanks conform to DOT regulations. In accordance with 49 CFR 179.3(b), the TCC must approve construction of a tank car that meets all Federal requirements.

When a party seeks to construct a railroad tank car to be used in hazardous materials service that does not meet a current DOT specification (*see* 49 CFR 179.10–179.500–18), the HMR authorize the TCC to review the proposed specification and report its recommendations on the proposal to DOT. 49 CFR 179.4. In this capacity, DOT benefits greatly from the technical expertise of the TCC members. However, final policy judgment lies with DOT, and only DOT is authorized to approve a new tank car specification, or, through issuance of a special permit in accordance with 49 CFR 107.101–.127, the construction and use of a tank car not meeting an existing DOT specification. DOT does not construe the procedures established in 49 CFR 179.4 as limitations on its rulemaking authority.

In addition to the approval authority noted above, in several subsections of Part 179 of the HMR, the TCC is authorized to approve fittings, attachments, materials, designs, methods, and procedures relevant to tank car design, construction, maintenance, repair, and inspection. For example, 49 CFR 179.103–2(a) provides that manway covers "shall be of approved design." Similarly, 49 CFR 179.201–9 states that "a gauging device of an approved design must be applied to permit determining the liquid level of the lading." In addition, 49 CFR 179.10 states that "[t]he manner in which tanks are attached to the car structure shall be approved." In each instance, the term "approved" refers to approval by the TCC. *See* 49 CFR 179.2.

The primary document containing the standards governing these approvals of the TCC is the Tank Car Manual. The December 2000 version of the Tank Car Manual is incorporated by reference into the HMR at 49 CFR 171.7; thus, compliance with the Tank Car Manual's standards is required under the HMR. Chapter 2 of the Tank Car Manual contains the AAR requirements for DOT tank cars. As noted above, the TCC, subject to certain limitations, may establish standards for tank cars that go beyond the standards set by DOT. For example, the Tank Car Manual requires that the heads and shells of pressure tank cars constructed of certain types of steel must be normalized; although DOT participated in the discussions leading to these standards and approves of them, the tank car specifications contained in the HMR do not contain comparable requirements.[10] However, as indicated above, because the December 2000 version of the Tank Car Manual is incorporated by reference into the HMR, compliance with the tank car standards specified in that version of the Tank Car Manual is required under the HMR. Under the Administrative Procedure Act, compliance with any other version of the Tank Car Manual would be required under the HMR only upon the incorporation of that version into the HMR by reference through rulemaking.

[9] Federal regulations also require tank car facilities to have quality assurance programs that are approved by AAR. These programs relate to construction, life-cycle maintenance, and continuing qualification for service.

[10] Chapter 2 of the Tank Car Manual also includes additional commodity specific tank car requirements relevant to certain PIH materials which are not included in the HMR. See §§ 2.1.2 (hydrogen sulfide tank cars) and 2.1.4 (hydrogen fluoride tank cars).

VI. Railroad Accidents Involving Hazardous Materials Releases and Accompanying NTSB Recommendations

The NTSB investigated three recent accidents involving tank cars transporting PIH materials, which occurred between 2002 and 2005 in Minot, North Dakota; Macdona, Texas; and Graniteville, South Carolina. In all three accidents, the NTSB recommended that FRA study improving the safety and structural integrity of tank cars and develop necessary operational measures to minimize the vulnerability of tank cars involved in accidents.

A. Minot

The accident occurred at approximately 1:30 a.m. on January 18, 2002, near Minot, North Dakota, and resulted in the derailment of 31 cars of a 112-car train. Eleven of the 31 derailed cars were pressurized tank cars transporting anhydrous ammonia, a toxic liquefied compressed gas. Five of those tank cars (DOT 105J300W cars) received sidewall impacts to their shells, causing the cars to catastrophically rupture and instantaneously release their contents. Approximately 146,700 gallons of anhydrous ammonia were released from those five cars. As a result, a toxic vapor plume covered the derailment site and the surrounding area. The plume rose approximately 300 feet and gradually expanded five miles downwind of the accident site. The remaining six pressurized tank cars transporting anhydrous ammonia that derailed also suffered from shell impacts. Those cars, DOT 105J300W, 112J340W, and 105S300W cars, gradually released 74,000 gallons of anhydrous ammonia due to damage to the cars' fittings or small punctures and/or tears to the shells. One resident was fatally injured, and 333 people suffered other injuries (11 serious). According to the NTSB, early in the emergency response effort, the Chief of the Minot Rural Fire Department ordered residents in the affected area to shelter-in-place (*i.e.*, remain inside their homes with the windows shut). NTSB concluded that sheltering-in-place was an effective emergency response and credited this action with the relatively low number of injuries, as compared to the number of persons affected by the vapor plume (333 injuries in 11,600 persons affected).

The NTSB determined that the probable cause of the accident was an undetected defective rail. Damages to rolling stock and track, as well as monetary loss from the damaged or destroyed lading, exceeded $2.6 million. As of March 15, 2004, over $8 million has been spent on environmental remediation. Other significant costs include: evacuation costs, truck delay, rerouting and associated out of service expenses, expenses for disruption to non-railroad businesses, and expenses incurred in settling claims arising from the accident.[11]

On March 15, 2004, the NTSB released Safety Recommendations R–04–01 through R–04–07 as a result of the Minot accident. The first three recommendations (R–04–01, R–04–02, and R–04–03) pertain to FRA's oversight of continuous welded rail maintenance programs and are not relevant to this rulemaking. The four remaining recommendations (R–04–04, R–04–05, R–04–06, and R–04–07) concern tank car structural integrity and are relevant to this rulemaking. In fact, these four recommendations served as the basis for the reformulation of FRA's tank car research program.[12] Recommendations R–04–04 through R–04–07 read as follows:

(*R–04–04*). Conduct a comprehensive analysis to determine the impact resistance of the steels in the shells of pressure tank cars constructed before 1989. At a minimum, the safety analysis should include the results of dynamic fracture toughness tests and/or the results of nondestructive testing techniques that provide information on material ductility and fracture toughness. The data should come from samples of steel from the tank shells from original manufacturing or from a statistically representative sampling of the shells of the pre-1989 pressure tank car fleet.

(*R–04–05*). Based on the results of the Federal Railroad Administration's comprehensive analysis to determine the impact resistance of the steels in the shells of pressure tank cars constructed before 1989, as addressed in Safety Recommendation R–04–04, establish a program to rank those cars according to their risk of catastrophic fracture and separation and implement measures to eliminate or mitigate this risk. This ranking should take into consideration operating temperatures, pressures, and maximum train speeds.

(*R–04–06*). Validate the predictive model the Federal Railroad Administration is developing to quantify the maximum dynamic forces acting on railroad tank cars under accident conditions.

(*R–04–07*). Develop and implement tank car design-specific fracture toughness standards, such as a minimum average Charpy value, for steels and other materials of construction for pressure tank cars used for the transportation of U.S. Department of Transportation class 2 hazardous materials, including those in ''low-temperature'' service. The performance criteria must apply to the material orientation with the minimum impact resistance and take into account the entire range of operating temperatures of the tank car.

B. FRA's Responses to the NTSB Tank Car Recommendations for Minot

In August 2004, the FRA responded to NTSB Safety Recommendations R–04–04 through R–04–07, which arose from the Minot accident. As for NTSB Recommendation R–04–04 and R–04–05, which recommended that FRA analyze the impact resistance of steels in the shells of pressure tank cars constructed before 1989 and establish a program to rank the cars according to their risk of fracture, FRA advised the NTSB that the TCC had developed a plan to sample steels from pre-1989 pressure tank cars and that a program to rank those cars would be established. Because of FRA's commitment to ranking the pre-1989 fleet, the NTSB classified Safety Recommendation R–04–05 as ''Open—Acceptable Response.'' The NTSB, however, classified Safety Recommendation R–04–04 as ''Open—Unacceptable Response'' because the Board did not believe that the necessary analysis would be completed in a timely manner. After FRA provided additional information to the NTSB about the sampling, including preliminary fracture toughness data relating to the samples from the pre-1989 tank cars, the NTSB reclassified Safety Recommendation R–04–04 as ''Open—Acceptable Response.''

As for NTSB Recommendation R–04–06, which recommended that FRA validate its model to quantify the dynamic forces acting on tank cars in accident conditions, the FRA advised the NTSB that it had initiated modeling programs at Volpe and the University of Illinois at Chicago to determine in-train forces on tank cars involved in train derailments. Based on FRA's response to Safety Recommendation R–04–06, the NTSB classified the Recommendation as ''Open—Acceptable Response.''

Finally, as for NTSB Recommendation R–04–07, which recommended that FRA develop tank car design-specific fracture toughness standards for steels used in pressure tank cars, the FRA responded by stating that more research was needed (approximately three years) to address tank car design-specific fracture toughness standards. Because the NTSB believed there were existing solutions and accident findings from which to gauge fracture toughness values, such as Charpy impact, in June 2005, the NTSB

[11] On October 9, 2007, a Federal judge approved a $7 million settlement in a class-action lawsuit between Canadian Pacific Railroad and individuals affected by the accident.

[12] *See* Section X, *infra,* for a more detailed discussion of FRA's tank car research program.

classified the FRA response to Safety Recommendation R–04–07 as ''Open—Unacceptable Response.'' Since June 2005, AAR, in cooperation with FRA, has developed standards that ensure a minimum level of impact resistance for normalized steel and that require that Charpy tests be performed in the orientation of the sample material with the lowest impact property. In July 2006, the NTSB determined that FRA had made progress on the development of fracture toughness standards, and it reclassified Safety Recommendation R–04–07 ''Open—Acceptable Response.''

C. Macdona

The accident occurred at approximately 5 a.m. on June 28, 2004, in Macdona, Texas, and resulted in the derailment of four locomotives and 36 cars belonging to two trains that collided while traveling on the same track in opposing directions. As the eastbound 123-car train was attempting to leave the main line to enter a parallel siding, it was struck midpoint by a westbound train traveling on the same main line track. The 16th car of the westbound train was a pressurized tank car transporting chlorine, a toxic liquefied compressed gas. This tank car, a DOT 105A500W car, was punctured in the lower quadrant of the tank car head and the puncture terminated one inch beyond the seam joining the tank-head to the tank shell. The tank car instantaneously released approximately 9,400 gallons of chlorine, and a toxic vapor plume engulfed the accident area to a radius of at least 700 feet before drifting away from the site. The NTSB noted that the vapor cloud drifted with the wind from the accident site and traveled in a northwesterly direction toward several residential areas within the city of San Antonio. NTSB further noted that Sea-World, a large commercial entertainment venue, was about 10 miles northwest of Macdona in the path of the chlorine vapor cloud.

The NTSB determined that the probable cause of the accident was UP train crew fatigue that resulted in the failure of the engineer and conductor to appropriately respond to wayside signals governing the movement of their train. Thirty-three persons were injured, three fatally (including the UP train conductor and two occupants of a residence located near the accident site).[13] Damages to rolling stock, track and signal equipment were estimated at $6.3 million. As of July 20, 2006, $150,000 was spent to clean-up environmental consequences. Other significant costs include: Evacuation costs, truck delay, rerouting and associated out of service expenses, expenses for disruption to non-railroad businesses, and expenses incurred in settling claims arising from the accident.

On July 20, 2006, the NTSB released Safety Recommendations R–06–14 and R–06–15 as a result of the Macdona accident. Although neither recommendation specifically addressed the vulnerability of tank cars involved in an accident, the NTSB stated that the successful and timely implementation of Safety Recommendations R–04–04 through R–04–07 (recommendations from the Minot accident) and R–05–16 through R–05–17 (recommendations from the Graniteville accident discussed below) may have prevented/mitigated the Macdona accident and any future catastrophic releases of hazardous materials from pressurized tank cars involved in an accident.

D. Graniteville

The accident occurred at approximately 2:30 a.m. on January 6, 2005, in Graniteville, South Carolina, when a freight train was improperly switched from a main line track onto an industry track and struck an unoccupied, parked train head-on, on a rail spur leading to a textile manufacturing facility. The collision resulted in the derailment of three locomotives and 17 cars belonging to the two trains. Three of the 17 derailed cars were pressurized tank cars transporting chlorine. One tank car, a DOT 105J500W car, was punctured in the shell by the coupler of another car, and instantaneously released approximately 9,220 gallons of chlorine, creating a toxic vapor plume that engulfed the surrounding area.

The NTSB concluded that the probable cause of the accident was the failure of a train crew to return a main line switch to the normal position after the crew completed work at the Avondale Mills' industry track. As a result of the chlorine release, 5,400 people within a 1-mile radius of the derailment site were evacuated for several days. Nine persons were fatally injured and 554 sustained other injuries (75 requiring hospitalization). The nine persons fatally injured included the train engineer, six employees of the textile manufacturing facility, Avondale Mills, a truck driver at one of Avondale Mills' facilities, and an individual in a residence south of the accident site.[14] Noting that emergency responders were enroute to the scene within two minutes of the accident occurring and that emergency responders used a ''particularly efficient and expeditious means'' of evacuating affected persons, the NTSB concluded that the emergency response efforts were ''timely, appropriate, and effective.''[15] The Board noted, however, that despite these emergency response efforts, the eight civilian fatalities were determined to have resulted from asphyxia that occurred within minutes of exposure to chlorine gas. In other words, the fatalities occurred within the minutes that passed before emergency responders arrived on the scene or were able, because of the toxic fumes, to begin a safe search and rescue effort.[16]

The property damage, including damages to the rolling stock and track, exceeded $6.9 million. Other significant costs include: evacuation costs, truck delay, rerouting and associated out of service expenses, expenses for disruption to non-railroad businesses, costs to affected local governments and residents, as well as expenses incurred in settling claims arising from the accident. According to financial documents produced by NS, the railroad recorded $41 million of expenses related to the accident in 2005 and it is estimated that the costs of the Graniteville accident were approximately $138 million, excluding chlorine cleanup costs.[17] This cost estimate likely greatly underestimates the actual costs incurred by those affected by the accident. For example, according to various South Carolina State Emergency Operations Center and U.S. Environmental Protection Agency Situation Reports,[18] schools were closed for several days, mail service for the

[13] The crew of the striking train survived the collision and exited the locomotive unassisted, but could not escape the chlorine gas. The conductor and engineer were able to walk some distance from the collision where they were transported to hospitals. The engineer was treated and released, the conductor died several hours later from inhalation of the toxic gas. Given that both crew members survived the collision, no fatalities or serious injuries would have resulted from the accident had a tank car of chlorine not been punctured.

[14] As was the case in the Macdona accident, both train crew members survived the collision (the engineer died later from exposure to the gas). Given that both crew members survived the collision, no fatalities or serious injuries would have resulted from the accident had a tank car of chlorine not been punctured.

[15] NTSB, Railroad Accident Report, NTSB/RAR–05/04, *Collision of Norfolk Southern Freight Train 192 With Standing Norfolk Southern Local Train P22 with Subsequent Hazardous Materials Release at Graniteville, South Carolina,* (Jan. 6, 2005), at p. 40, Available at *http://www.regulations.gov* in docket no. FRA–2006–25169 and at *http://www.ntsb.gov* (Graniteville Report).

[16] *Id.*

[17] *Norfolk* Southern Corporation, *Quarterly Financial Review, Fourth Quarter 2006,* at p. 4. (downloaded at *http://www.nscorp.com/nscportal/nscorp/pdf/financial_q4_06.pdf*).

[18] Available at *http://www.epa.osc.org.*

evacuated areas had to be forwarded to a neighboring post office, and preliminary estimates of costs to Aiken County were in the millions due to potential damage to electrical systems and equipment within homes and businesses, the cost of the first response and recovery operations, damage to fire and EMS response vehicles, and the treatment of the victims.

The fate of Avondale Mills, the textile manufacturing company with four facilities within the vicinity of the accident, illustrates the significant long-term economic impacts that may result from catastrophic hazardous materials transportation accidents. In July 2006, after spending $140 million on cleaning, re-cleaning, repairs, and damage mitigation as a result of the derailment, Avondale Mills reported that it was unable to recover financially from the derailment and closed its 10 mills in South Carolina and Georgia. The company cited irrevocable damage to its core facilities, as well as market and production losses caused by the derailment. For example, the Company was unable to identify cleaning and restoration protocols that would successfully or economically halt the chlorine's corrosive effects, repair the damage caused by the chlorine exposure, and return the affected facilities and equipment to their pre-derailment condition. As a result, the Company was faced with the expensive replacement of damaged assets in addition to the lost business, higher manufacturing costs, and lower profits related to the reduction in productive capacities resulting from the derailment.[19] At the time of its closure, Avondale Mills employed approximately 4,000 people.

Although the costs of associated legal claims resulting from the derailment are still accumulating, in May 2006, Avondale Mills reached a $215 million settlement with its primary property and casualty insurer for all claims related to the derailment. Even with this multi-million dollar settlement, Avondale Mills' management believed that the amount was substantially less than the full value of the losses incurred as a result of the derailment.[20] In June 2006, a Federal judge approved a class-action settlement in excess of $10.5 million between Norfolk Southern and almost 500 individuals who claimed they suffered serious injuries after the derailment. In May 2005, Norfolk Southern announced that it had reached agreement on settlements for Graniteville residents and businesses that were evacuated as a result of the derailment, but did not seek medical attention. Under the terms of this settlement, Norfolk Southern offered each resident who was evacuated, but did not seek medical attention within 72 hours of the accident a flat amount of $2,000 for the evacuation plus $200 per person per day of the evacuation. These amounts are separate from any property damage claims. Norfolk Southern settled separately with the families of the nine people killed as a result of the accident.

On December 12, 2005, the NTSB released Safety Recommendations R–05–14 through R–05–17 as a result of the Graniteville accident. The first recommendation (R–05–14) pertains to railroad switching devices and is not directly relevant to this rulemaking. The three remaining Safety Recommendations (R–05–15, R–05–16, and R–05–17) relate to operating speeds in non-signaled territory, as well as the transportation of PIH materials and other hazardous materials that may pose inhalation hazards in the event of unintentional release. Recommendations R–05–15 through R–05–17 read as follows:

(R–05–15). Require railroads, in non-signaled territory and in the absence of switch position indicator lights or other automated systems that provide train crews with advance notice of switch positions, to operate those trains at speeds that will allow them to be safely stopped in advance of misaligned switches.

(R–05–16). Require railroads to implement operating measures, such as positioning tank cars toward the rear of trains and reducing speeds through populated areas, to minimize impact forces from accidents and reduce the vulnerability of tank cars transporting chlorine, anhydrous ammonia, and other liquefied gases designated as poisonous by inhalation.

(R–05–17). Determine the most effective methods of providing emergency escape breathing apparatus for all crewmembers on freight trains carrying hazardous materials that would pose an inhalation hazard in the event of unintentional release, and then require railroads to provide these breathing apparatus to their crewmembers along with appropriate training.

In addition, noting that the punctured car was among the strongest tank cars in service, the NTSB concluded that even the "strongest tank cars in service can be punctured in accidents involving trains operating at moderate speeds." [21] The NTSB then repeated its concern for crashworthiness integrity of railroad tank cars by restating what it said, in part, in response to the Minot accident:

Improvements in the crashworthiness of pressure tank cars can be realized through the evaluation of alternative steels and tank car performance standards. The ultimate goal of this effort should be the construction of railroad tank cars that have sufficient impact resistance and that eliminate the risk of catastrophic brittle failures under all operating conditions and in all environments. Achieving such a goal does not necessarily require the construction of a tank car that is puncture-proof; it may only require construction of a car that will remain intact and slowly leak its contents if it is punctured.[22]

E. FRA's Responses to the NTSB Tank Car Recommendations for Graniteville.

On June 30, 2006, the FRA responded to NTSB Safety Recommendations R–05–15 through R–05–17, which arose from the Graniteville accident. As for NTSB Recommendation R–05–15, which recommended that railroads be required, under certain conditions, to operate trains at lower speeds in non-signaled territory, the FRA informed the NTSB that the Recommendation was not feasible for operational and economic reasons. From an operational standpoint, depending on the terrain at the switches and the train make-up, train braking could prove difficult, generating excessive in-train forces that could cause derailments. From an economic standpoint, Recommendation R–05–15 would impede the movement of trains, especially on tracks where many switches exist, thereby causing train delays and an increase in running time. The FRA also explained that Recommendation R–05–15 was overly broad in that it would apply to all trains, regardless of lading. The NTSB classified Safety Recommendation R–05–15 as "Open—Response Received."

As for NTSB Recommendation R–05–16, which suggested that FRA require railroads to position tank cars towards the rear of trains and reduce their speeds through populated areas, the FRA advised the NTSB that it would be imprudent to require the placement of tank cars carrying PIH materials at the rear of trains for several reasons. First, the placement of tank cars carrying PIH materials at the rear of trains could expose the cars to the consequences of rear-end collisions. Second, FRA's research demonstrates that the preferred location for loaded cars is towards the front of trains because, upon braking, heavy cars decelerate more slowly than empty cars. If loaded cars are placed towards the rear of trains, they would push the more rapidly decelerating cars

[19] *See* Avondale Incorporated, *Notes to Consolidated Financial Statements (Unaudited),* at note 1 (Aug. 25, 2006). Available at *http://www.sec.gov.*

[20] *Id.*

[21] *Graniteville* Report at p. 51.

[22] *Id.*

in front of them and generate higher buff forces. Finally, the switching of railroad cars to position tank cars containing PIH materials at the rear of trains involves the risk of increased yard accidents and employee injuries resulting from additional switching. In its response to NTSB Recommendation R–05–16, the FRA also noted several practical difficulties with slowing trains on a location-by-location basis (including the dangers of introducing additional train handling challenges, the impact of such a speed restriction on the efficiency and capacity of the rail network, as well as the potential negative effect that slowing operations could have on communities located along the track). Nonetheless, in its response, FRA stated that it would review the potential costs and benefits of slowing trains carrying certain toxic commodities. The NTSB classified Safety Recommendation R–05–16 as ''Open—Response Received.''

As for NTSB Recommendation R–05–17, which recommended that FRA examine the most effective methods of providing emergency escape breathing apparatus for crewmembers on trains carrying PIH materials, FRA explained to the NTSB that it would initiate a study of potential breathing apparatus for use by crewmembers of freight trains carrying TIH materials. Based on FRA's response to Safety Recommendation R–05–17, the NTSB classified the Recommendation as ''Open—Acceptable Response.''

The NTSB Safety Recommendations referenced in this section above and the publicly available responses to them may be found on the *http://www.regulations.gov* Web site under docket number FRA–2006–25169.

VII. Evaluating the Risk Related to Potential Catastrophic Releases From PIH Tank Cars in the Future

Although it is not possible to accurately determine the probability of future occurrences of railroad accidents that would result in the catastrophic release of hazardous materials, it is unrealistic to assume that absent the improvements proposed, consequences from future accidents involving hazardous materials tank cars would be of the same order of frequency and severity as in the past. In fact, absent the improvements proposed, one or more events could be significantly more severe than experienced thus far. All that would be required would be the necessary environmental conditions (concentrating and channeling a gas plume at ground level), an exposed population of scores or hundreds within the path of the plume, and an ineffective or delayed emergency response (either due to deficiencies in the emergency response process or because of safety risks posed to emergency responders prohibiting emergency responders from entering an accident area).

Each of the three accidents discussed in section VI above share certain similarities that effectively minimized the catastrophic results of the accidents. Each accident occurred in a relatively rural area, thereby limiting the population exposed to the hazardous materials release. Each accident occurred during the early morning hours, while most of the surrounding populations were in their homes and not in the immediate accident vicinity. The meteorological conditions at the time of each accident effectively limited the speed at which the resulting toxic plumes expanded and the distance over which the plumes expanded. Had any of the accidents occurred in a more densely populated area or later in the day, it is likely that many more people would have been exposed to the toxic plumes. Had the meteorological conditions at the time of any of the accidents been different (e.g., wind speed or direction, temperature, barometric pressure, or humidity) it is possible that the plumes could have expanded more than what actually occurred, again, exposing many more people to the toxic chemicals. To demonstrate the potential affects of different accident conditions, such as location, time of day, or the weather, the circumstances surrounding the Graniteville and Minot accidents are discussed below.

A. Graniteville

Graniteville is a mixed rural and suburban area of Aiken County, South Carolina, with a population of approximately 7,000.[23] Graniteville lies in a relatively shallow valley, approximately 200 feet above sea level. The terrain surrounding the accident site is approximately 225 feet above sea level, with the elevation of the industry track where the accident occurred moderately decreasing as the track extends north and west towards the Avondale Mills plant. The January 6, 2005, accident occurred at 2:30 in the morning, a time at which most individuals were asleep in their homes and very few individuals were on the premises of the Avondale Mills plant. At the time of the accident, a light wind was blowing in a south-southwest direction, the temperature was approximately 55° F, and humidity was high.

The NTSB concluded that approximately 120,000 pounds (9,218 gallons) of liquefied chlorine was released before emergency responders arrived on the scene.[24] The chlorine settled in low areas around the railroad tracks and the plume expanded to the west of the accident site and into the Avondale Mills plant, generally following the local topography, running downhill to the south and west,[25] before being blown to the north by light winds where it hovered. The NTSB concluded that based on emergency responder observations and the locations of those receiving fatal injuries, the cloud extended at least 2,500 feet to the north; 1,000 feet to the east; 900 feet to the south; and 1,000 feet to the west.

The area to the east of the accident site and extending in a southerly direction is primarily a residential area. To the west and extending in a northerly direction are several moderate- to large-sized industrial plant facilities, some of which operate continuously. A small commercial/retail district is just north of the accident site.

Given the demographics and topography surrounding the accident site, had the accident occurred at a different time of day, or had any of the meteorological variables been different (e.g., wind speed or direction, temperature, barometric pressure, or humidity), it is likely that many more people would have been exposed to the chlorine plume. For instance, if the accident had occurred while the Avondale Mills plant was fully staffed, or during an afternoon shift change, hundreds of individuals could have been exposed. In addition, a middle school is located approximately 1,000 feet north of the accident site (well within the area of the plume that did occur). Had the accident happened while school was in session, approximately 500 students and scores more school personnel could have been exposed to the toxic plume.

Similarly, had any meteorological variables been different (e.g., wind speed or direction, temperature, barometric pressure, or humidity), it is likely that the chlorine plume could have expanded more rapidly and affected a greater area than it did. For instance, at the time of the accident, a

[23] As of 2006, the approximate population of Aiken County was 152,000. U.S. Census Bureau, State & County QuickFacts (available at *http://quickfacts.census.gov*).

[24] Note: The vaporization of liquefied chlorine at 32 °F at atmospheric pressure can generate a gaseous cloud with a volume 450 times greater than the volume of the liquid released. *See* Graniteville NTSB Report at 49 (citation omitted).

[25] Because chlorine gas is heavier than air with a vapor density of 2.5 at 32 °F, it will seek the lowest point in the immediate area.

light wind was blowing in a south-southwest direction. If the wind had been blowing at the same intensity, but in a south-southeast direction, the chlorine plume could have hovered over the southeasterly side of the accident site, rather than the northwesterly side. Southeast of the accident site is primarily a residential area and given the size of the plume that did result, the plume could have endangered approximately 185 homes. Given the average household size of 2.68 in Aiken County,[26] almost 500 people to the southeast of the accident site could have been exposed to vapors above the ERPG–3 level causing significantly more casualties and fatalities.[27] We note as well that the high humidity at the time of the accident limited the plume's rate of expansion because the chlorine reacted with the moisture in the area (effectively diluting the chlorine) to form a weak hydrochloric acid. This weak hydrochloric acid, a highly corrosive liquid, then accumulated in low lying areas and on the abundant vegetation surrounding the accident site, limiting the expansion of the plume. At the time of the accident the outside temperate was approximately 55 °F. As the NTSB noted, the liquefied chlorine rapidly vaporized and expanded when it spilled from the tank car, but the sudden release of the gas caused the product remaining in the tank car to auto-refrigerate and remain in a liquid state, slowing the release of additional gas.[28] Had it been warmer, the higher temperature could have provided additional energy for the chlorine to expand, and it is likely that the chlorine plume would have expanded faster.

B. Minot

The Minot accident occurred at approximately 1:30 in the morning, a time at which most individuals were sleeping inside their homes with their windows closed. Almost instantaneously, approximately 146,700 gallons of anhydrous ammonia were released as five tank cars catastrophically ruptured. A toxic vapor plume formed almost immediately. The plume rose approximately 300 feet and gradually expanded five miles downwind of the accident site and over a population of about 11,600 people (approximately one-third the population of the City of Minot). The outside temperature at the time of the accident was −6 °F, a light snow had fallen earlier in the day and a large amount of residual snow was on the ground.

Recognizing the smell of the chemical, the responsible fire chief immediately determined that the leaking material was anhydrous ammonia. Because of the large amount of anhydrous ammonia released, emergency responders were unable to enter the accident area for approximately three hours. Within 15 minutes of the accident, however, 911 operators were advising residents in the affected area to shelter-in-place (i.e., remain inside their homes with the windows shut) and the emergency room of a local hospital was notified of the derailment.

Upon notification of the derailment, the hospital activated its disaster plan and staff secured the facility against the hazardous vapors by shutting down air handlers, setting up a portable air-handling unit in the emergency room, and establishing an alternate emergency room entrance away from the vapor cloud. Within three hours of the accident, the ammonia cloud had drifted to and encompassed the hospital. Nevertheless, throughout the incident, the hospital treated approximately 300 people.

Ultimately, one resident of the neighborhood nearest the derailment site was fatally injured, two residents were seriously injured, and 60–65 residents were rescued hours after the derailment. All three residents that were seriously injured left the protective confines of their homes and were directly exposed to the anhydrous ammonia cloud for a prolonged period of time (given the time of day and widespread power outages as a result of the accident, it is unknown whether these individuals had heard or seen any of the emergency directives to shelter-in-place). As a result of the accident, nine other people sustained serious injuries, and 322 people, including the two train crew members, sustained minor injuries.

The NTSB concluded that sheltering-in-place was an effective emergency response and credited this action with the relatively low number of injuries, as compared to the number of persons affected by the vapor plume (approximately 330 injuries in 11,600 persons affected). However, had this accident happened at another time of day, possibly during the morning commuting hours when people are generally not at home, or if emergency responders did not promptly direct residents to shelter-in-place, or if the local hospital had not taken appropriate measures to protect itself from the plume, the consequences of the release could have been much worse than what occurred on January 18, 2002.

Similar to the meteorological circumstances surrounding the Graniteville accident, had the atmospheric variables been different (particularly, the temperature at the time of the accident), it is likely that many more people could have been at risk of exposure to the toxic plume. The low atmospheric temperature at the time of the accident helped to keep the ammonia plume close to ground level as it traveled downwind and also minimized the chemical's vaporization, accordingly limiting the spreading of the plume. Had this accident happened in the spring or summer, or any other time of warmer temperatures, windows in the homes may have been open and it is likely that the ammonia plume would have expanded more rapidly, thus exposing a greater population to the chemical.

Although the Minot, Macdona, and Graniteville accidents each occurred during the early morning hours, while most of the surrounding populations were in their homes and not in the immediate accident vicinity, because hazardous material transportation is not limited to early morning transportation, any of the accidents could have occurred later in the day, when neighboring factories were fully staffed, schools were in session, and unsuspecting individuals were otherwise outside of the protective confines of their homes and workplaces going about their daily routines. As an example, at approximately 11 a.m. on October 10, 2007, a CSX train transporting mixed freight of grain, lumber, and tank cars of various hazardous materials, derailed in Painesville, Ohio,[29] resulting in an explosion and subsequent fire as hazardous materials were released to the environment. Although the train was reportedly not carrying any toxic inhalation hazard materials, and no injuries were reported, 600 people

[26] U.S. Census Bureau, American FactFinder (available at *http://factfinder.census.gov).*

[27] ''ERGP–3 level'' refers to the American Industrial Hygiene Association's (AIHA) Emergency Response Planning Guideline level 3 which means ''[t]he maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing or developing life-threatening health effects.'' *See* AIHA, Emergency Response Planning Committee, *Procedures and Responsibilities,* at 1 (Nov. 1, 2006) (downloaded from *http://www.aiha.org).* According to AIHA the ERGP levels are intended as health based guideline concentrations for single exposures to chemicals and the levels are commonly used in the emergency response planning industry for assessing the adequacy of accident prevention and emergency response plans. *Id.*

[28] Graniteville Report at 11, 49.

[29] Painesville is located approximately 30 miles from Cleveland and has an estimated population of 20,000.

(including over 300 children from a nearby elementary school) within a half mile radius of the train derailment were evacuated.

Although the Minot, Macdona, and Graniteville accidents each occurred in a relatively rural area, the accidents could have occurred anywhere, including in the midst of major metropolitan areas. The Minot accident was caused by an undetected defective rail. A crew's failure to appropriately respond to wayside signals governing movement of their train led to the Macdona accident. The Graniteville accident was caused by a train crew's failure to correctly align a switch. Each of these ''causes'' could have occurred in close proximity to a metropolitan area, thus potentially impacting a much larger population of people. The Painesville, Ohio, incident, although not an accident with catastrophic results, illustrates this point. As a Cleveland City Councilman noted, had the derailment occurred closer to Cleveland, more than 8,000 people could have been affected.[30]

VIII. The Railroad Industry's Liability and the Impact of Accidents Involving the Shipment of PIH Materials on Insurance Costs and Shipping Rates

In 2005, railroads moved just over 100,000 carloads of PIH materials and nearly 37 million total carloads.[31] The 100,000 carloads of PIH materials equate to approximately 0.3 percent of all rail carloads. Despite the small fraction of the railroad industry's business constituted by PIH materials (and the limited revenue it generates), railroad industry representatives, citing the Minot, Macdona, and Graniteville accidents, have noted that transporting PIH materials has led to the imposition of ''hundreds of millions of dollars of liability.'' [32] Further, noting that ''railroads can suffer multi-billion dollar judgments'' from accidents involving highly-hazardous materials, in 2007 the President and CEO of AAR testified before a Congressional committee that ''every time a railroad moves [a highly-hazardous shipment] it faces potentially ruinous liability'' and that the ''insurance industry is unwilling to insure railroads against the multi-billion dollar risks associated with highly-hazardous shipments.'' [33] In support of this assertion, a representative of the railroad industry noted that as a result of the Minot, Macdona, and Graniteville accidents, insurance costs for the entire railroad industry have gone up by 100 percent.[34]

This increase in railroad insurance rates, coupled with the actual costs of the accidents, has resulted in increased shipping rates for the shippers of hazardous materials. Minimally, shipping rates for PIH materials have doubled; however, many shippers report larger increases (including at least one shipper which has had its rates increased over 4.8 times in a two-year period).

IX. Industry Efforts To Improve Railroad Hazardous Materials Transportation Safety

A. General Industry Efforts

The rail industry, through the AAR, has developed a detailed protocol on recommended railroad operating practices for the transportation of hazardous materials. Although in early 1990 this protocol was implemented by only the Class 1 rail carriers operating in the United States, on July 17, 2006, AAR issued a revised version of this protocol, known as Circular OT–55–I, with short-line railroads also participating in the implementation. The Circular details recommended railroad operating practices for, among other things: (1) Designating certain trains hauling hazardous materials as ''key trains,'' defined as trains containing five or more tank car loads of PIH materials; (2) designating operating speed and equipment restrictions for key trains; (3) designating ''key routes'' [35] for key trains and setting standards for track inspection and wayside detectors on these ''key routes''; (4) yard operating practices for handling placarded tank cars; (5) storage, loading, unloading and handling of loaded tank cars; (6) assisting communities with emergency response training and information; (7) shipper notification procedures; and (8) the handling of time-sensitive materials. The Circular also (1) Restricts key trains to a maximum speed of 50 mph; (2) requires, as practicable, that unless a siding or auxiliary track meets FRA Class 2 standards, a key train will hold main track at meeting or passing points; (3) requires all cars in key trains to be equipped with roller bearings; and (4) imposes a further speed restriction of 30 mph in the event a defect in a key train bearing is reported by a wayside detector, but is not able to be confirmed visually. A copy of the most recent version of Circular OT–55–I has been placed in the docket.

In addition, FRA is aware that some carriers have individually taken voluntary steps to reduce the occurrence of accidents that can lead to hazardous material releases. For example, BNSF has implemented a derailment prevention program that includes, among other efforts, implementing advanced train control technology; utilizing various freight car condition monitoring technologies; and installing and maintaining switch point position indicators and broken rail protection in non-signaled territory. Specific to the transportation of hazardous materials through non-signaled territory, BNSF has also revised its operating practices at certain locations in its system through which a significant amount of PIH materials are transported in an effort to decrease the probability of an accident or incident involving a train hauling PIH material. A more detailed discussion of BNSF's efforts in this regard is found in the ''Discussion of Public Comments'' section below.

B. Trinity Industries, Inc.'s Special Permit Chlorine Car

In accordance with 49 CFR 107.105, in early 2005, Trinity Industries, Inc. (Trinity) applied for a Special Permit to manufacture, mark, and sell DOT 105J600W specification tank cars, for use in chlorine service, with a variation in design and construction of the protective housing (the ''Trinity car'').[36] Specifically, as noted in Trinity's

[30] David Summers, WKYZ–TV (Cleveland, Oh), Hazardous Cargo Legislation Stalled on the Tracks (Oct. 14, 2007).

[31] Written Statement of Edward R. Hamberger, President & CEO, AAR , before the U.S. House of Representatives Committee on Transportation and Infrastructure, Subcommittee on Railroads, Pipelines, and Hazardous Materials (Jan. 31, 2007) at 7 (Hamberger Statement).

[32] Statement of Bob Fronczak, Assistant Vice President, Environment and Hazardous Materials, AAR, at the Dec. 14, 2006 public meeting (Fronczak Statement). *See* document no. 19 in the docket.

[33] Hamberger Statement at 7–8. An example of such a judgment is *In re New Orleans Train Car Leakage Fire Litigation,* 795 So. 2d 364 (La. Ct. App. 2001). In that case, the Louisiana Court of Appeals upheld a class-action judgment of $850,000,000 in punitive damages and $2,100,000 in compensatory damages against CSX Transportation, Inc. Railroads, as common carriers, are generally required to provide transportation services in a reasonable manner and may not refuse to transport a material that the government has deemed safe for transportation.

[34] Fronczak Statement.

[35] Circular OT–55–I defines the term ''key routes'' as ''[a]ny track with a combination of 10,000 car loads or intermodal portable tank loads of hazardous materials, or a combination of 4,000 car loadings of PIH or TIH (Hazard zone A, B,C, or D), anhydrous ammonia, flammable gas, Class 1.1 or 1.2 explosives, environmentally-sensitive chemicals, Spent Nuclear Fuel (SNF), and High Level Radioactive Waste (HLRW) over a period of one year.''

[36] *See* 70 FR 12782, 12783 (Mar. 15, 2005) (Research and Special Programs Administration, List of Applications for Exemption). 49 U.S.C. § 5117 authorizes the DOT to issue special permits (previously referred to as ''exemptions'') authorizing a variance from the HMR if the proposed variance is equivalent to the level of safety required by the HMR.

application, the Trinity car varies from Federal standards because it has a protective housing welded, rather than bolted, to the tank nozzle and its maximum gross weight on rail is 286,000 pounds (due in part to a thicker head and shell than current chlorine cars).[37] In response to Trinity's application, several members of the hazardous materials shipping industry expressed concern with certain aspects of the proposed Trinity car. For example, commenters expressed concern regarding the proposed manway arrangement, noting that the modified pressure plate and protective housing may present difficulties for emergency responders because it was unclear whether the standard Emergency Kit C, which is used to contain leaks in and around the pressure relief device and angle valves, was compatible with the arrangement. Further, commenters expressed concern regarding the increased car pressure and corresponding pressure rating of the valves and fittings. Commenters also questioned the efficacy of increasing the thickness of the car's steel, but utilizing steel with a lower tensile strength than current chlorine cars. Furthermore, commenters expressed concern that given the increased weight of the car, some shipping and receiving facilities may not be able to handle the heavier car.

After careful review of Trinity's application, the comments received, and DOT's own analysis of the Trinity car, PHMSA issued the requested Special Permit on April 20, 2006, authorizing Trinity to manufacture, mark, and sell the car for use in chlorine service, subject to certain operational restrictions and inspection requirements.[38] Specifically, the terms of the Special Permit prohibit the Trinity car from being used in free interchange and require the manway nozzle welds to be requalified annually. The Special Permit was issued based on the finding that the Trinity car used under the specified conditions would provide an equivalent level of safety to current DOT specification cars and additionally would provide a way to gather data about an alternative to a regulatory standard over a relatively short time-span.

C. AAR Proposals for Enhanced Chlorine and Anhydrous Ammonia Tank Cars

In early 2006, the Safety and Operations Management Committee (SOMC) of the AAR directed the AAR's TCC to consider improved packaging for the shipment of chlorine and anhydrous ammonia. Specifically, SOMC directed the TCC to present a plan for developing performance standards for chlorine and anhydrous ammonia tank cars that would reduce the conditional probability of a release, given an accident, by a target of 65% from the current values, as well as a plan to phase in the new improved cars within a target time frame of five to seven years. The goal of a 65% reduction was based on the findings of researchers at the University of Illinois at Urbana-Champaign's Railroad Engineering Program, which concluded that utilizing existing technology, the probability of a release of anhydrous ammonia and chlorine from a tank car involved in an accident could be reduced by 65% or more by substituting enhanced tank cars for the cars currently used to transport these materials.[39] The enhanced tank car contemplated in the University of Illinois research is the thicker, heavier Trinity car designed for chlorine service and subject to PHMSA Special Permit 14167. As noted in the AAR Risk Analysis, the finding of a potential 65% improvement is premised on replacing the current 263,000 pound cars for anhydrous ammonia and chlorine with 286,000 pound cars equipped with additional head protection, thicker shells, and modified top fittings protection.

In response to this directive, the TCC established a task force to develop the requested plan. The task force consisted of a wide spectrum of interested parties, including hazardous material shippers, railroads, the Railway Supply Institute (RSI), and railroad industry consultants. The task force, however, was unable to reach consensus on a recommendation to the TCC.

In July 2006, the AAR TCC considered proposals for improved tank cars in light of its mandate from SOMC to make the cars transporting chlorine and anhydrous ammonia 65% safer. At the July TCC meeting, all member railroads, supported by Trinity, proposed that anhydrous ammonia be transported in DOT 112J500W tank cars, equipped with full-height half-inch thick or equivalent head shields and top fittings protection designed to withstand a rollover with a minimum linear velocity of nine miles per hour. Similarly, the same parties proposed that chlorine be transported in tank cars built to the 105J600W specification, equipped with full-height half-inch thick or equivalent head shields and top fittings protection designed to withstand a rollover with a minimum linear velocity of nine mph. Alternatively, cars for each commodity could be designed in accordance with a formula derived from the statistical analysis in the RSI–AAR Tank Car Safety Project Report RA 05–02.[40] For anhydrous ammonia, this statistical formula required shell and head protection to reduce the conditional probability of release (CPR) by 32% given that the car is derailed in an accident; for chlorine, the statistical formula required shell and head protection to reduce the CPR by at least 45%.[41] This railroad/Trinity proposal contemplated that 50% of a car owner's fleet of anhydrous ammonia and chlorine cars would be replaced with these ''enhanced cars'' within approximately six years, with their entire fleets being replaced within approximately eleven years.

At the same TCC meeting, all shipper members of the TCC, as well as every rail tank car builder other than Trinity, supported a proposal submitted jointly by The Fertilizer Institute (TFI) and the Chlorine Institute (CI). The TFI/CI proposal for cars constructed after a proposed effective date incorporated the Federal standard for head protection (49 CFR 179.16), with the ram car adjusted to reflect the increasing presence of cars with a gross rail load of 286,000 pounds. The TFI/CI proposal contemplated grandfathering existing cars in anhydrous ammonia and chlorine service prior to the effective date as compliant.

The initial result of this deliberation was the TCC's issuance of Casualty Prevention Circular 1175 (CPC–1175) on July 28, 2006. CPC–1175 proposed to implement the railroad/Trinity proposal introduced at the July TCC meeting. In response to CPC–1175, several members of the hazardous materials shipping

[37] The HMR require bolted top fittings and provide for a tank car maximum gross weight on rail of 263,000 pounds. *See* 49 CFR 179.100–12 and 179.13.

[38] *See* 71 FR 47288, 47301 (Aug. 16, 2006) (PHMSA Special Permit number DOT–SP 14167). Subsequently, the Special Permit was revised on August 10, 2006 to clarify the outage and filling density requirements and specify requirements for filing agreements between carriers and filing non-destructive testing procedures. More recently, Trinity requested that the Special Permit be revised to amend the manway protective housing design.

[39] Christopher P.L. Barkan, Ph.D., M. Rapik Saat, M.S., Railroad Engineering Program, Department of Civil and Environmental Engineering, University of Illinois at Urbana-Champaign, *Risk Analysis of Rail Transport of Chlorine and Ammonia on U.S. Railroad Mainlines* (Feb. 27, 2006) (AAR Risk Analysis).

[40] RSI–AAR Railroad Tank Car Safety Research and Test Project, *Safety Performance of Tank Cars in Accidents: Probabilities of Lading Loss,* RA–05–02 (Jan. 2006).

[41] While this statistical analysis sought to advance the safety of tank cars, it does not foster new technology because the CPR was derived from empirical data.

industry submitted comments to the AAR expressing concern with certain aspects of the proposal. For example, commenters expressed concern with the proposed implementation schedule, the proposed top fittings arrangement, and the scientific basis utilized for development of the standard. Commenters also questioned the efficacy of moving forward with the proposal without the benefit of the results of the FRA's Volpe research designed to quantify tank car survival conditions.

FRA also corresponded with the AAR in response to CPC–1175. In its letters, FRA first noted that the Circular contained two proposed, amended tank car specifications and two proposed, new specifications. Accordingly, FRA noted that before the TCC could implement the proposed requirements in CPC–1175, in accordance with 49 CFR 179.4, the proposals would have to be submitted to the Department. The FRA also expressed concern regarding the engineering analysis underlying the proposal, specifically related to the analysis of the top fittings, tank-head and shell, as well as the tank car's capacity.

In response to comments received from FRA and the industry, on October 18, 2006, the TCC issued Casualty Prevention Circular 1176 (CPC–1176), which adopted as a final TCC action the proposals set forth in CPC–1175 with minor modifications to the implementation period initially proposed. Specifically, the intermediate implementation goal of CPC–1175 (50% of the fleet by December 31, 2012) was eliminated and replaced by a requirement that the tank car owners' plans for implementation be submitted to AAR by December 31, 2007. Subsequently, on December 18, 2006, AAR issued Casualty Prevention Circular 1178 (CPC–1178) in response to appeals to CPC–1176. Although various aspects of CPC–1176 were appealed (e.g., the proposed implementation schedule, top fittings arrangement, and the scientific basis of the proposed design), CPC–1178 is substantially the same as CPC–1176, except the target implementation dates were delayed by one year (i.e., tank car owners' plans for implementation were required to be submitted by December 31, 2008 and tank cars were required to be 100% fleet compliant by December 31, 2018).[42]

D. Dow/UP Safety Initiative and the Next Generation Rail Tank Car Project

In October 2005, the Dow Chemical Company (Dow) and UP, Dow's largest rail service provider, formed a partnership to address rail safety and security improvements for the transportation of hazardous materials. Specific goals of the agreement between UP and Dow include: (1) Reducing idle times for hazmat shipments by 50 percent in high-threat urban areas; (2) redesigning Dow's customer supply chains to cut in half the amount of ''highly hazardous chemicals'' shipped by 2015; (3) eliminating all nonaccidental leaks of certain hazardous materials in three years; and (4) having hazardous material shipments monitored by satellite tracking tags and other sensors.[43] As Dow noted at the May 31-June 1, 2006, PHMSA/FRA public meeting, the companies' joint effort focuses on six areas for improvement: (1) Supply chain redesign; (2) next generation rail tank car design; (3) improved shipment visibility; (4) a strengthened commitment to TRANSCAER®;[44] (5) improved rail operations safety; and (6) hazardous material shipment routing.

With regard to supply chain redesign, Dow is evaluating potential ways to reduce the number and distance of shipments involving high-hazard materials. In this connection, Dow is evaluating the potential for co-location of production and consuming facilities; the use of pipelines instead of rail in some instances; and the conversion of highly hazardous products to less hazardous derivatives before shipping.[45] At the same public meeting, Dow noted that since 1999, the company has reduced the amount of chlorine it ships in the United States by 80%. Dow also noted that the company's current commitment is to have further reduced by 50 percent the number of shipments of highly hazardous materials (i.e., PIH materials and flammable gases) and container miles traveled by those shipments by 2015. Recognizing that the temperature, pressure, and other characteristics of the material being shipped affects the consequences of any hazardous materials release, Dow is also focusing its efforts on improving shipment visibility and tracking. Specifically, by the end of 2007, Dow's stated goal is to have implemented shipment tracking via GPS technology to know, in real time, exactly where its tank cars containing PIH materials are located and what condition they are in. Through TRANSCAER(r), Dow has also publicly committed to ''touch every community'' through which its highly hazardous materials travel within the next five years. Through this initiative, Dow's stated intent is to provide community awareness and emergency responder training to help ensure that the communities through which their highly hazardous materials travel are better prepared for potential chemical transportation emergencies.

We invite commenters to provide data and information concerning the extent to which other companies are voluntarily implementing measures to reduce the transportation safety risks associated with the transportation of PIH materials in tank cars. We are particularly interested in efforts planned or underway to modify or redesign supply chains, reduce the number of shipments and the time-in-transit of shipments, or enhance shipment visibility and tracking. We ask commenters to consider whether implementation of these and similar risk-reduction measures industry-wide would militate against the need to improve the accident survivability of the current PIH tank car fleet, as proposed in this NPRM.

With regard to improving rail tank car design, Dow, UP, and the Union Tank Car Company (Union Tank), which had joined the Dow/UP Partnership specifically to participate in the NGRTCP, initiated the NGRTCP for the stated purpose of collaborating on the design of a next generation railcar for the transportation of certain hazardous materials. The project is multi-generational with the first generation focusing on designing a breakthrough next generation tank car for the transport of PIH materials that will meet or exceed the AAR TCC performance requirements and provide a five- to ten-fold improvement in the safety and security performance of existing rail tank cars in PIH service. Subsequent generations of the project would build on the first generation to leverage the process, methodology, and criteria used in designing the next generation PIH tank car to design a tank car appropriate

[42] On August 28, 2007, the TCC issued Casualty Prevention Circular 1180 (CPC–1180) for public comment. CPC–1180 addresses certain high-hazard materials (including chlorine and anhydrous ammonia). CPC–1180 proposes an implementation period for a top fittings requirement consistent with that of CPC–1178, but also includes requirements for commodity specific tank improvement factors. The tank improvement factor requirements are new requirements for chlorine and anhydrous ammonia.

[43] John D. Boyd, *UP, Dow Sign Safety Pact,* Traffic World (Mar. 19, 2007).

[44] TRANSCAER® (Transportation Community Awareness and Emergency Response) is a voluntary national outreach effort that focuses on assisting communities to prepare for and respond to a possible hazardous materials transportation incident. TRANSCAER® members consist of volunteer representatives from the chemical manufacturing, transportation, distributor, and emergency response industries, as well as the government. For more information on TRANSCAER® see *http://www.transcaer.com/public/about.cfm.*

[45] *See* Transcript of May 31–June 1, 2006, public meeting in docket no. FRA–2006–25169.

for other hazardous materials, such as flammable gases or chemicals that pose a significant risk to the environment if released. Dow's stated goal is full implementation within the company of a next generation PIH tank car by the end of 2014, and full implementation of further generations of tank cars for flammable gases and environmentally-sensitive chemicals by the end of 2029.

The NGRTCP team includes industry leaders and representatives from Dow, UP, Union Tank, as well as an external advisory panel of academic, industry, and former regulatory leaders to help guide the development of the next generation rail tank car design. Recognizing the significant opportunities to leverage government and industry resources in designing this next generation rail tank car, in January 2007, FRA signed a Memorandum of Cooperation (MOC) with the companies involved in the NGRTCP. This MOC provides for extensive information sharing and cooperation between ongoing FRA and industry research programs to improve the safety of rail shipments of hazardous commodities such as PIH materials. FRA hazardous materials safety and R&D personnel are actively involved in the project.[46]

The NGRTCP is following a six sigma approach (i.e., a data driven approach and methodology for eliminating defects) to tank car design, evaluating such issues as: (1) Coupler penetration to tank sides and heads; (2) hydrostatic failure; (3) ability of tanks to withstand ballistic impacts; (4) fittings protection; (5) operational efficiency (including payload, infrastructure, maintenance and re-qualification); as well as (6) fire and thermal protection. Recognizing that the traditional method of enhancing tank car survivability (i.e., utilizing thicker, stronger steel) is limited, the project is evaluating the use of alternative technologies and design concepts from other industry sectors (e.g., automotive and aerospace). The general framework for the modeling and testing contemplated by the NGRTCP consists of the use of quantitative analysis (computer simulation using finite element analysis), component testing, quarter- to half-scale model testing, and limited full-scale testing. The project also involves a comparison of any potential new design with existing designs (e.g., the DOT 105A500W base car, the DOT 105J600W tank car with full head shields and top fittings protection).[47]

[46] The MOC was amended in early 2007 when Transport Canada joined the project.

[47] Additional discussion of the NGRTCP may be found in the ''Discussion of Public Comments'' section below and in the transcript to the December 14, 2006, public meeting (document no. 22 in FRA docket no. FRA–2006–25169).

E. The Chlorine Institute (CI) Study

In late 2005, CI established a research program to investigate tank car puncture resistance and the potential development of alternative materials tests (e.g., un-notched Charpy test) to develop and validate alternative fracture criteria. The CI study recognizes that considerable advances have been made in the design of tank car steels to improve and increase the ductile-to-brittle transition temperature and that these improvements have resulted in recent tank car failures occurring in a ductile fashion due to an overload of the tank. The CI research is looking at several alternative strategies to increase the ductile performance of tank car design, including the development of novel material tests to better establish a relationship between overloading and material failure from specimens that do not include a pre-existing crack. This information will be used to refine how modeling of tank car failures occurs and to help with the evaluation of the alternative strategies being reviewed.

X. Discussion of Relevant Tank Car Research

The process of improving the safety of railroad tank cars has been ongoing for decades. It involves railroads, tank car builders, chemical companies, and government regulators. Historically, FRA has conducted, and continues to fund and co-fund, a substantial amount of tank car safety research and development projects with Transport Canada, as well as with RSI and AAR, through their cooperatively funded RSI–AAR Railroad Tank Car Safety Research and Test Project. The RSI–AAR Railroad Tank Car Safety Research and Test Project conducts tank car safety research in two principal ways: (1) By maintaining a comprehensive database on the details of the damage suffered by tank cars in accidents, to enable better understanding of tank car design strengths and weaknesses, and (2) by conducting engineering analyses of specific problems. The FRA further collaborates with industry through the TCC to develop standards for designing, constructing, maintaining, and safely operating railroad tank cars in North America.

Historically, the Department's research has focused on developing information on damage tolerance for tailoring inspection intervals for specific tank car designs; developing non-destructive evaluation and testing techniques and methodologies; improving fittings protection and gaskets; reviewing tank car operating environments; and developing new linings, coatings, and tank car steels. Since the 1970s, based on the combined research efforts of the Department and industry, DOT has issued a number of regulations to improve the survivability of tank cars in accidents. For example, DOT has promulgated regulations requiring the installation of tank-head puncture-resistance systems (head protection), coupler vertical restraint systems (shelf couplers), insulation, and thermal protection systems on tank cars used to transport certain hazardous materials.

Despite these safety improvements, as noted above, in the last several years there have been a number of rail tank car accidents in which the tank car was breached and product was lost on the ground or into the atmosphere. FRA's research focus changed after the tragic occurrence of these accidents. Specifically, as discussed in Section VI above, the NTSB issued seven safety recommendations to FRA as a result of the Minot derailment. Four of these recommendations concern tank car structural integrity (R–04–04, R–04–05, R–04–06, and R–04–07), and these four recommendations served as the basis for the reformulation of FRA's tank car research and development program. The current FRA tank car research program objective is the development of effective strategies to maintain tank integrity during train derailments or accidents. The key metric identified for this research is the maximum speed for which tank integrity is maintained. This metric has been identified because of the comparable ability for other researchers to perform large deformation analysis. Ascertaining the specifics of material failure through analysis is still extremely challenging. The ability to model tank car integrity with confidence will be critical to the ability of tank car manufacturers to develop new designs that conform to the performance standards proposed in this NPRM.

Specifically, in response to NTSB's Minot recommendation R–04–07, work was conducted on the testing of tank car steels to examine the dynamic fracture toughness of such steels as a function of service temperature. This work included standardized fracture mechanics tests and the comparison of results from these tests with Charpy V-notch impact energies at different temperatures. Due to inherent material variability, the results from the fracture toughness tests are scattered by a factor of four, which would require a safety factor of at least 2 in a quality assurance (QA) specification. This means, for example, the samples taken from a production heat of steel would have to average at least twice the toughness needed for service.

Tightening the QA on steel products can result in inordinately expensive steel costs and most likely would be cost prohibitive. Alternatively, an unacceptable gain in structure weight may be required to sufficiently decrease the applied stresses to meet the safety factor with achievable material performance. Additionally, a specification will not provide an absolute guarantee of safety because, despite the implementation of any QA specification, some materials released from production may not meet the minimum fracture toughness standard. Accordingly, although FRA is in the process of completing the dynamic fracture toughness testing, it does not appear that a workable steel specification could be developed based on the results. Instead, in this NPRM, the Department has chosen to explore advances in tank car safety through engineering redesign of tank car structures to increase the amount of energy absorption a tank car experiences prior to a breach. The Department will continue to examine the dynamic fracture toughness of steels used in the construction of pressure tank cars in hazardous materials service and will incorporate any workable tank car design-specific fracture toughness standards into the HMR as appropriate in future rulemakings.

Also in response to NTSB's Minot recommendations, a risk model framework was developed to provide the technical basis to rank the factors affecting catastrophic failure of tank cars in derailments or collisions. The risk model framework focuses on determining whether the risk of lading loss in an accident situation could be minimized by specifying a particular material, e.g., normalized versus non-normalized steel. A hierarchal approach (i.e., Level 1, Level 2, and Level 3) was applied and as research results become available they will be incorporated.

In Level 1, a qualitative ranking is conducted by identifying the factors that are perceived to affect risk. These factors are then grossly sorted in terms of their expected impact on risk (e.g., high, medium, or low impacts). A simple Level 1 risk ranking has been completed. In Level 2, a systematic framework will be developed to provide a technical basis for ranking the risk factors. In this semi-quantitative method, a probabilistic approach will be used to account for uncertainties due to physical randomness and/or limited information. Different probability distributions (e.g., normal, Weibull, triangular, etc.) have been used to assess various uncertainties in the model. In Level 3, a quantitative risk ranking, the information obtained from other research programs will be incorporated with the goal of ranking tank cars that are perceived to be the most vulnerable to catastrophic failure. Although material properties play an important role in the performance of a tank car subjected to fatigue type loading, for overload conditions such as those experienced in collisions or derailments, the ranking developed is not expected to provide a tool for improving tank car performance. Instead, as noted above, in the NPRM, the Department has chosen to examine the potential redesign of the tank car structure to minimize the effect of the overload conditions, e.g., to absorb more energy prior to incipient rupture and spread the load over as large an area as possible.

Currently, FRA's research focusing on the accident survivability of railroad tank cars involves a three-step process to assess the effects of various types of train accidents (e.g., derailments or collisions) on tank cars. Each phase involves the development of computational models with different objectives. The first phase involved the development of a physics-based model to analyze the gross motions of rail cars in a derailment (i.e., a derailment dynamics model). This derailment dynamics model was then used to estimate the closing speeds, peak impact forces, and angles of incidence between an impactor (e.g., the coupler of another car) and the tank car head or shell. The second phase involved the development of structural finite element analysis models to simulate the structural response of the tank car head or shell to an assumed scenario (i.e., penetrator shape, initial closing velocity, and effective collision mass). The third phase is an assessment of the damage created by the impacting loads, which entails the application of fracture mechanics testing and analysis methods. The research is being conducted by Volpe and is summarized below. In addition, a more detailed discussion of the research can be found in the transcript to the March 30, 2007, public meeting (document no. 29 in docket no. FRA–2006–25169) and in FRA's ''Research Results'' (document no. 24 in docket no. FRA–2006–25169).

The first phase of FRA's current research program developed information about the performance of a train consist after a derailment occurs. Initially, this phase of the research was aimed at developing a derailment model effectively recreating the Minot derailment. However, due to the chaotic events and inherent complexities (e.g., track layout and condition; the three dimensional topography of the local terrain; car types in a train; and the location of each car in a train) of derailment situations, the initial and boundary conditions that lead up to specific derailment scenarios are very poorly understood. Early in its research effort, FRA realized that the exact circumstances and boundary conditions of the Minot derailment could not be accurately reproduced.

Accordingly, FRA revised its objective in this first phase of research from trying to replicate the conditions of the Minot accident, to identifying all of the salient features of derailment situations based on historical accident consequence review, as well as active accident investigations, thereby creating a generalized accident scenario with well-defined initial and boundary conditions. This information was then used to establish more easily analyzed impact scenarios. Specifically, the derailment dynamics model was used to estimate the post-derailment car-to-car interactions; that is, the gross motions of the cars as they come off the track after a derailment, the closing impact speeds, and the orientations at which the derailed cars come together in a generalized derailment scenario.

Sensitivity studies were then performed to assess the relative effect of various factors on derailment severity. The factors analyzed included: (1) The number of cars derailed; (2) the secondary car-to-car closing speed; (3) the peak forces that the couplers experience; and (4) the lateral displacement of the derailed cars from the point of derailment. Although there are several potential alternative analysis techniques that could be employed, FRA used two different types of models to calculate the gross motions of rail cars during a derailment scenario. One model was a purpose-built model using an explicit derivation of the equations of motions for a two-dimensional lumped-parameter representation. The second model involved a commercially-available, general-purpose model for rigid-body dynamics, commonly accepted within the rail industry. The inputs for the models included: (1) Operational factors such as the number of cars in the train and the masses of the cars; (2) descriptions of the initial conditions such as the longitudinal speed of the train just prior to derailment and the initial angular velocity used to perturb the train set and cause the derailment; (3) the coefficients of friction between the tank car trucks (i.e., the swiveling frames of wheels under each end of the tank car) and the rail or the ground; (4) specific coupler characteristics such as length, dead band, stiffness, and maximum swing angles; and (5) higher-level model assumptions such as how the couplers break, the car-to-car contact forces, and lumped mass simplification.

The input parameters were varied by as much as +/− fifty percent. The models consistently demonstrated that significant sensitivities are associated with initial train speed and ground friction. The higher the initial train speed, the higher the post-derailment car-to-car impact closing speed and the greater the number of derailed cars. However, the results indicate that, in general, the secondary car-to-car impact speed is one-half that of the initial train speed across the variation in input parameters. Additionally, the resulting car-to-car impact speeds are negatively affected by increases in ground friction. That is, for higher ground friction, the resulting car-to-car closing speeds are lower and fewer cars derail. Of interest was the finding that within the parameters of the modeling, the mass of the cars was not a significant factor on post-derailment car-to-car closing speeds or on the number of cars derailed.

Results of the derailment dynamics modeling also demonstrated similar car-to-car interactions as observed in real world accident situations. For example, one type of impact occurs when two cars come together and the second car impacts the head of the first car (e.g., the Macdona accident). A second type of impact is associated with side/shell impacts (e.g., the Minot accident). Both the derailment dynamics models, as well as real world incidents documented in the RSI–AAR Tank Car Accident Damage Database, demonstrate that these head/shell impacts occur both at the centerline of the car as well as at the ends of the cars above the trucks/bogies. By combining this information, simple impact scenarios were developed that could be readily analyzed to compare the performance of different types of tank car designs (whether from the existing fleet or newer proposed designs).

The second phase of FRA's current research program utilized the information generated from the derailment dynamics modeling to assess the forces to which cars can be subjected in the event of a collision or derailment. This work required the development of large deformation finite element models capable of analyzing post buckling/plastic deformations. Both head and shell impacts were analyzed, but emphasis was placed on head impacts because there is a greater body of knowledge available on head performance.

In cooperation with FRA, extensive head puncture testing was conducted by the RSI–AAR Test Project throughout the 1970's and 1980's. This research, conducted on both empty, non-pressurized and loaded, pressurized tank cars, led to the HMR's current specification for head protection. It is important when developing such complicated models to start simply and build up in levels of complexity. Because head impacts are better understood, as is the deformation of a tank car unloaded and unpressurized, FRA initially modeled an empty, unpressurized tank car. There is greater uncertainty associated with pressurized fully-loaded cars, as well as understanding the stress states the cars experience prior to rupture. Results from the RSI–AAR head impact data, empirical puncture models, and three-dimensional laser mapping of the damage from the cars in Graniteville were used to help establish the validity and fidelity of the models. FRA intends to continue its modeling efforts to increase the level of complexity to analyze a loaded, pressurized car.

The third phase of the FRA's current research program is an extension of the model development and assessment of damage to tank cars from prescribed impact loading conditions that may lead to catastrophic failure. The results from full-scale tests will be used to validate the second and third phases of the research.

The FRA and the NGRTCP group are conducting a series of shell impact tests to provide information about the performance of conventional PIH tank cars under the collision conditions defined from the previous research program. In addition to providing baseline performance data, the test conditions developed are intended to aid in the development of a testing process that can be used to assess the relative performance of different designs, as well as to qualify a design. The full-scale testing approach involves a generalized impact condition based upon the scenarios defined previously and is designed to be simple to set-up, safe to conduct, and readily analyzed. It is also designed to provide consistent and repeatable results. The test conditions developed are not intended to replicate any specific accident conditions but are rather intended to result in similar failure and deformation modes as observed in accidents. This is a very similar approach that parallels the automotive 30 mph barrier test.

Three full-scale tests have been conducted to date, on April 11, 2007, April 26, 2007, and July 11, 2007. These tests involved a side impact between a rigid ram car with a stylized punch striking a standing pressurized DOT specification 105 tank car broadside at the centerline of the tank, both horizontally and vertically. The ram car was ballasted to a weight of 286,000 pounds. The standing tank car was pressurized to 100 psig and was loaded with clay slurry with a density equal to liquid chlorine with an outage of 10.6%. The ram car was pulled back to a predetermined position on the slightly graded tangent track and released to achieve the desired impact speed. Just prior to impact with the standing tank car, the air brakes on the ram car were activated, such that upon rebound, a second impact would not occur. In the first two tests, the punch face size was approximately 23 inches by 17 inches; in the third test, the punch face size was approximately 6 inches by 6 inches.

The first test was a limited instrumented assurance test designed to develop information about how the colliding equipment interact and to better understand the gross motions of the two cars. Because the test was designed to develop more detailed information about the interacting cars' behavior, and puncturing the standing car would have unnecessarily complicated the analysis and test set-up, the test speed was defined such that no puncture would occur. Specifically, the first test was conducted at 9.6 mph, and as predicted, no puncture occurred. The limited instrumentation on both the ram car and the standing tank car were analyzed and the force-time histories measured and predicted. The measured force-time histories from the collected data were within the standard deviation of the predicted test results.

The second test that was conducted had a fully-instrumented standing tank car. The additional instrumentation helped to define load path into the tank car, the evolution of the plastic dent growth, and recovery. It also refined the measurements of the gross motions of the colliding cars' interaction. The test was conducted at 14.0 mph. As with the first test, this test speed was chosen so that puncture would not occur. The ram car was again released from a pre-defined location and allowed to roll freely under gravity and the grade to impact the standing tank car. The analysis of the test data are on-going, but preliminary review suggests that again the force-time histories of the ram car and the struck tank car are within the standard deviation of the predicted test results.

After the second test, a careful inspection of the ram car showed that a modest amount of damage was inflicted on the lead truck and its carbody attachment. This damage was attributed to the off-axis vertical motions resulting from the difference in the centerline of the impactor and the height of the center-of-gravity of the ram car.

In order to safely run a test to puncture the baseline car, either a smaller punch would be needed and the test speed maintained at 14 mph, or the center-of-gravity of the ram car would have to be raised to be more in line with the centerline of the punch, to minimize ram car vertical motions for impact speeds greater than 14 mph. The option selected was to reduce the punch size to 6 inches by 6 inches. There was equal confidence in simulating the influence of punch size and impact speed on tank rupture. DOT is seeking to significantly increase the impact speed at which tank cars carrying PIH materials can protect their lading. For a wide range of sizes, this goal is independent of punch size. In order to allow for safer test procedures and lower test speeds, it was decided to use the smaller punch size in the regulation.

Because of the results of the second test, in the third test, the punch face size was approximately 6 inches by 6 inches. The standing tank car that was used during the third test was fully-instrumented. The test was conducted at 15.1 mph, and this test speed was chosen so that puncture would occur. The third test was designed to confirm that material failure of the tank car and puncture would occur at 15 mph with a smaller impactor. The test also provides a comparative baseline reference for the enhanced tank car designs. As with the second test, the ram car was again released from a pre-defined location and allowed to roll freely under gravity and the grade to impact the standing tank car. The analysis of the test data are on-going, but preliminary review suggests that again the force-time histories of the ram car and the struck tank car are within the standard deviation of the predicted test results.

Additional tank car testing is planned. The further testing will provide additional insight and validation to the modeling. The additional tests include material, full-scale sub-assembly, and full-scale prototype car tests. Materials tests improve the constitutive models applicable to the specific sub-components used in alternative designs, such as behavior of composites, foams, and multi-layered metal structures. The full-scale sub-assembly tests build confidence in the fidelity of the models used as they capture both material and geometric nonlinear behavior exhibited by larger scale components. Finally, in conjunction with the NGRTC program, full-scale prototype cars will be subjected to side and head impact and over-the-road testing. Each additional test enhances the modelers' ability to predict and capture increasingly complicated behavior under extreme accident loading conditions. As noted in the discussion of the proposed rule text, the proposed head and shell performance standard is based on the model that has been developed by Volpe. As more testing is completed, any new information or refinements to the test procedure will be considered for incorporation in this proposed rule.

For the reasons outlined above, FRA's research has focused on ways to enhance the accident survivability of tank cars through implementation of an enhanced performance standard for head shields and tank shells. We recognize that there may be a number of different ways for tank car manufacturers to meet this performance standard, including different design-types, variations in materials of construction, and the like. We invite commenters to suggest specific measures that would be utilized to meet the proposed performance standard. In addition, commenters may wish to provide data and information that would support alternative strategies for achieving the goal of improved tank car accident survivability.

XI. Discussion of Public Comments

As noted above, recognizing the need for public input as part of DOT's comprehensive review of design and operational factors affecting rail tank car safety, PHMSA and FRA held three public meetings inviting interested parties to comment on relevant aspects of tank car safety. As part of the public comment process, FRA established a public docket (Docket No. FRA–2006–25169), providing interested parties with a central location to both send and review relevant information concerning the safety of railroad tank car transportation of hazardous materials. The FRA docket contains several submissions from FRA (e.g., transcripts of the three public meetings, relevant Congressional testimony, research reports), as well as comments from numerous members of the regulated community. Specifically, written comments were received from the following organizations: BASF Corporation, the Institute of Makers of Explosives, Dow, TFI, Trinity, Applied Solutions, Inc., the Brotherhood of Railroad Signalmen, Agrium U.S. Inc., CI, and PPG Industries (PPG). Many of these same organizations attended the public meetings and provided oral comments at those meetings. The following discussion provides an overview of the written and verbal comments that were received. Where appropriate, a more detailed discussion of specific comments and how DOT has chosen to address those comments in this proposed rule can be found in Section XIII below, the Section-by-Section analysis portion of this preamble.

A. May 31–June 1, 2006 Public Meeting

The primary purpose of the first public meeting, held on May 31–June 1, 2006, was to surface and prioritize issues relating to the safe transportation of hazardous materials in railroad tank cars. Attendees included representatives from the railroad industry, shipping industry, railroad tank car manufacturing and repair companies, labor organizations, the NTSB, Transport Canada, and the Transportation Security Administration (TSA). At this meeting, commenters from both the railroad industry and the hazardous materials shipping industry expressed the view that rail is the safest mode of transportation for hazardous materials over land. For example, the AAR explained that since 1980, the rate of rail accidents with a hazardous materials release per thousand rail carload has dropped by 89%. RSI noted that approximately 1.7 million carloads of hazardous materials are transported by rail throughout the United States each year and 99.98% of those shipments reach their destinations without incident. Similarly, RSI commented that statistics demonstrate that it is 16 times safer to move hazardous materials by rail, as compared to highway. Noting that it would take approximately four cargo tank trucks to deliver the amount of hazardous materials that can be carried in one rail tank car, several shippers expressed concern that if shippers were forced to transport hazardous materials via highway, the overall safety risk would increase because of the increased number of shipments on the nation's roads. Several representatives of the hazardous materials shipping industry expressed the view that rail transportation of hazardous materials is essential to the competitiveness of the U.S. chemical and agricultural industries, to the public health, safety and welfare, as well as to the economy of the United States. Dow, the largest chemical company in the world, indicated that its North American business model is based on the belief that the rail transportation of hazardous materials is the safest, most efficient, most economical, and most socially acceptable way of shipping hazardous materials over land.

Despite these safety statistics, meeting participants from both the railroad and shipping industries expressed agreement on the need for continuous improvement in the safe transportation of hazardous materials by railroad tank car, particularly in light of the Minot, Macdona, and Graniteville accidents. However, participants expressed differing views on how to accomplish that goal. Many representatives of organizations that depend on railroads for shipping hazardous materials stated that improvements in the safe transportation of hazardous materials by railroad tank car should be made only after a ''holistic'' consideration of the rail transportation system. For instance, several commenters expressed the view that not only should tank car design improvements be considered, but safety improvements should also address railroad operating and maintenance practices; railroad routing practices and how to reduce ton miles PIH materials travel due to inefficient routes; shipper commodity handling practices; and emergency response procedures. Both the Brotherhood of Locomotive Engineers and Trainmen (BLET) and the United Transportation Union (UTU) echoed several of these same concerns, particularly noting human factors issues, the prevalence of non-signalized territory, the training of crews to handle hazardous materials, and crews' access to personal protective equipment in the event of an incident. One commenter specifically suggested that DOT adopt AAR Circular OT–55-I as a regulation. Several commenters noted that the tank car is only one component of the rail transportation system, and no single component of the system can provide the entire means to improving tank car safety. Accordingly, many commenters expressed a desire for DOT to take a leadership role in addressing the safe transportation of hazardous materials by railroad tank car on a system-wide basis.

FRA and PHMSA generally agree with these commenters. Although this NPRM focuses on enhancing the tank car packaging, it also proposes certain operational restrictions specific to tank cars transporting PIH materials, and DOT's comprehensive review of design and operational factors affecting rail tank car safety is not so limited. As noted above, DOT's rail safety efforts are multi-faceted, and DOT is addressing operational issues such as human factors, track conditions, and signal and train control systems designed to prevent accidents in the first place, as well as emergency response issues intended to ensure that in the event of an incident, emergency responders are able to respond appropriately. In addition, PHMSA has issued a proposed rule that would require railroads to gather traffic and commodity data on certain explosive, radioactive, and PIH materials they transport; analyze safety and security vulnerabilities of current and alternative routes used for these materials; and select the routes that pose the least safety and security risks after considering any mitigation measures that could be implemented. *See* 71 FR 76834 (Dec. 21, 2006).

Other commenters noted the voluntary efforts already underway by many hazardous materials shippers to improve the safe transportation of their materials by rail. One example of an industry effort to address the safe transportation of hazardous materials in tank cars is the partnering of Dow and UP in a series of initiatives to improve rail safety and security, including the NGRTCP. These initiatives are discussed in more detail in Section IX above.

Railroad participants, including the AAR, CP, and BNSF, expressed the view that the railroad industry itself has taken many voluntary steps to reduce the occurrence of accidents that can lead to hazardous materials releases. For instance, a representative from BNSF presented information on the carrier's derailment prevention efforts aimed at track caused derailments, equipment caused derailments, as well as derailments relating to operating practices. BNSF's efforts include implementing advanced train control technology; utilizing various freight car condition monitoring technologies; installing and maintaining switch point position indicators and broken rail protection in non-signalized dark territory; as well as modifying the carrier's operating practices when transporting a significant amount of PIH materials over non-signalized territory. Specifically, noting that nearly 50% of BNSF's PIH movement is over non-signaled territory, BNSF explained changes in its operating practices aimed at ensuring the safe transport of PIH materials over this type of territory. BNSF noted the following changes in operating practices when transporting PIH materials over dark territory: (1) Inspecting the route prior to operating trains carrying PIH materials; (2) restricting the speed of trains carrying PIH materials to 35 miles per hour; (3) requiring that trains hauling PIH materials hold the main line during meets; and (4) requiring trains on sidings to stop before PIH trains pass. Additionally, a representative from CP presented information on the carrier's efforts, dating back to 1995, to address human factors issues in the railroad environment, including efforts directed at crew resource management, and fatigue risk management.

Noting member railroads' efforts to reduce the occurrence of accidents that can lead to hazardous materials releases, the AAR expressed the view that ''[r]esponsible planning must consider that accidents can occur'' and ''in addition to the efforts to prevent accidents, industry must also do everything it can to reduce the probability of a release of TIH [materials], such as anhydrous ammonia and chlorine, should an incident occur.'' Based on its research through the University of Illinois, AAR noted that there appears to be a significant opportunity to reduce the probability of a release of anhydrous ammonia and chlorine in the event of an accident.

AAR indicated that the University of Illinois research concluded that, utilizing existing technology, the probability of a release of anhydrous ammonia and chlorine from a tank car involved in an accident could be reduced by 65 percent or more by substituting enhanced tank cars for the cars currently used to transport these materials. AAR explained that this conclusion was premised on replacing the current 263,000 pound tank cars used for transporting anhydrous ammonia and chlorine with 286,000 pound tank cars equipped with additional head protection, thicker shells, and enhanced top fittings protection (i.e., the Trinity car).

Most commenters representing members of the hazardous materials shipping industry generally expressed support for the efforts of the AAR TCC to improve the transportation of hazardous materials by rail. However, those commenters expressed concerns with several aspects of the TCC's recent proposals. First, commenters stated that the implementation period proposed by AAR (i.e., replacing the entire chlorine and anhydrous tank car fleet within five to seven years) was unrealistic, particularly given tank car manufacturing capacity. One commenter, Terra Industries (Terra), a shipper of anhydrous ammonia, objected to AAR's proposal noting that the estimated costs to build cars to the standard would be approximately 160% higher than new ammonia cars being built today. In addition, Terra noted that because the cars would hold approximately 80% as much product as compared to current ammonia cars due to infrastructure restrictions, shippers would need more cars in order to make shipments at current levels. This, in turn, according to Terra, would increase the costs of shipping by approximately 75% before rail freight and fuel charges. Several other shippers and chemical manufacturers echoed Terra's concern regarding reduced capacity, noting that infrastructure restrictions of many facilities and some shortline railroads would prohibit utilizing a car weighing 286,000 pounds. These commenters also noted that this reduced car capacity could lead to an increased number of railroad tank car shipments, and in the case of anhydrous ammonia, a shift from rail transportation to highway transportation.

Terra also noted that AAR's approach was inconsistent with the NTSB's recommendations in response to the Minot accident. Specifically, Terra stated that the NTSB's report for the Minot accident indicated that the construction of tank cars with sufficient impact resistance to eliminate or reduce leaks would require an evaluation of the dynamic forces acting on the tank cars in an accident situation, as well as an integrated analysis of the response of the tank's structure and the tank material to these forces. Terra noted that AAR's proposed approach considered none of these factors.

Similarly, noting FRA's on-going research with Volpe, several commenters stated that any potential tank car design improvements should take into consideration the results of the Volpe research. Commenters generally noted that improved tank car design is dependent on understanding and defining the environment in which the tank car is expected to perform. FRA and PHMSA agree that in order to design an enhanced tank car with increased accident survivability, an understanding of the forces acting upon a tank car in a typical derailment or collision scenario is necessary. Accordingly, FRA has aggressively accelerated its research efforts related to tank car integrity and, as discussed above, FRA is working cooperatively with industry to leverage R&D resources. We will continue to update this docket to reflect the results of our ongoing research efforts and, as indicated above, may incorporate research results in a final rule developed as a result of this NPRM.

Several commenters further expressed the view that the overriding goal of any effort must be to prevent accidents from occurring in the first place and that AAR's proposal does not address the root causes of accidents (e.g., operating factors). Again, FRA and PHMSA agree with commenters in this respect. As described above, FRA is aggressively working through a comprehensive action plan to not only improve the integrity of tank cars used to transport hazardous materials, but to address the root causes of such accidents as well.

B. December 14, 2006 Public Meeting

Although commenters at the second public meeting, which was held on December 14, 2006, raised many of the same issues discussed at the prior public meeting, discussion at the meeting focused on a series of nine questions posed by PHMSA and FRA in the meeting notice publication. *See* 71 FR 67015 (Nov. 17, 2006). Attendees again included representatives from the railroad industry, shipping industry, railroad tank car manufacturing and repair companies, Transport Canada, and TSA.

First, PHMSA and FRA asked what new designs, materials, or structures DOT should be investigating for improved accident/derailment survivability of hazardous materials tank cars. In response to this question, CI expressed the view that advances in material science present an opportunity to investigate new materials for the construction and protection of tank cars. For example, CI noted advances in steelmaking practices, composites used for insulation, materials used for thermal protection, as well as crash energy management materials. Similarly, Trinity explained that the AAR TCC has an ongoing program evaluating non-traditional steels for tank car construction (*i.e.*, steels not typically used in the construction of railroad tank cars) and suggested that DOT should actively participate in, and fund, this activity. FRA notes that it is an active participant in the AAR task force evaluating these steels, and FRA looks forward to continuing to work with industry on this research. CI commented further, however, that prior to the use of any of these new materials, DOT and industry would need to conduct appropriate research, utilizing real world accident data. To that end, CI noted its ongoing research through Structural Reliability Technologies, which preliminarily identified certain materials as having the potential to improve accident survivability of hazardous material rail cars.

ARI stated that in order to accommodate material advances, certain existing DOT regulatory requirements may need to be revised. For example, ARI noted that the J-type tank car requires a metal external jacket for fire protection purposes, but because fire protection is now provided through layers of insulation, the metal jacket is not necessarily needed any longer. Instead, ARI explained that certain carbon fibers may better serve the purpose of the metal jacket. As discussed in more detail in the Section-by-Section analysis below, this NPRM proposes to retain the requirement that tank cars used to transport PIH materials be equipped with metal jackets. DOT, however, invites further comments on the efficacy of maintaining this requirement or suggestions for effective, feasible alternatives.

On behalf of the NGRTCP, a representative of Dow generally explained the new designs, materials, and structures being explored by the project. The commenter noted that the current rail car design for the typical jacketed pressure car relies on the inner tank to serve three functions: (1) Contain the commodity; (2) carry all train stresses and loads; and (3) protect the commodity from external forces. The NGRTCP is evaluating the potential to separate these tank functions, so that the inner tank's primary purpose is to contain the commodity and then effectively add layers of functionality to address train stresses and loads and protect the inner tank from external forces. This commenter also noted that the current jacketed pressure car is made up of three components: (1) An outer shell or jacket, (2) an interstitial space (typically 10–12 inches for a chlorine tank car), and (3) the inner tank and that the NGRTCP is analyzing what can be done to improve tank car survivability by utilizing the interstitial space.

Dow further explained that the NGRTCP was evaluating two high-level tank car designs. The first design under evaluation is how a typical jacketed pressure car could be improved by adding layers of functionality and incorporating alternative technologies, particularly in the interstitial space. The second design under evaluation by the NGRTCP is similar to a DOT 113/115 tank-within-a-tank design. The primary purpose of the inner tank in this design is to contain the commodity. The interstitial space and outer structure of the tank is then used to bear trainload stresses and protect the inner tank from external forces. A tank-within-a-tank approach allows the inner tank to be designed around the physical and chemical properties of the material being transported and allows for several different alternatives for designing the interstitial space and the outer tank structure to bear trainloads and protect the inner tank. For example, Dow explained that the inner tank could potentially be made of a thinner steel than that used in current cars and wrapped in a composite material. Additionally, deformable materials could be used to create ''crumple zones'' in the interstitial space; the outer structure of the tank could be constructed of a different type of steel, not necessarily suitable for use in a typical pressure car; and potentially an impact resistant coating could be applied to the outer structure. Dow noted that this could possibly result in a stronger tank, which weighs less than the current design.

The Department encourages industry to continue evaluating the potential use of the new materials, new types of steel, and alternative designs discussed at the meeting. FRA believes that, by utilizing existing technology, a significant improvement can be made to enhance railroad tank car accident survivability. Accordingly, the performance standards for enhanced head and shell protection set forth in this NPRM are technology-neutral and are intended to allow for the most design, material, and manufacturing flexibility, while significantly improving the accident survivability of railroad tank cars. We ask commenters to submit data and information concerning alternative strategies for enhancing accident survivability that may be as effective as, or more effective than, the enhanced head and shell protection measures proposed in this NPRM.

Second, PHMSA and FRA solicited information regarding tank car top fittings. Specifically, the agencies asked whether there were any design changes that would enhance the survivability of tank car top fittings (*e.g.*, modifications to height or placement of valves or modifications to the protective structure that surrounds the valves). In response to this question, commenters generally agreed that two of the most important factors for top fitting survivability in an accident are lowering the profile of the fittings to reduce vulnerability and strengthening the protection surrounding the fittings. Along those lines, a few commenters representing the railroad industry suggested that the ultimate goal of enhancing top fittings protection should be a tank car with only a flange on the pressure plate that could be skid- or roll bar-protected, or a tank car that could be shipped with no fittings, requiring that the fittings be installed at the point of unloading. In response to the idea of a tank car being shipped with no fittings, however, shippers generally expressed concern with the safety and compatibility of such a system given existing plant infrastructure and the regulatory scheme surrounding tank car unloading. Trinity suggested that DOT could facilitate improvements in top fittings protection by modifying the regulations to require lower profiles and by replacing the current hardware-specific requirements with a performance standard. As noted in Section IX above, CPC–1178 would require anhydrous ammonia and chlorine tank cars constructed after January 1, 2008 and used in interchange to have top fittings designed to withstand a rollover with a minimum linear velocity of nine mph. See discussion in Section V above on interchange requirements.

Although DOT is aware that incidents involving tank car top fittings do occur, historical accident data demonstrates that top fittings are not a significant factor in attempting to reduce the risk associated with large product losses. For example, considering the more than 2 million chlorine shipments between 1965 and 2005, only 1 of the 14 losses in accidents from top fittings was reasonably deemed substantial, with 1,000 gallons lost. During the same time frame, the next largest chlorine release from top fittings in an accident involved 100 gallons, while the remaining 12 top fitting losses in accidents were small amounts, many of them 10 gallons or less, with an average loss of approximately 13 gallons. None of these incidents resulted in injuries. At the same time, catastrophic losses from tank-head or shell punctures averaged approximately 10,000 gallons per accident. These data demonstrate that failures or breaches of tank car heads or shells tend to lead to large quantities of chemicals released, and accordingly, pose the greatest safety risk.

Despite the minimal risk of substantial releases from tank car top fittings in accidents, FRA and industry are actively researching methods for enhancing tank car safety through modifications to top fittings. FRA has an ongoing research program focused on improving the performance of tank car top fittings in the event of roll-over incidents. Additionally, both the TCC and the NGRTCP are investigating potential improvements to top fittings. The TCC is examining the effectiveness of various fitting protection devices and the feasibility of using recessed fittings. The TCC has indicated that initial simulations of these concepts demonstrate potential for providing significant protection, particularly at higher speeds. The NGRTCP is examining potential improvements including (1) Lowering the profile of the fittings; (2) reducing the number of valves; (3) the use of internal closures; and (4) redesign of the pressure relief valve. We expect that modified top fittings will be ready for service trials in early 2008.

Although the research appears promising, at this time it is inappropriate to propose new standards (by rulemaking or otherwise) for top fittings protection because it is not yet clear what modifications would provide a substantial improvement in the ability of top fittings to:

(1) Withstand accident conditions, while providing at least the same level of protection from non-accident releases,

(2) Continue to work with industry's existing loading and unloading infrastructure, and

(3) Maintain compatibility with current emergency response requirements (e.g., compatibility with Emergency Kit C, which is used to contain leaks in and around the pressure relief device and valves in the case of chlorine tank cars).

We expect that FRA's research, together with the findings of the TCC and NGRTCP, will lead to a consensus-based industry standard for enhanced tank car top fittings protection. Provided that the design does not deviate from Federal regulations, the Department will evaluate implementation. If the consensus design does deviate from Federal standards or if the Department deems that the industry actions are not sufficient, we will propose revised Federal standards for top fittings in a separate rulemaking proceeding as early as next year. To support these efforts, the Department intends to hold a public meeting early next year to discuss the need for revised top fittings standards. Parties wishing the Department to consider proposed revised top fittings standards may, of course, petition the Department at any time for a rulemaking to change the existing Federal standards. 49 CFR 106.55.

As discussed in Section I above, improving the safety and security of hazardous materials transportation via railroad tank car is an ongoing process. As we continue our comprehensive review of tank car safety, we anticipate holding additional public meetings to address relevant issues other than those contained in this NPRM. At this time, however, because the loss of lading from side or head impacts in accident scenarios presents the greatest risk, FRA is concentrating its efforts on those areas for purposes of this rulemaking. We do, however, invite commenters to provide any data or other information relative to potential modifications to tank car top fittings or potential enhanced safety standards for fittings, including the design of fittings utilized on the Trinity tank car. Commenters may also wish to provide data and information concerning the costs that would be incurred to modify tank cars built to the performance standard proposed in this NPRM to incorporate enhanced fitting designs. We also remind interested parties that any person may petition the Department to initiate a rulemaking proceeding regarding issues relevant to the transportation of hazardous materials by rail. 49 CFR 106.55.

The third question posed by PHMSA and FRA pertained to tank car puncture-resistance (including the puncture-resistance of the head and shell), and specifically whether there are any design, material, or manufacturing changes that could lead to improved tank car puncture-resistance. In response to this question, a representative of the NTSB suggested that the relevant issue should not be limited to what PHMSA and FRA termed ''puncture-resistance.'' Instead, the NTSB noted that low-speed impacts by large objects lead to structural deformation and possible puncture, and accordingly, any structural deformation and puncture must be looked at together as an issue of structural impact and response.

DOT recognizes NTSB's point with regard to the specific term ''puncture resistance.'' However, DOT's research efforts are aimed at improving the accident survivability of railroad tank cars, and in examining this issue, DOT is considering not just the ability of a tank car to resist puncture, but as noted in Section X above, the agency has analyzed the equipment's overall structural response to head or shell impacts. DOT believes that an understanding of a tank car's overall structural response to impacts is necessary in any effort to improve the ability of a tank car to maintain its integrity under accident conditions. However, DOT believes that for purposes of regulatory language setting forth a performance standard regarding a tank car's ability to maintain its integrity under accident conditions, the term ''puncture resistance'' is an accurate representation of the performance that needs to be achieved (i.e., the tank car maintains its integrity such that no lading is released as a result of the impact). Accordingly, in this NPRM, DOT has maintained the term ''puncture resistance.''

The NTSB also stated that any new tank car design should take advantage of the large increase in structural stiffness and strength that results from coupling two rigid shells together, as opposed to a floating tank-within-a-tank design. The NTSB further suggested that the materials utilized between the inner and outer shells should be designed so that they can serve as a local impact energy dissipation momentum transfer mechanism, effectively spreading out the impacting force. Following the NTSB's line of reasoning and noting that pressure within a tank is a ''pushback'' against external forces, ARI expressed the view that consideration needs to be given to lowering the internal pressure of tank cars (depending on the vapor pressure of the commodity contained in the car), so that impact forces result in deformation to the tank shell, rather than a puncture of the shell.

Commenters generally noted that several concepts aimed at improving tank car puncture-resistance are currently being explored in the industry, or could be explored. For example, Trinity suggested that tank-head protection could be provided by ultra-high strength, non-formable, flat plates such as armor plating, thereby permitting tank-head thickness to be reduced to that required to contain the internal pressure. CI commented that improving puncture resistance is the single most important design factor in enhancing accident survivability. To this end, CI noted that through its ongoing research with Structural Reliability Technologies (SRT), it is looking at potential improvements through a combination of new material for tank and/or jacket construction (e.g., high strength/low alloy steels) and the incorporation of energy-absorbing materials into the configuration of tank cars and tank car jackets. Commenters also suggested that DOT consider technologies utilized in other industries. For example, one commenter noted antiterrorism industry projects regarding self-sealing technologies. DOT, together with TSA and industry, are currently investigating the potential of utilizing self-sealing technologies on hazardous material tank cars to aid in the quick repair of the tank in the event of a breach. DOT believes that this research is promising, particularly in the context of ballistic impacts. However, the technologies appear to be of limited utility in the repair of tank breaches resulting from derailments and other collision scenarios where the area breached tends to be larger than what results from ballistic impacts.

Dow, on behalf of the NGRTCP, explained that in connection with improved puncture-resistance, the project is examining different types of steels (e.g., the current TC–128 with varying sulfur contents, as well as other types of steels not currently used in railroad tank car construction). In addition, the NGRTCP is considering structural foams as energy absorbing and diffusing materials, as well as crash energy management systems, impact limiters, the use of deformable materials (particularly based on experience in the automobile racing industry), and impact resistant coatings.

In the fourth question, PHMSA and FRA solicited information pertaining to whether there were measures, other than accident survivability, such as improved security of operating fittings, or an ability to locate cars beyond current car movement reporting systems, that could improve the overall safety and security of hazardous material shipments via railroad tank car. In response to this question, commenters generally noted the many voluntary efforts, which are already underway in both the shipping and railroad industries, designed to detect hazardous materials leaks, monitor the temperature and other conditions of materials being transported in railroad tank cars, and track the locations of railroad tank car hazardous material shipments. Although commenters generally expressed the view that the existing car movement reporting system, including the automatic equipment identification system, is sufficient for purposes of locating shipments in a timely fashion, most commenters expressed support for utilizing additional location monitoring and other shipment monitoring technologies (e.g., car securement sensors, temperature sensors) depending on the commercial viability of the technologies and the risk presented by the product being shipped.

The fifth question PHMSA and FRA posed at the public meeting pertained to whether, in addition to accident survivability, tank cars should be designed to withstand other types of extraordinary events (e.g., ballistic attack or unauthorized access to tank car valving). In response to this question, one shipper commented that tank cars should not be designed to withstand extraordinary events. Instead, the environment in which tank cars operate needs to be modified to prevent such extraordinary events as derailments. Other commenters suggested that tank car design changes should be made to prevent unauthorized access to the cars' contents and to potentially withstand ballistic attack. Generally, however, commenters recognized the need to examine any such potential changes on a risk basis, taking into consideration whether such requirements would be cost effective in particular situations given the risk presented by a particular commodity.

Noting that the HMR currently include performance standards for coupler vertical restraint systems, pressure relief devices, tank-head puncture-resistance systems, thermal protection systems, and service equipment protection, the sixth question PHMSA and FRA posed at the public meeting pertained to whether those standards are adequate for future tank cars, and if not, what areas and aspects of railroad tank cars need to be improved. In response to this question, Trinity suggested that the current requirement in the HMR for top fittings protection on pressure cars (49 CFR 179.100–12) is not a performance standard and should be made one. In addition, Trinity suggested that the HMR should be updated in other areas, such as bottom outlet protection and requiring normalized steel for pressure cars, to make the regulations consistent with industry standards. Echoing comments raised at the initial public meeting, CI suggested that all railroad freight cars be equipped with double shelf couplers to avoid couplers on non-hazardous materials cars from becoming disengaged and breaching a tank car containing hazardous materials. FRA is actively researching the potential benefits of modifying freight car couplers (e.g., the use of push-back couplers or other coupler technology advancements) to potentially reduce the likelihood of a tank car being punctured by the coupler of another car during an accident. If the results of FRA's research demonstrates that such coupler modifications would increase safety cost-effectively, FRA will consider such a requirement in a future rulemaking proceeding.

Commenters generally expressed a preference for the development of performance standards, as opposed to hardware-specific requirements. Commenters noted, however, that there is not uniform agreement on what constitutes a performance standard. For example, CI stated that a performance standard is something that is physically verifiable, that can be tested to, considers risks and benefits, and that can be applied to new technologies and new designs. However, CI noted that the probability of release is not something that can be tested to. Trinity also expressed support for utilizing performance standards in the tank car regulations. Trinity suggested that any performance standard should also include at least one default hardware-specific standard that can be applied by those who do not have the time or resources to develop their own performance-based design. As an example, Trinity cited AAR's CPC–1176, which contains both a performance standard and a default design standard conforming to the performance standard. Expressing the view that CPC–1176 is a true performance standard, AAR encouraged the Department to use the work already done by the TCC.

We agree with an approach that specifies a performance standard. In fact, in the final rule relating to Crashworthiness Protection Requirements for Tank Cars,[48] we agreed with commenters that a performance-based standard for shell-puncture resistance could have merit over a specification-based standard. At that time, however, we did not have the data to support a performance-based standard. Since then, we have assembled enough research and data to allow for the promulgation of a performance-based standard, which will foster new technology and provide design, material, and manufacturing flexibility.

The seventh question on which PHMSA and FRA solicited information pertained to how the agencies should consider risk factors in determining whether to require tank car safety and security enhancements. For example, the agencies asked whether the risk of the car/commodity pair should be considered so that improvements would first apply to the car/commodity pairs considered to have the greatest risk or for which the car/commodity pair would benefit most from the improvement. In addition, the agencies solicited information on what other risk factors should be considered.

In response to this question, commenters generally maintained that tank car safety and security enhancements should be based on the hazard of the commodity involved, as well as the existing tank car safety features, materials, and methods of construction. For example, CI stated that the appropriate way to prioritize tank car safety enhancements is to start with those commodities that have the greatest consequence and greatest likelihood of causing consequences if released. Accordingly, CI concluded that starting with PIH materials was logical. Similarly, citing its efforts at developing an enhanced tank car standard, AAR commented that tank car safety improvements should first focus on the cars carrying commodities that are hazardous to human health (i.e., PIH materials). Even more specifically, AAR suggested that those PIH materials with the highest hazards and those shipped most often, should be addressed first. With regard to the tank car itself, ARI noted that the better protected a tank car is at the present time, it should be one of the last cars retrofitted or taken out of service. In addition, ARI expressed the view that the order in which cars are retrofitted or taken out of service should be left to car owners.

We agree that car owners need a certain amount of flexibility in managing improvements to their tank car fleets. Accordingly, this NPRM proposes an implementation period spread over eight years during which car owners are free to manage the implementation of the proposed enhancements within their fleets, provided certain milestones are met. The NPRM does provide, however, that five years after the effective date of the final rule, tank cars manufactured using non-normalized steel for head or shell construction would no longer be authorized for the transportation of PIH materials.

The eighth question posed by PHMSA and FRA pertained to whether the installation of bearing sensors or other on-board tracking/monitoring systems capable of monitoring, for example, tank car pressure, temperature, and safety conditions, would improve the safety and security of hazardous materials shipments by railroad tank car and, if so, whether implementing such a system is feasible.

In response to this question, commenters generally noted that many hazardous materials shippers have already implemented onboard tracking and monitoring systems for a variety of reasons. A representative of the NGRTCP noted that it was expected that certain on-board tracking/monitoring systems would be included in the Next Generation Rail Car design, but that many detailed practicalities of such a system would need to be addressed (e.g., monitors attached to individual cars or through a system of wayside detectors, the utilization of data collected and communication of that data to affected parties).

The final question posed by PHMSA and FRA pertained to whether the installation of electronically controlled pneumatic (ECP) brake systems on tank cars would improve the safety of hazardous materials shipments by railroad tank car. Only Trinity and a representative of the NGRTCP responded to this question. Expressing the view that for ECP brakes to be effective, all equipment in a train would have to be equipped with such brakes,

[48] *Crashworthiness Protection Requirements for Tank Cars; Detection and Repair of Cracks, Pits, Corrosion, Lining Flaws, Thermal Protection Flaws and Other Defects of Tank Car Tanks*, 60 FR 49048 (Sept. 21, 1995).

Trinity commented that ECP brakes would be of little or no benefit to improving hazardous material safety. A representative of the NGRTCP, however, noted that the Next Generation Rail Car will probably incorporate a duality of systems—a traditional brake system with the anticipation of ECP brakes. This commenter further noted that the implementation of ECP brakes is a long-term issue. Although FRA encourages industry to pursue implementation of ECP brake technology as expeditiously as possible, and is encouraged by NGRTCP's representation that a new tank car design may incorporate the duality of brake systems, FRA recognizes that this is a long-term issue affecting the entire railroad industry, and accordingly, such a requirement is outside the scope of this rulemaking.

C. March 30, 2007 Public Meeting

The third public meeting was held on March 30, 2007. At this meeting, FRA explained that DOT is aggressively working to develop a performance standard for an enhanced tank car design, which will allow innovation and foster new technology in the tank car design process. FRA, through representatives of Volpe, presented its preliminary research results regarding tank car survivability, and solicited comments from meeting participants on several specific ideas regarding how DOT was considering moving forward with the development and implementation of a performance standard based on that research. In addition, on behalf of the AAR, Christopher P.L. Barkan, Ph.D., of the University of Illinois at Urbana-Champaign, Railroad Engineering Program, presented the results of a risk analysis performed by the University on behalf of AAR pertaining to PIH materials transported by railroad tank car.

First, FRA noted that, in light of the NTSB recommendations in response to the Minot accident and the mandates of SAFETEA–LU, the agency's current research efforts regarding tank car survivability are primarily focused on tank-head and shell performance. In response, commenters stated that DOT should also consider enhancements to top fittings protection in any rulemaking designed to improve tank car accident survivability. As discussed previously in this section, although we believe that improvements to tank car top fittings may be one method of enhancing tank car safety, we are not proposing new standards for top fittings protection at this time because the research demonstrating the efficacy and feasibility of such enhanced standards is not yet complete. Additionally, based on historical accident data, the greatest likelihood of a catastrophic release of material from a tank car is through the tank-head or shell, not the fittings. Accordingly, this NPRM focuses on enhancing tank-head and shell impact resistance. FRA will, however, continue to investigate potential improvements to tank car top fittings and if appropriate, will pursue such improvements in a separate rulemaking proceeding.

Second, Volpe made presentations relating to FRA's tank car research program. Volpe's presentations focused on three aspects of FRA's ongoing tank car research program: (1) Derailment dynamics analysis (designed to calculate ranges of closing speeds and incidence angles between cars involved in pile-ups); (2) dynamic structural analysis (designed to estimate the forces corresponding to closing speeds for head and shell impacts); and (3) damage assessment (designed to estimate deformations to tank-heads and shells and the force at which puncture is expected to occur). Volpe explained that the key results of the derailment dynamics study are that (1) train speed has the most significant effect on the number of cars that derail, and (2) closing speed (that is, the car-to-car impact speed) is approximately one-half the train speed at which the derailment occurs.

In response to Volpe's presentations, meeting participants posed several questions. A few participants questioned why FRA did not explicitly model the Minot or Graniteville derailments and what efforts have been made to relate the modeling results to real world scenarios. Similarly, noting that Volpe's derailment dynamics models were ''straightforward'' models that consider just one force acting against a car, one commenter noted that real life derailment situations are generally more complicated. As noted in Section X, above, FRA's research was initially aimed at developing a derailment model specific to the Minot accident. However, due to the inherent complexities and variables surrounding any derailment situation (e.g. track layout and condition, three dimensional topography of the local terrain, car type and location within train consist), the initial and boundary conditions of particular accident scenarios cannot be reasonably ascertained. Additionally, the initial perturbation (i.e., the train speed and track location) resulting in derailments is not precisely known. Accordingly, FRA revised its research objective to define a generalized derailment situation identifying the salient features of derailment situations based on historical accident consequences. This information was then used to establish more easily analyzed impact scenarios (i.e., post derailment car-to-car interactions; and the speeds, orientations and trajectories of the cars as a function of location in the train).

Commenters also noted that although Volpe apparently used two different models in its derailment dynamics study, only the results of one model were presented in detail. As noted at the public meeting, although Volpe utilized two models to investigate the derailment kinematics, each of the models predicted the same trends. Accordingly, for ease of presentation, only the results of the ADAMS (Automatic Dynamic Analysis of Mechanical Systems) model were presented in any detail at the meeting because of the ability of the ADAMS software to provide animations of the results.

Noting that Volpe's presentation showed that the highest closing speed occurs for the last car that allows the coupler to break, one commenter questioned what would happen if more couplers were allowed to break and whether it was expected that the highest closing speed would always occur at the point. FRA explained that the highest closing speed may occur at the point of the last coupler break, but again noted that the average closing speed between cars is approximately one-half the initial train speed. In addition, because software limitations only allowed the modeling of up to ten coupler breaks in a particular scenario, FRA stated that before any more concrete conclusions can be drawn, further research would be necessary.

Another commenter inquired as to how much variation in force the derailment model could predict and whether Monte Carlo techniques (i.e., a type of computational algorithm utilizing random numbers and probability statistics to simulate the behavior of physical or mathematical systems) should be applied to try to develop a more statistical understanding of the potential variability. FRA noted that although Monte Carlo techniques could be applied, FRA's first and foremost focus is on predicting the salient car-to-car interactions that take place during derailments. FRA intends to analyze the forces achieved in other modeling programs using non-linear large deformation crush calculations and validate the models by full scale testing.

Commenters also questioned why the baseline car mass utilized in the derailment dynamics study was 150,000 pounds (which does not represent a typical light car or a typical loaded car) and whether the initial angular velocity used to cause a derailment has a large effect on the number of cars derailed and/or the secondary car-to-car impact speeds. In response, FRA explained that the baseline values utilized in the study were varied +/−20% to +/−50%. Further, FRA noted that a sensitivity analysis of the results from generalized derailment scenarios demonstrated that both car mass and initial angular speed causing a derailment are very weakly correlated to the number of cars that derail. Instead, the highest sensitivities are associated with initial train speed and the ground friction experienced.

Stating that, in most real-world accident scenarios, tank cars are impacted by ''coupler like'' objects, one commenter questioned the use of a square flat-surface ram in Volpe's modeling to impact the tank-heads and shells while another commenter questioned why the collision dynamic model of a car is shaped like a cube. Specifically, Trinity noted that in its own crashworthiness analysis performed on the newly designed Trinity car, a rigid coupler head was used as the impacting object. Further, Trinity noted that after the crashworthiness analysis was completed, the results were compared with real-world accidents, as well as the type of punctures and tank deformations that occurred. Trinity further reported finding a good correlation between their crashworthiness analysis and the shape of punctures and deformations found in real-world accident vehicles.

FRA responded that the collision dynamics model is a lumped mass model connected by non-linear springs and that the masses are treated as rigid objects. Further, the collision dynamics model uses as an input the force-crush characteristics predicted or measured from analysis and testing. This input is derived through the application of the simplified collision scenarios defined for the performance standards. The shape of the force crush characteristic is weakly affected by the impactor size for a range within +/−50 percent of that prescribed in the testing program. If the impactor size was sufficiently small, then the mode of material failure initiation would change. The impactor size chosen for the baseline testing captures the salient deformation and failure modes observed in accidents and testing. Accordingly, neither the shape of the impactor or the car is determinative. FRA further explained that in accident scenarios, a tank car may be impacted by a variety of different objects (e.g., couplers, pieces of rail, rail car trucks, other car draft sills, side sills) and accordingly, the goal of FRA's current research is to develop a standardized method for comparing the relative performance between different tank car designs, regardless of what the impactor is in a particular scenario. Additionally, as Volpe noted at the meeting, the simulations have resulted in modes of deformation that are similar to the deformations found in accident vehicles.

Another commenter also noted that the modeling presented by Volpe at the meeting addressed main line derailments only and questioned whether FRA intended to expand the analysis to collision scenarios. In response to this comment, FRA explained that generally, collisions degenerate into derailment-like situations. Accordingly, the secondary car-to-car interactions obtained through Volpe's modeling and review of historical accident consequences provided a methodology to simplify the impact conditions such that a generalized performance standard for two cars interacting could be identified. Utilization of this performance standard compares the relative performance between different tank car designs, and FRA further plans to investigate the use of pushback couplers and deformable anti-climbing systems to decrease the aggressivity between new and older tank car designs in the future.

With regard to the dynamic structural analysis, noting the apparent ductile properties of the model materials (i.e., that the elliptical head almost turns itself inside out), one commenter questioned what type of material model was being used. At the meeting, Volpe explained that the tensile strength of the material being modeled is the minimum required for TC–128 steel. Further, DOT noted that the results presented were of an empty tank, where material failure was not allowed. The results represented the first step in a series of models that gradually build in complexity—starting with an empty tank and applying first elastic, then elastic with plastic loadings, and finally building up to material failure. After the model results are checked against analytical solutions available in literature, pressurized fluid tanks will be evaluated in the same manner.

At the meeting, Volpe also addressed the full-scale impact tests being performed on existing DOT 105A500W cars in an effort to develop a methodology for assuring a minimum level of tank integrity, defining the conditions for which a tank car is capable of maintaining its contents, and identifying the maximum speed at which a tank car can survive the generalized impact scenarios developed in the derailment dynamics study. In response to this portion of Volpe's presentation, commenters raised two main concerns. First, commenters questioned how the pressure and outage requirements used in the tests to establish the baseline performance of current tank cars were chosen. DOT explained that although a pressure and outage that could be expected in everyday transport were utilized (i.e., 10.6 percent outage, 100 psi pressure), because the goal is to establish the relative performance of different tank car designs, such parameters are ultimately irrelevant, provided the same pressure and outage is used for all cars analyzed. In other words, in order to establish the relative performance of different tank car designs, all designs must be tested under the same initial and boundary conditions (including weights, pressure, and outage).

Second, commenters again questioned why DOT was performing ''simplified tests'' and not examining the effect of applying multiple forces simultaneously in different locations on tank cars. DOT responded that its goal is to establish the relative performance of different tank car designs by developing a safe and simple test that is relatively easy to set up and conduct, easy to analyze, and provides repeatable results. FRA reiterated that it did not intend to conduct a test that represents any particular accident situation. Instead, FRA's goal is to establish a test that provides the salient and predominant failure modes observed from historical accident consequences in a consistent manner.

At the March 30, 2007 meeting, FRA also presented several specific ideas regarding how DOT was considering moving forward, given the results of Volpe's research. FRA noted that it was considering imposing a 50 mph speed restriction on all tank cars carrying PIH materials. Assuming a 50 mph speed restriction, based on Volpe's research anticipating a closing speed of 25 mph in the event of a derailment or collision, FRA stated that it was also considering setting a performance standard requiring tank cars to be constructed such that tank-heads and shells would resist puncture or other catastrophic loss from impacts at speeds around 25 mph. Because any necessary tank car fleet change out would require a reasonable implementation period, as an interim measure, FRA noted its consideration of imposing an interim 30 mph speed restriction in dark territory for trains transporting PIH tank cars of current designs, based on the higher train mile collision risk and the increased derailment risk present in dark territory.

In response to FRA's ideas, one commenter noted that FRA's proposal presented a ''one-size-fits-all'' approach to enhancing PIH transportation via railroad tank car. This commenter noted that there are many PIH materials that do not pose the same dangers as materials such as chlorine and anhydrous ammonia. This commenter expressed the view that FRA's proposal would be ''extremely penalizing'' to those other materials.

For uniformity purposes, in its regulations, DOT has historically addressed hazardous materials as a class. Employing this rationale, DOT decided that, for the purposes of the present rulemaking, it would similarly address PIH materials as a class. Moreover, while some PIH materials may not pose as great a threat to the public and the environment as other PIH materials, it is in the public's best interest that all PIH materials are transported in the safest manner possible. Additionally, in this proposed rule, DOT has identified a performance standard rather than a specific standard, which provides the regulated community with the flexibility to design an enhanced tank car with features that are appropriate for the type of PIH materials that the car will transport.

Other commenters questioned whether risk would be considered and how benefits of implementing such new requirements would be quantified. Lastly, one commenter expressed the view that given current tank car manufacturing capacity, a five- to ten-year implementation period would be reasonable. This commenter further noted that existing tank cars designed to carry anhydrous ammonia could be retrofitted and utilized to transport materials other than PIH materials, but existing chlorine cars, however, would probably need to be replaced.

XII. Proposed Rule and Alternatives

The proposed rule would seek to control destructive forces brought to bear on tank cars in the course of derailments and collisions by establishing a maximum speed limit and by enhancing the ability of the package to withstand those forces by making it more crashworthy. Although the proposed rule would establish a performance standard for head and shell puncture-resistance, this is most likely to be achieved by a strategy to absorb energy short of breaching the tank. The proposed rule would also impose a more stringent limit on train speed during the period tank cars of current design remain in use. There may be other means of achieving the same end results (e.g., protecting persons from the effects of PIH materials released into the atmosphere), and DOT invites comments that might identify such means and describe how their effectiveness might be verified.

Mitigation of harm from accidental releases is a major component of any effort to improve the safety of hazardous materials transportation. DOT engages in significant actions to help prepare emergency responders for hazardous materials releases. For instance, PHMSA periodically publishes an Emergency Response Guidebook, which provides information on initial steps to take to respond to hazardous materials accidents, with the objective of ensuring that it is present at every command center and on every emergency vehicle. As noted above, the railroad and chemical industries conduct outreach to local authorities through the TRANSCAER® program. In March 2005, the AAR, with FRA encouragement, adopted an amendment to its Circular No. OT–55, which established procedures for providing information to local emergency response agencies concerning the top 25 hazardous materials transported through their communities.

Ensuring the availability of detailed hazardous materials information, when an event does occur, is also a critical means of mitigating the consequences of a release. The HMR require that railroads maintain hazardous materials information on-board trains reflecting the position of cars in the train, and hazard information regarding the commodities transported in specific rail cars.[49] FRA actively enforces these requirements through periodic audits of railroad information systems and through review of documentation on-board trains.

In response to the accidents detailed in this notice, FRA approached the AAR and requested consideration of additional action to ensure that detailed and specific hazardous materials information, including the position of cars in the train, is readily available to emergency responders even when crew members are disabled or otherwise unable to contact responders at the scene. FRA conducted two meetings with the AAR, various railroads, and emergency response organizations to discuss enhancements to the emergency response system that would ensure emergency responders have access to necessary information during incidents and accidents. As a result of the discussions, and in response to the positive comments from the emergency response community, CSX Transportation (CSXT) and Chemtrec, the chemical industry's 24-hour hotline, entered into a pilot project in August of 2005, to test improvements. The pilot project consists of providing access to the Chemtrec watchstanders, who have direct communications with emergency responders, to CSXT's information network where they can obtain virtually real-time information, either verbally or via electronic means, almost immediately after receiving notification of an incident or accident. This system relies in part on train position information from CSXT locomotives equipped with Global Positioning System receivers and means for communicating the position to the CSXT operations center, together with a geographic information system on which the information is displayed. This is a capability not yet fully available elsewhere in the industry, but it could be acquired. PHMSA and FRA request that commenters address the following questions: (1) Are other rail carriers considering the implementation of emergency response communications systems similar to that currently being tested by CSXT? (2) Are there impediments to more widespread implementation of such communication systems? If so, how should these impediments be addressed? (3) Should the Federal government promote more widespread adoption of such communication systems? If so, how could this be accomplished?

More generally, we ask commenters to consider the relationship between effective emergency response actions and risk reduction. As indicated above, the HMR address risk in two ways—that is, the regulations are intended to reduce the risk of an accident occurring and to minimize the consequences of an accident should one occur. Commenters may wish to provide comments concerning the extent to which effective emergency response, including proactive measures such as alert warnings, evacuations, and shelter-in-place directives, affects the basic risk equation (risk = the probability of an accident multiplied by the consequences of an accident) and whether there are ways to combine more effective emergency response with accident prevention measures to enhance overall safety.

Similarly, Dow's safety program for these products is exploring more effective tracking and remote monitoring of tank cars so that, in the case of an incident or accident, critical parameters such as geographic location, internal pressure, or product

[49] 49 CFR part 172, subpart G; 49 CFR § 174.26.

temperature might be determined and provided to emergency responders. PHMSA and FRA invite commenters to address the extent to which this strategy promises advances in safety that might substitute, in whole or in part, for the proposals contained in this NPRM. We also ask commenters to discuss whether there are additional regulatory options that should be considered.

XIII. Section-by-Section Analysis

Part 171

Section 171.7—Reference Material

Existing § 171.7 addresses reference materials that are not specifically set forth in the HMR, but that are incorporated by reference into the HMR. We propose to amend § 171.7(a)(3), the table of material incorporated by reference, to add the entry for AAR Standard S–286–2002, Specification for 286,000 lbs. Gross Rail Load Cars for Free/Unrestricted Interchange Service, revised as of September 1, 2005. AAR Standard S–286–2002 is the existing industry standard for designing, building, and operating rail cars at gross weights between 263,000 pounds and 286,000 pounds. By incorporating AAR Standard S–286–2002 into the HMR, we will ensure that tank cars exceeding the existing 263,000 pound limitation and weighing up to 286,000 pounds gross weight on rail are mechanically and structurally sound.

Part 173

Section 173.31—Use of Tank Cars

Existing § 173.31 addresses the use of tank cars to transport hazardous materials and contains various safety system and marking requirements. This NPRM proposes to revise existing paragraphs (a)(6), (b)(3), (b)(6) and (e)(2)(ii), as well as add new paragraphs (b)(7) and (b)(8). Existing paragraph (a)(6) explains that any tank car of the same class with a higher tank test pressure than the tank car authorized in the HMR may be used. It also specifies the hierarchy of the letters in the specification marking that indicate special protective systems (e.g., ''J'' for thermally protected, jacketed cars; ''T'' for thermally protected, non-jacketed cars; ''S'' for cars with head shields but without thermal protection; and ''A'' for cars without protective systems) for which cars are equipped. We are proposing to add the letter ''M'' to represent tank cars with the enhanced tank-head and shell puncture-resistance systems of this proposed rule, but that do not meet the HMR's thermal protection requirement. For tank cars that meet the thermal protection requirement and are equipped with the enhanced tank-head and shell puncture-resistance systems proposed, we are proposing the use of the letter ''N'' in the specification marking. Additionally, we are proposing to modify the hierarchy of use to incorporate these two new delimiters in a manner consistent with the current hierarchy. In other words, tank cars with the delimiter ''M'' may be used when ''A'' or ''S'' is authorized. Tank cars with the delimiter ''N'' may be used when tank cars with an ''A,'' ''S,'' ''T,'' ''J,'' or ''M'' are authorized.

We are proposing the use of two different delimiters for tank cars meeting the enhanced head and shell protection requirements of this proposal because there are some PIH materials for which the HMR do not require use of a tank car with a thermal protection system (e.g., hydrogen fluoride, anhydrous ammonia). Therefore, we have proposed to allow a tank car to be constructed that would meet the enhanced tank-head and shell puncture-resistance system requirements, but not be equipped with a thermal protection system.

Existing paragraph (b)(3) requires head protection for all tank cars transporting Class 2 materials and tank cars constructed from aluminum or nickel plate. We are proposing to revise this paragraph to remove outdated compliance dates, and require tank cars used to transport PIH materials to be equipped with an enhanced tank-head puncture-resistance system. Specifically, proposed paragraph (b)(3)(i) reiterates the existing head protection requirements for tank cars used to transport Class 2 materials, other than PIH materials, and tank cars constructed from aluminum or nickel plate used to transport hazardous materials.

New paragraph (b)(3)(ii) would require all tank cars used to transport PIH materials to be equipped with the enhanced tank-head puncture-resistance system of proposed 179.16(b). Specifically, beginning two years after the effective date of the final rule, new paragraph (b)(3)(ii)(A) would require all new tank cars used for the transportation of PIH materials to conform to the enhanced head protection requirements of 179.16(b). Within eight years of the effective date of the final rule, new paragraph (b)(3)(ii)(B) would require all tank cars used to transport PIH materials to conform to the enhanced head protection standard. This proposed implementation period would allow one year for the design of tank cars meeting the proposed performance standard, a second year for tank car manufacturers to modify their manufacturing process as necessary to construct the improved tank cars, and a further six-year period to bring the entire North American fleet of PIH tank cars into compliance with the enhanced standards. The Department has developed this proposed implementation schedule after careful consideration of the number of tank cars in PIH service and tank car manufacturing capacity. After the implementation period, any tank car that transports PIH materials in the United States, including PIH-carrying tank cars that originate in countries outside of the United States, must conform to the enhanced tank-head puncture-resistance standard. As in all aspects of this proposal, however, the Department requests comments as to the feasibility and costs of this proposed implementation schedule, as well as suggestions for any alternatives. We are particularly interested in data and information concerning current tank car manufacturing capacity and whether capacity limitations will affect the implementation period proposed in this NPRM.

Existing paragraph (b)(6) requires tank car owners to implement measures to ensure the phased-in completion of modifications previously required by the Department and to annually report progress on such phased-in implementation. This NPRM proposes to modify paragraph (b)(6) by deleting the references to paragraphs (b)(3) (head protection) and (e)(2) (special requirements for tank cars used to transport PIH materials) because the existing compliance dates in each section have now passed and this NPRM proposes new modifications, with new compliance dates set forth in proposed §§ 173.31(b)(3) (head protection), (b)(7) (shell protection), and (b)(8) (implementation schedule).

New paragraph (b)(7) would require tank cars used to transport PIH material to be equipped with an enhanced tank shell puncture-resistance system. Specifically, proposed paragraph (b)(7)(i) would require that beginning two years after the effective date of the final rule, all new tank cars to be used for the transportation of PIH materials must comply with the shell protection requirements of 179.24. Furthermore, new paragraph (b)(7)(ii) would require that within eight years of the effective date of the final rule, all tank cars used to transport PIH materials must comply with the enhanced shell protection standard. This proposed implementation schedule is consistent with that proposed for the enhanced tank-head protection system. It would allow one year for the design of tank cars meeting the proposed performance standard, a second year for tank car manufacturers to modify their manufacturing process as necessary to construct the improved tank cars, and a further six year period to bring the entire North American fleet of PIH tank cars into compliance with the enhanced standard. Again, after the implementation period, any tank car that transports PIH materials in the United States, including PIH-carrying tank cars that originate in countries outside of the United States, must conform to the enhanced tank shell puncture-resistance standard. The Department requests comments as to the feasibility and costs of this proposed implementation schedule, as well as suggestions for any alternatives.

New paragraph (b)(8) is added to set forth the phased-in implementation schedule for the enhanced head- and shell-protection requirements of proposed 179.16(b) and 179.24. Specifically, new paragraph (b)(8)(i) would require owners of tank cars subject to these enhanced requirements to have brought at least 50 percent of their affected fleet into compliance with the new requirements within five years of the final rule's effective date. The Department believes that allowing a full five years to replace half of the PIH tank car fleet is reasonable and will ensure the phased-in construction and use of tank cars meeting the enhanced standards. Further, this implementation period again contemplates an initial one-year design period, a second year for manufacturers to modify their manufacturing process as necessary to construct the improved tank cars, three years to replace half of the fleet, and a final three-year period to complete fleet replacement.

New paragraph (b)(8)(ii) prohibits the use of tank cars manufactured using non-normalized steel for head or shell construction for the transportation of PIH material five years after the final rule's effective date. In other words, the Department expects that tank cars constructed of non-normalized steel in the head or shell will be phased out within the first half of the fleet replacement period (*i.e.*, no later than five years after the effective date of the final rule). This section is intended to ensure that tank cars constructed prior to 1989 that utilize non-normalized steel in the head or shell are the first cars phased out in the course of implementing the proposed enhanced standards. The Department understands that pre-1989 tank cars constructed of non-normalized steel comprise almost 50 percent of the current chlorine tank car fleet and approximately 20 percent of the current anhydrous ammonia tank car fleet. Significantly, a large portion of chlorine cars with non-normalized steel are approaching retirement age. Because chlorine and anhydrous ammonia account for over 80 percent of the annual PIH shipments in the United States, the Department believes that requiring the phase out of these cars within the first half of the fleet replacement period is reasonable.

Finally, proposed paragraph (b)(8)(iii) requires the submission of a progress report to FRA two months after the initial five years of the implementation period has passed. Specifically, this section would require tank car owners to report to FRA the total number of in-service tank cars in PIH service and the number of those cars in compliance with the enhanced head and shell protection requirements of proposed §§ 179.16(b) and 179.24. In addition, this paragraph would require that tank car owners certify that their fleets do not contain any pre-1989 tank cars in PIH service utilizing non-normalized steel in the head or shell construction.

Existing paragraph (e)(2) requires that tank cars used to transport PIH materials must have a minimum tank test pressure of 20.7 Bar (300 psig), head protection, and a metal jacket. We are proposing to revise this paragraph to remove the outdated compliance date in (e)(2)(ii), and cross reference the proposed requirements for enhanced head- and shell protection contained in proposed §§ 179.16(b) and 179.24 to make it clear that tank cars used to transport PIH materials must meet the enhanced head- and shell-protection requirements of this proposal. We are also proposing to cross reference the proposed implementation schedule for the tank-head and shell puncture-resistance systems in paragraph (b)(8). This will make it clear that five years after the final rule's effective date, at least 50 percent of each tank car owner's fleet of tank cars that transport PIH materials must comply with the enhanced tank-head and shell requirements and that five years after the final rule's effective date, tank cars manufactured with non-normalized steel for tank-heads or shells are no longer authorized for the transport of PIH materials. Finally, we are proposing to maintain the requirement that tank cars used to transport PIH materials be equipped with metal jackets because as noted in an earlier rulemaking proceeding, the purpose of the metal jacket is to provide ''both accident damage and fire protection'' for certain PIH materials.[50] As in all aspects of this proposal, DOT invites comments on the proposed revisions to this section.

Section 173.249—Bromine

Existing § 173.249 sets forth specific packaging requirements, including specific tank car requirements, for bromine, a PIH material. This NPRM proposes to add new paragraph (g) to the section, clarifying that railroad tank cars transporting bromine must comply with the enhanced tank-head and shell puncture-resistance requirements of proposed §§ 179.16(b) and 179.24.

Section 173.314—Compressed Gases in Tank Cars and Multi-Unit Tank Cars

Existing § 173.314 sets forth specific filling limits and tank car packaging requirements for various compressed gases, including chlorine, a PIH material. As relevant to this NPRM, existing paragraph (c) prohibits the transportation of more than 90 tons of chlorine in a single unit-tank car and paragraph (k) contains specific tank car packaging requirements relevant to chlorine. We propose to revise paragraph (k) to make clear that railroad tank cars transporting chlorine must comply with the enhanced tank-head and shell puncture-resistance requirements of proposed §§ 179.16(b) and 179.24.

We are also proposing to replace the current insulation system of 2-inches glass fiber over 2-inches ceramic fiber with a requirement to meet the existing thermal protection requirements of § 179.18, or with a system that has an overall thermal conductance of no more than 0.613 kilojoules per hour, per square meter, per degree Celsius temperature differential. This proposal does not impose a new requirement for the chlorine cars. Based on research conducted by FRA,[51] the 2+2 glass and ceramic fiber insulation used for chlorine cars provides an equivalent level of thermal protection as the requirements of § 179.18. We are replacing the specific requirement for

[50] *Crashworthiness Protection Requirements for Tank Cars; Detection and Repair of Cracks, Pits, Corrosion, Lining Flaws, Thermal Protection Flaws and Other Defects of Tank Car Tanks; Final Rule*, 60 FR 49048, 49054 (Sept. 21, 1995) (citing final rule on *Performance-Oriented Packaging Standards; Miscellaneous Amendments*, 58 FR 50224 (Sept. 24, 1993) and the NPRM, 58 FR 37612 (July 12, 1993)).

[51] W. Wright, W. Slack, and W. Jackson, *Thermal Insulation Systems Study for the Chlorine Tank Car*, FRA–ORD–85–10, April 1985, Federal Railroad Administration, Washington, DC 20590; and W. Wright, W. Slack, and W. Jackson, *Evaluation of the Thermal Effectiveness of Urethane Foam and Fiberglass as Insulation Systems for Tank Cars*, FRA–ORD–87–11, July 1987, Federal Railroad Administration, Washington, DC 20590.

the insulation system with the more generic requirements to allow flexibility in the use of the interstitial space between the tank shell and jacket. Use of this space for crush energy management is integral to improving the accident survivability of the PIH tank cars.

We are not proposing any change to the 90-ton single-unit tank car commodity limit. However, we believe tank car manufacturers could employ innovative engineering design changes to meet the proposed enhanced accident survivability standard, and it may be possible, using new technology and materials, to actually increase the volume capacity of the tank car and meet the new performance standards. It is not clear, however, that increasing the quantity of chlorine transported in the tank car is advantageous—to the shipper, the receiver, or the emergency response community. If the 90-ton limit were changed, we could rely solely on the normal lading and filling density limits; we could increase the limit from 90 tons to a slightly higher amount (*e.g.*, 94 tons); or we could incorporate a process for application to FRA for approval to increase the limit above the 90 tons, either by the manufacturer for a specific design or by the shipper for specified tank cars. We are asking commenters to consider these alternatives and provide input on potentially changing the 90-ton limit. In particular, we are interested in the potential positive or negative ramifications of allowing an increase in the quantity of chlorine in a tank car.

We recognize that chlorine is regularly transported between the United States and Canada. The Canadian requirements for transporting chlorine do not include the 90-ton capacity limit; however there is a requirement for use of tank cars with a minimum 500 psi tank test pressure.

Section 173.323—Ethylene Oxide

Existing § 173.323 sets forth specific packaging requirements, including specific tank car requirements, for ethylene oxide, a PIH material. Relevant to this proposal, paragraph (c)(1) contains specific requirements for transporting ethylene oxide in railroad tank cars. Accordingly, we propose to revise paragraph (c)(1) to make clear that railroad tank cars transporting ethylene oxide must comply with the enhanced tank-head and shell puncture-resistance requirements of proposed §§ 179.16(b) and 179.24.

Part 174

Section 174.86—Maximum Allowable Operating Speed

Existing § 174.86 addresses the maximum allowable operating speed for molten metals and molten glass. We propose to amend this section to (1) limit the operating speed of all railroad tank cars transporting PIH materials to 50 mph, and (2) in non-signaled territory limit the operating speed of railroad tank cars transporting PIH materials to 30 mph, unless alternative measures providing an equivalent level of safety are provided, or the material is being transported in a tank car conforming to the enhanced requirements of proposed §§ 179.16(b) and 179.24. Specifically, new paragraph (b) would restrict all tank cars containing PIH materials to a maximum operating speed of 50 mph. As discussed above, the current industry standard, OT–55-I, currently restricts the operating speed of trains containing five or more tank car loads of PIH materials to a maximum of 50 mph and we believe that extending this restriction to all tank cars transporting PIH materials is a reasonable way to control the forces experienced by the tank car during most derailment or accident conditions, without unduly burdening industry. Moreover, this 50 mph speed restriction in conjunction with the 25 mph enhanced shell and the 30 mph enhanced tank-head puncture-resistance performance standards, should ensure that tank integrity will be maintained in most derailments or other accidents.

New paragraph (c)(1) provides that if a tank car not meeting the enhanced performance standards of proposed §§ 179.16(b) and 179.24 is used to transport PIH material over non-signaled territory, its maximum operating speed is limited to 30 mph. For purposes of this section, non-signaled territory is defined to mean ''a rail line not equipped with a traffic control system or automatic block signal system'' compliant with 49 CFR part 236. As discussed above, this 30 mph speed restriction is based on FRA's finding that a disproportionate number of incidents occurring between 1965 and 2005, which resulted in loss of product from head and shell punctures, cracks, and tears, occurred in non-signaled territory.

New paragraph (c)(2) proposes an alternative to complying with the speed restriction of paragraph (c)(1) in non-signaled territory. Specifically, paragraph (c)(2) proposes to allow railroads to implement alternative safety measures in lieu of complying with the 30 mph speed restriction, so long as those alternative safety measures provide an equivalent level of safety as a traffic control system complying with 49 CFR part 236 (Part 236). A traffic control system is a block signal system [52] under which train movements are authorized by block signals whose indications supersede the superiority of trains for both opposing and following movements on the same track. Part 236 sets forth standards governing the use of traffic control systems. Typically, railroads utilize a centralized traffic control system, governed by a series of signal arrangements and capable of detecting the presence of trains and the positions of switches. Although the vital circuitry for a typical centralized traffic control system is in the field, the dispatcher can request movement authority.

Potential mitigation measures which could provide an equivalent (or better) level of safety as a traffic control system, depending on the particular circumstances of a location, include an automatic block signal (ABS) system, an interlocking arrangement, or a positive train control system. Part 236 again sets forth standards governing the implementation and use of ABS systems, interlockings, and certain types of PTC systems. *See* 49 CFR part 236, subparts B, C and H. Track circuits, which are integral to any Part 236 traffic control system or ABS system, are electrical devices designed to detect the presence or absence of a train on a certain segment of track, but also serve to detect broken rails due to electrical discontinuity. Any potential alternative risk mitigation measures designed to comply with paragraph (c)(2), must take into consideration the alternative's ability to detect broken rails.

A railroad might also be able to establish equivalent safety by implementing a combination of measures that together address the relevant risks, but without installing a full signal or train control system on the line. For instance, by installing a switch position monitoring system, track integrity circuits, and additional safety procedures (e.g., patrolling ahead of PIH trains or reducing PIH train speeds to something less than 49 mph), a railroad might be able to demonstrate that reducing PIH train speeds to 30 mph is not warranted. The proposed rule would

[52] A block signal system is a method of governing the movement of trains into or within one or more blocks by block signals (*i.e.*, roadway signals operated either automatically or manually at the entrance to a block) or cab signals (*i.e.*, a signal located in the engineer's compartment or cab, indicating a condition affecting the movement of a train).

permit any combination of technologies or procedures that could be shown to be effective.

Paragraph (c)(2) further provides that once a railroad completes a risk assessment demonstrating that certain identified alternative measures provide an equivalent level of safety to a Part 236 traffic control system, and FRA approves this risk assessment, the railroad may operate tank cars containing PIH materials at up to 50 mph. Because, in this proposal, we are providing for specific markings to delineate tank cars complying with the enhanced head and shell protection standards proposed, railroad personnel should be able to easily identify tank cars that are not subject to the non-signaled territory speed restriction.

DOT believes that the proposed operating restrictions in this section are responsive to NTSB Safety Recommendations R–05–15 and R–05–16 stemming from the Graniteville accident. We recognize that this proposal does not directly adopt the NTSB's recommendations to reduce speeds of tank cars transporting certain highly-hazardous materials through populated areas or reduce speeds of all trains in non-signaled territory in the absence of advance notice of switch positions. However, we believe that this proposal will achieve the goal of the recommendation, i.e., to minimize impact forces from accidents and reduce the vulnerability of tank cars transporting certain hazardous materials. At the same time, the proposal will adequately take into consideration the practical issues related to any reduction in train speed, such as higher crew costs and longer trip time.

Comment is requested on means to further limit any burdens associated with the 30 mph speed restriction in dark territory, and the proposed rule may be changed based on the comments received. For instance, because it is desirable from a safety standpoint and from the point of view of fuel conservation to maintain constant train speed, because most affected rail lines intersect scores of small towns and suburban areas, and because even very small populations present the potential for serious consequences, this proposal would apply regardless of the population size along the line. Major hazardous material accidents have historically occurred in small-to mid-sized communities away from major terminals, in part because of the elevated actual speeds that can be attained in these areas. However, there may be lines that traverse wilderness areas or extensive farm lands over distances that would permit increases in train speed without the threat of serious consequences should a release occur. We ask commenters to address the following questions: (1) Should an exception be made for those line segments? (2) How should any such exception be defined? (3) Do railroads have sufficient information regarding abutting land use, and changes in land use over time, so that such an exception could be implemented practicably? (4) If an exception is provided, should it extend to all PIH materials, or are there materials whose potential impacts on the environment are so great that the exception should not apply?

Part 179

Section 179.13—Tank Car Capacity and Gross Weight Limitation

Existing § 179.13 sets forth tank car capacity and gross weight limitations. Specifically, this section provides that tank cars may not exceed a capacity of 34,500 gallons or 263,000 pounds gross weight on rail. These limitations date back to 1970 and were based on DOT's findings that weight related stress failures in track and car parts accounted for approximately 50 percent of all rail accidents at the time. 35 FR 14216, 14217 (Sept. 9, 1970). Accordingly, DOT reasoned that imposing capacity and gross weight limitations on tank cars would limit the impact forces in a derailment and therefore lessen the likelihood that a tank car would be breached in the event of a derailment or other accident. *Id.* at 14217. Since the promulgation of this section in 1970, however, rail infrastructure has changed, and through industry and regulatory efforts, tank car accident survivability has improved.[53]

To ensure that tank cars that transport PIH materials and that exceed the existing 263,000 pound limitation and weigh up to 286,000 pounds gross weight on rail are mechanically and structurally sound, we propose to require that such cars comply with AAR Standard S–286–2002, SPECIFICATION FOR 286,000 LBS. GROSS RAIL LOAD CARS FOR FREE/UNRESTRICTED INTERCHANGE SERVICE (adopted November 2002 and revised September 1, 2005). AAR Standard S–286–2002 is the existing industry standard for designing, building, and operating rail cars at gross weights between 263,000 pounds and 286,000 pounds. This standard sets forth industry-tested practices for designing, building and operating rail cars at gross weights between 263,000 pounds and 286,000 pounds.

Section 179.16—Tank-Head Puncture-Resistance Systems

Existing § 179.16 contains the tank-head puncture resistance requirements applicable to tank cars currently required under the HMR to have tank-head puncture-resistance systems. We propose to amend this section to specify an enhanced tank-head puncture-resistance performance standard for tank cars used to transport PIH materials.

As discussed above, research prepared by Volpe was relied upon to develop this performance standard. Specifically, the speed chosen for this performance standard, a 30 mph impact, is related to the maximum allowable operating speed of 50 mph, which is also proposed in this NPRM. FRA is cognizant that while the proposed 25 mph closing speed, which is based on the maximum allowable operating speed of 50 mph, protects well against derailment-like events in which the secondary car-to-car impact speeds are approximately half the original train speed, impacts can occur in rail yards, at switches or turnouts, and in mainline tracks where a tank car can be involved in the primary collision. In this situation, it is desirable to have better protection strategies available to help alleviate the risk of loss of lading. The proposed tank-head puncture resistance system can accommodate the proposed 30 mph impact speed because there is more space available in the front of the tank-head to place energy absorbing material between the head shield or jacket and the inner commodity tank when compared with tank shell protection systems, which have more limited expansion space due to design constraints.

Section 179.22—Marking

Existing § 179.22 contains marking requirements applicable to railroad tank cars. Specifically, this section provides that tank cars must be marked in accordance with the Tank Car Manual and assigns meaning to each of the delimiters used in tank car specification markings (*e.g.*, a tank car with a tank-head puncture-resistance system must include the letter ''S'' in its specification marking, a car with a tank-head puncture-resistance system, a thermal protection system, and a metal jacket, must be marked with the letter ''J'' in its specification marking). Proposed new

[53] DOT has also issued several Special Permits allowing the use of tank cars weighing up to 286,000 pounds. For example, on April 20, 2006, Trinity was issued Special Permit number DOT-SP 14167, authorizing it to manufacture, mark, and sell the Trinity Cart, which has a maximum gross weight on rail of 286,000 pounds. *See* 71 FR 47288, 47301 (Aug. 16, 2001).

paragraphs (e) and (f) of this section would define the delimiters to be used to mark tank cars conforming to the enhanced head- and shell-protection requirements of this proposal. Specifically, new paragraph (e) provides that each tank car that requires a tank-head puncture-resistance system prescribed in proposed § 179.16(b), a shell puncture-resistance system prescribed in § 179.24, and without a thermal protection, must be marked with the delimiter ''M'' in its specification marking. Similarly, new paragraph (f) provides that each tank car that requires a tank-head puncture-resistance system prescribed in proposed § 179.16(b), a shell puncture-resistance system prescribed in § 179.24, and a thermal protection system, must be marked with the delimiter ''N'' in its specification marking.

Section 179.24—Tank Shell Puncture-Resistance Systems

Proposed new § 179.24 specifies an enhanced tank shell puncture-resistance performance standard for tank cars used to transport PIH materials. Previous rulemakings have not focused on shell protection, but the statutory mandate, recent accidents, and Volpe's derailment dynamics research together indicate the need to extend a higher level of protection to the tank car body, including both the tank-head and the shell. As discussed above, research prepared by Volpe was relied upon to develop the performance standard proposed, a 25 mph impact test, which is directly tied to the proposed speed restriction of 50 mph. It is important to note, the impact test proposed in Appendix C is to resist puncture at a particular point on the shell. The performance standard requirement for tank car shell protection is intended to apply to the entire tank shell.

Section 179.102–17—Hydrogen Chloride, Refrigerated Liquid

Existing § 179.102–17 sets forth specific tank car packaging requirements for hydrogen chloride, refrigerated liquid, a PIH material. We propose to revise this section by adding a new paragraph (m) to make clear that railroad tank cars transporting hydrogen chloride must comply with the enhanced tank-head and shell puncture-resistance requirements of proposed §§ 179.16(b) and 179.24.

XIV. Regulatory Analyses and Notices

A. Statutory/Legal Authority for This Rulemaking

This NPRM is published under authority of the Federal hazmat law. Section 5103(b) of Federal hazmat law authorizes the Secretary of Transportation to prescribe regulations for the safe transportation, including security, of hazardous materials in intrastate, interstate, and foreign commerce. SAFETEA–LU, which added section 20155 to the Federal hazmat law, requires, in part, that FRA (1) validate a predictive model quantifying the relevant dynamic forces acting on railroad tank cars under accident conditions and (2) initiate a rulemaking to develop and implement appropriate design standards for pressurized tank cars. Additionally, the Federal Railroad Safety Act, 49 U.S.C. 20101 *et seq.*, authorizes the Secretary to issue regulations over all areas of railroad transportation safety.

B. Executive Order 12866 and DOT Regulatory Policies and Procedures

This proposed rule has been evaluated in accordance with existing policies and procedures, and determined to be significant under both Executive Order 12866 and DOT policies and procedures (44 FR 11034; Feb. 26, 1979). We have prepared and placed in the docket a regulatory impact analysis (RIA) addressing the economic impact of this proposed rule. PHMSA and FRA invite comments on this RIA.

The costs anticipated to accrue from adopting this proposed rule would include: (1) The labor and material costs for incorporating enhanced crashworthiness features into tank cars that transport PIH materials, (2) the design and re-engineering costs required to implement the proposed enhanced tank-head and shell puncture-resistance systems, (3) the costs for transferring existing PIH tank cars to other commodity services, and (4) the maintenance and inspection costs for the new more crashworthy tank cars. Additionally, there would be costs incurred as a result of the operational restrictions for tank cars that transport PIH materials, including: (1) The cost of restricting railroad tank cars used to transport PIH materials to 50 mph, and (2) the cost of temporarily restricting existing railroad tank cars used to transport PIH materials in non-signaled territory to 30 mph. Finally, there would be a cost for the increased traffic or volume of tank cars that transport PIH materials due to the increased weight, and thus lower commodity capacity, of those cars.

The primary potential benefits or savings expected to accrue from the implementation of this proposed rule would be the reduction in the number and severity of casualties arising from train accidents and derailments involving tank cars that transport PIH materials. In addition, benefits would accrue from a decrease in property damages, including damages to locomotives, railroad cars, and track; environmental damage; track closures; road closures; and evacuations. Moreover, there would also be a benefit in fuel savings (which may offset some of the operational costs) due to limiting train operating speeds.

This document presents a 30-year analysis of the costs and benefits associated with DOT's proposed rule, using both 7 percent and 3 percent discount rates. It also presents an analysis of a regulatory alternative considered, and sensitivity analyses associated with varying assumptions used for estimating PIH release-related benefits.

A baseline cost estimate is particularly important for the conduct of these analyses. The railroad industry has expressed its intention to proceed with a standard of its own absent issuance of a DOT rule requiring enhanced crashworthiness of PIH tank cars. In general, industry participants appear to recognize the need to improve the design of tank cars transporting PIH materials. In fact, the AAR has mandated (but temporarily suspended to permit issuance of this notice of proposed rulemaking) use of heavier cars with top fittings that meet specified requirements such as the new tank cars built by Trinity for the transportation of PIH materials. Accordingly the baseline for the analyses conducted reflects compliance with the AAR standard by replacing the existing fleet of PIH tank cars with AAR compliant Trinity-like tank cars. This baseline includes incremental costs associated with the design, construction, and operation of new Trinity-like tank cars to replace existing cars and the transfer of existing PIH tank cars to other commodity services. The 30-year cost estimates associated with this baseline are $476.6 million (PV, 7%) and $718.7 million (PV, 3%). Annualized costs are $38.4 million (PV, 7%) and $36.7 million (PV, 3%).

The analysis of the proposed rule takes into account the incremental impacts that would be incurred with meeting the proposed requirements (*i.e.*, the design, construction, and operation costs for the new DOT-compliant cars in excess of the baseline impacts that would be incurred absent this rulemaking with the introduction of the AAR-mandated cars). In addition, the proposed rule analyzes full impacts related to the proposed operating speed restrictions). Thus, this analysis takes into account the fact that the AAR and shippers have active plans to make major changes in the tank car fleet that moves PIH commodities. The 30-year cost estimates associated with implementation of the proposed rule are $350.6 million (PV, 7%) and $431.6 million (PV, 3%). Annualized costs are $28.3 million (PV, 7%) and $22.0 million (PV, 3%).

The benefits of the proposed rule fall into two sub-groups. The first group consists of benefits that would accrue from avoidance of collision- and derailment-related PIH releases resulting from a combination of the enhanced tank car crashworthiness standards and operating speed restrictions. This group of benefits includes reductions in casualties; property damage, including damage to locomotives, rail cars and track; environmental damage; evacuation and shelter-in-place costs; track closures; road closures; and electric power disruptions. Casualty mitigation estimates are based on a value of statistical life of $5.8 million. This group of benefits also includes more difficult to monetize benefits such as the avoidance of hazmat accident related costs incurred by Federal, state, and local governments and impacts to local businesses. As with costs, the benefits associated with introducing DOT-compliant tank cars are reduced by the level of benefits that DOT estimates would accrue from replacing existing cars with AAR-mandated cars absent this rulemaking. This analysis includes a scenario which DOT believes is the most realistic projection of benefits that would be realized, including the possibility of an event with moderately more severe consequences than has occurred in the past 10 years. This approach recognizes the significant probability that, given the quantity of product released and the proximity of potentially affected populations to accident sites, in one or more events the consequences known to be possible will be realized, with loss of life on a scale not previously encountered.

The second group of benefits consists of business benefits that would accrue in response to the operating speed restrictions (which may partially offset the operating costs imposed by these restrictions) and the enhanced tank car design. This group includes fuel savings from economic efficiencies resulting from operating speed restrictions and repair savings from more salvageable tank cars. DOT believes that the useful life of compliant tank cars introduced during the 30-year analysis period will extend well beyond that period. Moreover, the residual value at year 30 of tank cars constructed to meet the enhanced standards proposed will be greater than the residual value of conventional tank cars and Trinity-like tank cars contemplated by AAR's new standard. Thus, the analysis includes a benefit reflecting the higher residual value for the new tank cars at year 30.

FRA then added up both of these groups of benefits over the next 30 years. Taking both of these groups of benefits, relative to the state of the world where the AAR would enforce it's interchange standard, the 30-year benefit estimates associated with implementation of the proposed rule are $666 million (PV, 7%) and $1.089 billion (PV, 3%). Annualized benefits are $53.7 million (PV, 7%) and $55.6 million (PV, 3%).

An evaluation of a ''status quo'' alternative is also included. In general, industry parties appear to recognize the need to improve the design of tank cars transporting PIH materials. In fact, as previously noted, the AAR has mandated the use of Trinity-like cars for the transportation of PIH materials in interchange. Accordingly, the ''status quo'' alternative would be to allow the AAR to enforce its interchange standard. The costs associated with such an alternative would still be represented by the baseline cost scenario; however, they would be equivalent to the costs the railroad industry is willing to incur voluntarily, and thus, would not be considered true regulatory costs. In addition, this alternative would not include costs from any operating speed restrictions. The benefits from this alternative would be those resulting from the use of a heavier car of the same basic design currently in place and can be estimated as approximately 15% of the benefits that would be expected to result from implementation of the crashworthiness requirements of the proposed rule. As with the costs, this alternative would not offer any of the business benefits associated with the DOT proposal due to the operating speed restrictions. The 30-year cost estimates associated with this alternative are $476.6 million (PV, 7%) and $718.7 million (PV, 3%).

Finally, three sensitivity analyses varying assumptions used to estimate the benefits of the proposed rule are included. The first addresses the uncertainty regarding the consequences from release of PIH materials resulting from train accidents. This analysis is based on the assumption that the consequences of projected incidents will be of the same average severity as those in the past ten years. It does not recognize how fortunate the circumstances surrounding recent past incidents have been. Given the rarity of the occurrence of rail accidents resulting in the release of PIH materials from tank cars, and the high variability in the circumstances and consequences of such events, this sensitivity analysis is useful. The 30-year benefit estimates associated with this scenario are $786,073,251 (PV, 7%) and $866,616,695 (PV, 3%). The second and third sensitivity analyses address the imprecision of assumptions regarding the value of a life, which affect the level of safety benefits (*i.e.*, casualty mitigation) that would result from promulgation of the proposed rule. This analysis presents benefit levels associated with values of a statistical life of $3.2 million and $8.4 million. The 30-year benefit estimates associated with these scenario are $562,100,371 (PV, 7%, VSL: $3.2M), $857,952,000 (PV, 7%, VSL: $8.4M).

This rulemaking would fulfill the mandate of SAFETEA-LU and respond to NTSB's recommendations pertaining to tank car structural integrity and operational measures, by specifying performance standards and operational restrictions sufficient to reduce the likely frequency of catastrophic releases to a level as low as reasonably possible, given the need to transport the products in question, and based on analysis of the forces that result from serious train accidents. PHMSA and FRA note that, while the proposed actions are based exclusively on railroad safety considerations, strengthening the protective systems on PIH tank cars may also reduce the likelihood of a catastrophic release caused by criminal acts, such as deliberately throwing a switch in the face of an oncoming train or taking other action that could result in a derailment or collision.

The proposed actions would not reduce to zero the probability of a catastrophic release. However, achieving that goal is likely inconsistent with the purpose of the transportation service provided and beyond design practice that presently can be conceived. The proposed actions would substantially reduce the risk presently attending transportation of the subject products, and these reductions can be achieved within a time certain. Providing reassurance to the communities through which these trains travel, that every feasible action has been taken to safeguard those potentially affected, itself provides societal benefits. Included among these benefits are peace of mind of residents and others within the potential zones of danger, and likely avoidance of more costly and less effective public responses (such as prohibiting transportation of the products outright or establishing burdensome conditions of transportation that are perceived to benefit individual communities while driving up total public exposure).

C. Executive Order 13132

This NPRM has been analyzed in accordance with the principles and criteria contained in Executive Order 13132 (''Federalism''). If adopted in a final rule, the proposals in this NPRM would amend PHMSA's existing regulations on the design and manufacturing of rail tank cars authorized for the transportation of PIH materials and the handling of rail shipments of PIH materials in these rail tank cars. As discussed below, State and local requirements on the same subject matters covered by PHMSA's existing regulations and the amendments proposed in this NPRM, including certain State common law tort actions, are preempted by 49 U.S.C. 5125 and 20106. At the same time, this NPRM does not propose any regulation that would have direct effects on the States, the relationship between the national government and the States, or the distribution of power and responsibilities among the various levels of government. Additionally, it would not impose any direct compliance costs on State and local governments. Therefore, the consultation and funding requirements of Executive Order 13132 do not apply.

The Federal Railroad Safety Act (49 U.S.C. 20101 *et seq.*) provides that all regulations prescribed by the Secretary related to railroad safety (such as the rule proposed in this NPRM) preempt any State law, regulation, or order covering the same subject matter, except a provision necessary to eliminate or reduce an essentially local safety or security hazard that is not incompatible with a Federal law, regulation, or order and that does not unreasonably burden interstate commerce. An amendment to Section 20106 enacted in 2007 alters the preemption of certain tort actions by this section that arise from events or activities occurring on or after January 18, 2002, to the extent that a tort action seeks damages for personal injury, death, or property damage and alleges: (1) A violation of the Federal standard of care established by regulation or order issued by the Secretary of Transportation (with respect to railroad safety) or the Secretary of Homeland Security (with respect to railroad security); (2) a party's violation of, or failure to comply with, its own plan, rule, or standard that it created pursuant to a regulation or order issued by either of the two Secretaries; or (3) a party's violation of a State standard that is necessary to eliminate or reduce an essentially local safety or security hazard, is not incompatible with a law, regulation, or order of the United States Government, and does not unreasonably burden interstate commerce.

While this recent amendment has altered the preemptive reach of Section 20106, it is important to note that there are limits to this exception. For example, Congress provided an exception only for an action in State court seeking damages for personal injury, death, or property damage. The statute does not provide for the recovery of punitive damages in the permitted common law tort actions. In addition, the statue permits actions for violation of an internal plan, rule, or standard only when such are created pursuant to a Federal regulation or order issued by DOT or DHS to the minimum required by the Federal regulation or order. While parties are encouraged to go beyond the minimum regulatory standard in establishing safety and security standards, these requirements are not created pursuant to Federal regulation or order. Accordingly, there is no clear authorization of a common law tort action alleging a violation of those aspects of such an internal plan, rule, or standard related to the subject matter of this regulation that exceeds the minimum required by the Federal regulation or order.

Separately, the Federal hazardous materials transportation law, 49 U.S.C. 5101 *et seq.*, contains an express provision (49 U.S.C. 5125(b)) preempting State, local, and Indian tribe requirements on certain covered subjects. Covered subjects are:

(1) The designation, description, and classification of hazardous material;

(2) the packing, repacking, handling, labeling, marking, and placarding of hazardous material;

(3) the preparation, execution, and use of shipping documents related to hazardous material and requirements related to the number, contents, and placement of those documents;

(4) the written notification, recording, and reporting of the unintentional release in transportation of hazardous material; and

(5) the design, manufacturing, fabricating, marking, maintenance, reconditioning, repairing, or testing of a packaging or container represented, marked, certified, or sold as qualified for use in transporting hazardous material.

This proposed rule addresses both items 2 and 5 of the HMR and would therefore preempt any State, local, or Indian tribe requirement that is not substantively the same as PHMSA's regulations on these subject matters, as those regulations would be amended as proposed in this NPRM. The agency welcomes comments about the extent to which the preemptive effect under this statutory authority differs from that discussed above.

Pursuant to 49 U.S.C. 5125(b)(2) of the Federal hazmat law, if the Secretary of Transportation issues a regulation concerning any of the covered subjects, the Secretary must determine and publish in the **Federal Register** the effective date of Federal preemption. The effective date may not be earlier than the 90th day following the date of issuance of the final rule and not later than two years after the date of issuance. PHMSA has determined that the effective date of Federal preemption for these requirements under the Federal hazmat law would be one year from the date of publication of a final rule in the **Federal Register**.

D. Executive Order 13175

We analyzed this proposed rule in accordance with the principles and criteria contained in Executive Order 13175 (''Consultation and Coordination with Indian Tribal Governments''). Because this proposed rule does not significantly or uniquely affect tribes and does not impose substantial and direct compliance costs on Indian tribal governments, the funding and consultation requirements of Executive Order 13175 do not apply, and a tribal summary impact statement is not required.

E. Regulatory Flexibility Act and Executive Order 13272; Initial Regulatory Flexibility Assessment

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) and Executive Order 13272 require a review of proposed and final rules to assess their impacts on small entities. An agency must prepare an initial regulatory flexibility analysis (IRFA) unless it determines and certifies that a rule, if promulgated, would not have a significant impact on a substantial number of small entities. DOT has not determined whether this proposed rule would have a significant economic impact on a substantial number of small entities. Therefore, we are publishing this IRFA to aid the public in commenting on the potential small business impacts of the proposals in this NPRM. We invite all interested parties to submit data and information regarding the potential economic impact that would result from adoption of the proposals in this NPRM. We will consider all comments received in the public comment process when making a determination in the final Regulatory Flexibility Assessment (RFA).

In accordance with the Regulatory Flexibility Act, an IRFA must contain:

(1) A description of the reasons why action by the agency is being considered;

(2) A succinct statement of the objectives of, and the legal basis for, the proposed rule;

(3) A description of, and where feasible, an estimate of the number of small entities to which the proposed rule will apply;

(4) A description of the projected reporting, recordkeeping and other compliance requirements of the proposed rule, including an estimate of the classes of small entities that will be subject to the requirement and the type of professional skills necessary for preparation of the report or record;

(5) An identification, to the extent practicable, of all relevant Federal rules that may duplicate, overlap, or conflict with the proposed rule; and

(6) A description of any significant alternatives to the proposed rule that accomplish the state objectives of applicable statutes and which minimize any significant economic impact of the proposed rule on small entities. 5 U.S.C. 603(b), (c).

I. Reasons for Considering Agency Action

As discussed in earlier sections of this preamble, in the last several years there have been a number of serious rail tank car accidents involving catastrophic releases of PIH materials causing the attention of the rail industry, PIH shippers and other members of the public, press, NTSB and the Congress to focus on the serious consequences of these events. In 2005 SAFETEA-LU directed the Secretary of Transportation to ''initiate a rulemaking to develop and implement appropriate design standards for pressurized tank cars.'' This proposed rulemaking is responsive to SAFETEA-LU's mandate, as well as recommendations of the NTSB.

II. Objectives and Legal Basis for Proposed Rule

A. Legal Basis for Proposed Rule

As discussed in more detail in section III of this preamble, Federal hazmat law authorizes the Secretary of Transportation to ''prescribe regulations for the safe transportation, including security, of hazardous material in intrastate, interstate, and foreign commerce.'' The Secretary has delegated this authority to PHMSA. The Secretary also has authority over all areas of railroad transportation safety (Federal Railroad Safety laws, 49 U.S.C. 20101 *et seq.*) and has delegated this authority to FRA. 49 CFR 1.49.

A primary safety and security concern in the rail transportation of hazardous materials is the prevention of a catastrophic release in proximity to places such as populated areas, events or venues with large numbers of people in attendance, iconic buildings, landmarks, or environmentally sensitive areas. Over the past several years, several very serious accidents involving catastrophic releases of PIH materials from railroad tank cars have focused the attention of the public, press, NTSB, and the Congress on the serious consequences of these events. Since 2002, NTSB investigated three accidents involving tank cars transporting PIH materials. (See section VI of the preamble for a more detailed discussion of the relevant accidents). In response to all three accidents, the NTSB recommended that FRA study improving the safety and structural integrity of tank cars and develop necessary operational measures to minimize the vulnerability of tank cars involved in accidents. In particular, in response to a January 18, 2002, freight train derailment in Minot, North Dakota, which resulted in one death and 11 serious injuries due to the release of anhydrous ammonia when five tank cars carrying the product catastrophically ruptured and a vapor plume covered the derailment site and surrounding area, the NTSB made four safety recommendations to FRA specific to the structural integrity of hazardous material tank cars. Subsequently, in 2005, section 20155 of SAFETEA-LU reiterated NTSB's recommendations in part and further directed the Secretary of Transportation to ''initiate a rulemaking to develop and implement appropriate design standards for pressurized tank cars.''

B. Objective of Proposed Rule

The objective of this proposed rule is to improve the crashworthiness protection of railroad tank cars designed to transport PIH materials by (1) requiring enhanced tank-head and shell protection, and (2) limiting the operating speed of the tank cars. See sections II and XII of the preamble for a more detailed discussion regarding the objective of this proposed rule.

III. Description and Estimate of Small Entities Affected

The ''universe'' of the entities to be considered in an IRFA generally includes only those small entities that can reasonably be expected to be directly regulated by the proposed action. Five types of small entities are potentially affected by this proposed rule: (1) PIH material shippers and tank car owners; (2) governmental jurisdictions of small communities; (3) small railroads; (4) small farms; and (5) small explosives manufacturers.

''Small entity'' is defined in 5 U.S.C. 601. Section 601(3) defines a ''small entity'' as having the same meaning as ''small business concern'' under section 3 of the Small Business Act. This includes any small business concern that is independently owned and operated, and is not dominant in its field of operation. Section 601(4) includes not-for-profit enterprises that are independently owned and operated, and are not dominant in their field of operations within the definition of ''small entities.'' Additionally, section 601(5) defines as ''small entities'' governments of cities, counties, towns, townships, villages, school districts, or special districts with populations less than 50,000.

The U.S. Small Business Administration (SBA) stipulates ''size standards'' for small entities. It provides that the largest a for-profit railroad business firm may be (and still classify as a ''small entity'') is 1,500 employees for ''Line-Haul Operating'' railroads, and 500 employees for ''Short-Line Operating'' railroads.[54] For PIH material shippers potentially impacted by this rule, SBA's size standard is 750 or 1,000 employees, depending on the industry the shipper is in as determined by its North American Industry Classification System (NAICS) Code. SBA size standards also stipulate in NAICS Code Subsector 111 that the average annual receipt for ''crop production'' agriculture is $750,000 per year. Thus, any farm that produces crops is not considered to be a small entity unless its annual revenue is less than $750,000. For explosives manufacturers, NAICS Code 325920, the size standard is 750 employees.

SBA size standards may be altered by Federal agencies in consultation with SBA, and in conjunction with public comment. Pursuant to the authority provided to it by SBA, FRA has published a final policy, which formally establishes small entities as railroads that meet the line haulage revenue requirements of a Class III railroad.[55] Currently, the revenue requirements are $20 million or less in annual operating revenue, adjusted annually for inflation. The $20 million limit (adjusted

[54] ''Table of Size Standards,'' U.S. Small Business Administration, January 31, 1996, 13 CFR Part 121. *See also* NAICS Codes 482111 and 482112.

[55] *See* 68 FR 24891 (May 9, 2003).

annually for inflation) is based on the Surface Transportation Board's threshold of a Class III railroad carrier, which is adjusted by applying the railroad revenue deflator adjustment.[56] The same dollar limit on revenues is established to determine whether a railroad shipper or contractor is a small entity. DOT proposes to use this definition for this rulemaking.

A. Shippers

Almost all hazardous materials tank cars, including those cars that transport PIH materials, are owned or leased by shippers. DOT believes that a majority, if not all, of these shippers are large entities. DOT used data from the DOT/PHMSA Hazardous Materials Information System (HMIS) database to screen for PIH material shippers that may be small entities. The HMIS uses the SBA size standards as the basis for determining if a company qualifies as a small business. DOT also gathered data from industry trade groups such as the American Chemistry Council and The Fertilizer Institute (TFI) to help identify the number of small shippers that might be affected. After identifying the set of small businesses that could potentially be impacted, DOT cross-referenced this group with *The Official Railway Equipment Register* (October, 2007) to determine if any of these actually own tank cars subject to this rule.

From the DOT/PHMSA HMIS database, and industry sources, DOT found eight small shippers that might be impacted. By further checking information available on the companies' Web sites, all eight shippers are noted as being subsidiaries of larger businesses. Out of these eight, however, only one owns tank cars that would be affected. The remaining seven shippers either do not own tank cars or own tank cars that would not be affected by this rule. The one remaining small shipper potentially impacted has annual revenues that exceed by 20 times the FRA size standard for a small entity. Further, although this shipper is for-profit, the parent company is a non-profit. Thus, DOT believes that there are none or very few PIH material shippers that are small businesses affected by this rule. Additionally, no small shippers commented during the public meeting process. DOT invites commenters to submit information that might assist it in assessing the quantity of small shippers that may be affected by the requirements set forth in the proposed rule, as well as the potential impact on any such entities.

B. Governmental Jurisdictions of Small Communities

Small entities that are classified as governmental jurisdictions of small communities may also be affected by the proposals in this NPRM. As stated above, and defined by SBA, this term refers to governments of cities, counties, towns, townships, villages, school districts, or special districts with populations of less than 50,000. The potential impact of this rulemaking to these entities is related to chlorine and the use of it in the water purification process for community water districts. DOT does not know how many community water systems are owned by governmental jurisdictions that meet SBA's definition of a small entity, how many community water systems use chlorine at their facilities, or how many could easily substitute a nondangerous or less lethal material, i.e., bleach, for chlorine.

DOT understands that most water plants for small communities receive their chlorine via 1-ton tanks, which are transported in highway vehicles. These facilities might be impacted indirectly by increasing prices for chlorine due to higher shipping rates. Also, in recent years, the shipping rates for chlorine have been increased due to the PIH accidents that have occurred over the past 10 years. With the introduction of this proposed regulation, DOT expects that the rates will flatten or will increase at a slower pace because the safety features of the rule will reduce the chance of an accident that releases PIH materials, and therefore result in lower accident and associated costs.

DOT notes that many existing chlorine tank cars are nearing the end of their useful lives. Even in the absence of the proposed rulemaking, the affected entities would have to replace these older chlorine tank cars in the next few years. The industry, through AAR, has also been working to improve tank car safety. As discussed in section IX of this preamble, absent this regulation, new AAR chlorine tank car standards will also result in existing tank cars being replaced and entities impacted through higher shipping rates.

Accordingly, DOT cannot accurately assess the number of governmental jurisdictions of small communities that would be directly impacted by this proposed regulation and what the impact would be. DOT requests comment from affected governmental jurisdictions as to the impact the proposed rule will have on them.

C. Railroads

DOT estimates that approximately 46 railroads meeting the definition of "small entity" as described above transport PIH materials via railroad tank car.[57] Because the proposed rule would apply to all 46 of these small railroads, we have concluded that a substantial number of such entities would be impacted.

It is important to note, however, that absent this rulemaking, all railroads that transport PIH materials via railroad tank car, including the 46 railroads identified as small entities, would still have to incur the additional expense to accommodate 286,000-pound tank cars to comply with the new AAR PIH tank car standard (*i.e.*, a 286,000-pound tank car equipped with additional head protection, thicker shell, and modified top fittings). (See section IX of this preamble for a more detailed discussion of the new AAR PIH tank car standard).

As noted in section I of this preamble, however, DOT anticipates that tank car designers, working with end users, will develop tank cars that will meet the proposed enhanced tank-head and shell performance standards of this NPRM while minimizing the addition of weight to the empty cars. Recognizing the growing use of rail cars with gross weight on rail exceeding 263,000 pounds for non-hazardous commodities, such as grain, this NPRM provides the flexibility to design a tank car for the transportation of PIH materials weighing up to 286,000 pounds, in line with AAR's existing standard S–286–2002. Accordingly, the actual impact of the general increase in gross weight on rail of products in this commodity group in relation to the overall transition now being completed within the industry (which has been eased by tax incentives and, in some cases, government-guaranteed loan arrangements) should not be substantial. While we recognize that some small railroads will not be able to accommodate the additional weight on some of their bridges and track, we believe that railroads that handle PIH cars have, in general, already made or are making the transition to track structures and bridges capable of handling 286,000-pound cars in line with the general movement in the industry toward these heavier freight cars. These railroads include many switching and terminal railroads

[56] For further information on the calculation of the specific dollar limit, please see 49 CFR Part 1201.

[57] Data provided by Railinc, Corp. (a subsidiary of AAR) indicates that approximately 80 short-line and regional railroads transport PIH materials via railroad tank car. Of these 80 railroads, 34 are regional railroads that meet the Surface Transportation Board's definition of a Class II railroad, and thus, are not considered "small entities" for the purposes of this IRFA.

that are partially or totally owned by Class 1 railroads as interline connections. These connections have previously mandated upgrading to 286,000-pound capability.

For example, in 2005, the Texas Transportation Institute reported that 42 percent of the short-line railroad miles that were operated in Texas that year had already been upgraded, nine percent would not need an upgrade, and 47 percent needed upgrading if they wanted to transport any type of 286,000-pound shipments.[58] In addition, the results of a 1998–1999 survey conducted by the ASLRRA indicated that 41 percent of respondent short-line railroads could handle 286,000-pound rail cars and 87 percent of the respondent short-line railroads indicated that they would need to accommodate 286,000-pound railcars in the future.[59] More current data from the ASLRRA suggests that many of the railroads needing future capability to handle 286,000-pound rail loads for this rule have been upgraded within the past two years.[60]

Nevertheless, we believe that some new 263,000-pound cars will be built for anhydrous ammonia service to address rail line and facility compatibility concerns thus minimizing the burden of the rule on small railroads.

In general, most of the impacts will not burden the 46 small railroads potentially affected by this proposed rule. Any costs incurred by railroads most likely will be passed to shippers and end users through higher transportation costs. Thus, DOT does not expect this regulation to impose a significant burden on the affected small railroads. We invite commenters to submit information that might assist us in assessing the cost impacts on small railroads of the proposals in this NPRM.

D. Farms

Anhydrous ammonia is an important source of nitrogen fertilizer for crops. It is used in farming because it is one of the most efficient and widely used sources of nitrogen for plant growth. Its use has increased because it is relatively easy to apply and readily available. Nonetheless, it does carry disadvantages to the farming environment because it must be stored and handled under high pressure. Urea, urea ammonium nitrate, or ammonium nitrate could be used for anhydrous ammonia as substitutes for agricultural purposes. Anhydrous ammonia has a free ammonia percentage of 86 percent, while the substitutes have a free ammonia percentage of 46, 28–32, and 34 percent, respectively.

Shippers of anhydrous ammonia do not own tank cars; rather they are leased from larger entities. According to TFI, a switch to a redesigned heavier tank car would increase monthly car lease rates from the current level of $800–$850 per car to $1,300–$1,400 per car. TFI's members lease about 6,000 tank cars and ship about 52,000 cars per year. If these increased lease costs are passed through to customers, then any agricultural or farming operation that utilizes anhydrous ammonia as part of its fertilizing program could be negatively impacted.

It is important to note, however, that not all crops utilize anhydrous ammonia, nor in the same quantities. Agriculture crops that require greater leaf development, such as corn and wheat, utilize anhydrous ammonia as a fertilizer more than crops that require a greater root development, e.g., carrots, potatoes, and beets, which utilize phosphorus more as a fertilizer. Therefore, not all small farms will be impacted in the same way by an increase in the shipping rates for anhydrous ammonia. DOT invites commenters to submit information that might assist it in assessing the quantity of small agricultural operations that may be affected by the requirements set forth in the proposed rule.

During DOT's public meetings, one commenter noted that the survival of family farms in the Northwest is tied to retaining a cheap source of nitrogen via anhydrous ammonia which is transported via rail.[61] Other commenters noted that NH3 costs 40 to 50 percent less per pound of nitrogen than less concentrated forms of nitrogen.[62] For example, one commenter noted that anhydrous ammonia costs 24 cents per pound of nitrogen, compared to 34 cents per pound for ammonium nitrate.[63]

Anhydrous ammonia is dependent on natural gas for its production. In North America, anhydrous ammonia production plants are typically built near a dedicated supply of natural gas, and the price and demand for the product are also dependent and responsive to the price of natural gas. Thus, the production at some plants is currently down due to the increase in price of natural gas. On the demand side of the economic equation there is an increase in the demand and use of anhydrous ammonia due to the recent increase in ethanol demand. Ethanol is typically produced in the United States from corn, and the production of corn requires substantial amounts of nitrogen, much of which comes from anhydrous ammonia.

Because there are a number of factors contributing to increased costs for anhydrous ammonia, it is difficult to determine how much of any increase in the price of the PIH material would be a product of this proposed regulation and shipping via rail. We note as well that increased costs may well make substitute produces more attractive.

Currently PIH shippers are experiencing rapidly increasing rate increases as a result of the railroads' concern over possible train accidents involving the release of PIH materials. The use of the more crashworthy tank cars coupled with the operating restrictions DOT is proposing should significantly reduce the risk of catastrophic PIH releases and ultimately translate into relief from these escalating rail transportation costs. (These rate escalations would likely continue were DOT not to issue its proposed rule since the car mandated by AAR's new standard (i.e., a Trinity-type car) would probably not prevent PIH tank car releases in even moderate speed train accidents). Shippers would be able to make the case that higher rates would no longer be ''reasonable'' given the significantly reduced probability of a catastrophic release. This ''cost-savings'' would allow shippers to offset new-car costs to a large extent. Given that new car expenses are typically financed over several years, we believe that the increased costs passed on by shippers to small farmers would not be significant. The farmers, in turn, would be expected to pass shipping cost increases to end consumers in the form of higher agricultural product prices.

We request comment from affected agricultural operations as to the impact that the proposed rule would have on them.

E. Explosives Manufacturers

Anhydrous ammonia is also used in producing explosives. The Institute of Makers of Explosives (IME), an industry trade group, reports that there are 22 explosives manufacturers in the United

[58] Jeffrey E. Warner & Manuel Solari Terra, ''Assessment of Texas Short Line Railroads, '' Texas Transportation Institute (Nov. 15, 2005).

[59] The Ten-Year Needs of Short Line and Regional Railroads, Standing Committee on Rail Transportation, American Association of State Highway and Transportation Officials, Washington, DC (Dec. 1999). This report was based on a survey conducted by the ASLRRA in 1998 and 1999 with data from 1997.

[60] John Gallagher, ''Tank Car Tensions,'' Traffic World (June 19, 2006).

[61] U.S. DOT Public Meeting Transcripts, Testimony of Fred Morscheck from the McGregor Company, May 31, 2006, p. 168.

[62] *Id.* p. 169.

[63] U.S. DOT Public Meeting Transcripts, Testimony of William Wolf from The Andersons, Inc. (a shipper), May 31, 2006, p. 190.

States. Of these 22 manufacturers, eight actually produce explosives material while the remaining 14 are associated manufacturers making components or assemblies. Finally, three manufacturers consume anhydrous ammonia to produce explosives. None of these three potentially impacted manufactures, however, is considered a small business.

IV. Description of Reporting, Recordkeeping, and Other Compliance Requirements and Impacts on Small Entities Resulting From Specific Proposed Requirements

A. Reporting Requirement of Proposed § 173.31(b)(8)(iii)

Proposed § 173.31(b)(8)(iii) requires that after the initial 5-year implementation period has passed, owners of PIH tank cars submit a progress report to FRA identifying the total number of in-service tank cars in PIH service owned and the number of those cars in compliance with the enhanced head and shell protection requirements of the proposed rule. This paragraph would also require that tank car owners certify in their progress reports that their fleet does not contain any pre-1989 tank cars in PIH service subject to paragraph (b)(8)(ii).[64]

DOT estimates that the burden for this reporting would be 5 minutes per pertinent tank car.[65] In the Regulatory Impact Analysis (RIA), DOT estimated that this requirement will cost $19,200 in the beginning of the 6th year of the analysis, and this cost is for each tank car. In addition, DOT has provided postage, envelopes, and handling charges of $1 per tank car report. This cost would total $7,650, which would also be incurred in the beginning of the 6th year of the analysis. The total cost for this requirement is $26,800 for all PIH tank car owners. DOT does not expect many of these tank cars to be owned by small entities. Therefore, this reporting requirement would have very little, if any, impact on small entities.

B. Filing Requirement for Alternative Compliance With Proposed § 174.86(c)(1)

Proposed § 174.86(c)(1) provides that if a tank car not meeting the enhanced tank-head and shell puncture resistance standards of the proposed rule is used to transport PIH material over non-signaled territory, its maximum operating speed is limited to 30 mph. Alternatively, paragraph (c)(2) provides that railroads may implement alternative safety measures in lieu of complying with the 30 mph speed restriction, so long as those alternative safety measures provides an equivalent level of safety as a traffic control system complying with 49 CFR Part 236 and the railroad completes a risk assessment demonstrating this equivalent level of safety. The rule proposes that this risk assessment be submitted to FRA for review and approval.

DOT does not expect a great number of these applications. A typical submission might consist of a commitment to install a switch position monitoring system, track integrity circuits (except in areas where new rail is prevalent), and a temporary speed reduction to 40 mph during the period a positive train control system is installed on the wayside. DOT expects that the average submission would consist of between 20 and 30 pages. DOT does not expect any of these applications to be by small railroads.

C. Demonstration of Compliance With Proposed Enhanced Tank-Head and Shell Puncture Resistance System Tests

Proposed Appendix C to 49 CFR Part 179 provides that compliance with the proposed enhanced tank head and shell puncture-resistance standards can be shown by computer simulation, by simulation in conjunction with substructure testing, by full-scale impact testing, or a combination thereof. The lowest cost and lowest level of confidence is provided by simulation alone. Substructure testing increases the confidence in simulation modeling, potentially with relatively modest costs, depending on the details of the substructure test. The highest level of confidence is provided by full-scale impact testing, along with the greatest cost. The cost of such compliance is not important to this assessment. DOT firmly believes that no small entities will be impacted by this requirement.

D. Impacts on Small Entities Resulting From Specific Proposed Requirements

The impacts from this proposed rulemaking would primarily result from complying with the requirements for building enhanced PIH tank cars. The proposed rule provides affected entities an 8-year period of time in which to accomplish this goal.

1. Additional Cost for Enhanced PIH Tank Cars

One of the impacts from this proposed regulation would be an increase in the cost of new PIH tank cars. The enhanced crashworthiness features, while increasing safety, would cause the average PIH tank car to increase in cost and also increase in weight. DOT believes that the impact from this increased cost in the tank cars would be substantially passed from the manufacturer to the tank car owners. Since most tank cars are owned by the shippers, much of this cost would be passed on to them. These shippers would most likely pass this cost on to the end users in the form of higher shipping costs. The capacity constraints in the railroad system give shippers some market power to pass on a substantial portion of the costs (*i.e.*, shippers do not need to cut costs to attract customers). However, the flexibility provided by the long phase in period of the rulemaking, and the ability of some customers to use substitute products or purchase from shippers that rely on other modes of transportation if costs rise beyond their willingness to pay, may temper passing through of costs. If any of the additional or marginal increases in a PIH tank car's cost are absorbed by shippers, then few, if any, PIH material shippers that are considered to be small entities would be negatively affected. Based on information from the DOT/PHMSA HMIS registry of shippers, and industry trade groups, DOT believes no small PIH material shippers would be impacted. If the higher cost of cars meeting the proposed performance standard are not absorbed by shippers and are not offset by reductions in shipping rates attributable to reduce potential liability for catastrophic releases, small farmers using anhydrous ammonia for fertilizer might be impacted. The degree to which they might be impacted depends, among other things, on their ability to pass costs on to consumers of agricultural products. This may, in turn, be affected by Federal government agricultural policy. FRA specifically requests comments on this issue.

2. Transferring Current PIH Tank Cars to Other Services

A second impact from this proposed rulemaking is the cost for transferring the current PIH tank car fleet into service for other products. This cost would only be incurred for those PIH tank cars that still have a useful life left. DOT has estimated a cost of $2,500 per PIH tank car for this impact. This cost would only be incurred to the extent that such an investment is believed to yield a positive return to the investor. As noted above, very few, if any, PIH material shippers are considered to be small entities. Thus, DOT does not

[64] This proposed requirement restricts the use of PIH tank cars that were manufactured using non-normalized steel for tank-head or shell construction. Under it, tank cars manufactured using non-normalized steel for the tank-head or shell are not authorized to transport PIH materials five years after the effective date of the final rule.

[65] CALCULATION: ($30.05 wage rate) * (5 minutes/60 minutes) * (15,300 *.5) = $19,157.

believe that a substantial number of PIH material shippers would be impacted, nor by a significant economic amount.

3. Maintenance, Inspections, and Training Related to the New PIH Tank Cars

Another proposed requirement that could impact small entities is the maintenance, inspection, and training costs related to the new PIH tank cars. This impact will be borne by the shippers. This impact would be temporary and would occur as the first new PIH tank cars are placed into service because DOT expects that initially it may be necessary to inspect the new tank cars more often than conventional tank cars to ensure conformance with the enhanced performance standards.

4. Fuel Cost: Impact of the Additional Weight in New PIH Tank Cars

One of the impacts from this proposed regulation would be an increased fuel usage by trains resulting from the additional 23,000 lbs that the new PIH tank cars will carry due to the enhanced crashworthiness features. (This increased fuel cost would also be incurred under the new AAR PIH tank car standard.) Initially, this is a cost that would be borne by the railroads. However, the railroads would likely pass much of that cost on to the PIH material shippers through higher shipping rates. This cost would in turn be passed on to the end users, depending on the product's price elasticity of demand, and the factors noted in the ''Additional Cost for Enhanced PIH Tank Cars'' section above. Thus, this impact should not affect any of the small railroads. Any shippers that qualify as a small entity will most likely pass the cost on to an end user. Small farms and governmental jurisdictions of small communities are end users of PIH materials. They could potentially be impacted by this cost. However, the cost would be reflected in the shipping rates of these materials. The shipping rates of these products should also decrease or stop increasing due to the insurance costs related to the PIH materials. This is because the proposed enhanced features for the future PIH tank cars would serve to reduce the likelihood of a PIH material release. Therefore, the risk of an accident or derailment occurring where a PIH tank car is ruptured and releases its contents would have decreased, and therefore serve to lower the insurance costs associated with the shipment of these materials.

5. Cost of Restricting Traffic Speed to 50 mph

One of the proposed requirements of this rulemaking is that PIH tank cars be limited to speeds of 50 mph on signaled territory or track. This requirement is not expected to impact any small railroads, because none of them travel at speeds greater than 50 mph.

6. Increased Traffic/Volume of PIH Tank Cars

Due to several of the proposed requirements in this rulemaking, it is anticipated that the actual volume of PIH tank car traffic would increase. In general, this could affect railroads. However, most small railroads transport PIH tank cars from the manufacturing facility to the connection point with the Class I railroad. The traffic of these types of shipments, for the short time they are handled by small railroads, is not expected to impact these railroads. The number of cars will be few at that point, and small railroads usually only run one or two trains a day.

7. Cost of Restricting Speed to 30 mph in Dark Territory

In proposed § 174.86(c), PIH tank cars that do not meet the new performance requirements would not be allowed to travel at speeds in excess of 30 mph when that tank car travels in non-signaled territory. Railroads could exceed the 30 mph limit, provided equivalent safety criteria are met. This proposed requirement should not impact small railroads since most do not operate at speeds greater than 30 mph. This proposed requirement could serve to delay deliveries for PIH material shippers and contribute to higher shipping rates. However, DOT does not believe that there are any small PIH material shippers. DOT would encourage any entities that do meet these criteria and would be negatively impacted to provide comment to this rulemaking. Governmental jurisdictions of small communities that own a water system that uses chlorine could be impacted. Most chlorine that is transported to these facilities is transported to the end destination via a truck in 1-ton tanks. This requirement will serve to slow down some rail traffic and increase the cost to ship via rail. Therefore, small farms that use anhydrous ammonia as a fertilizer could also be impacted.

V. Identification of Relevant Duplicative, Overlapping, or Conflicting Federal Rules

There are no Federal rules that would duplicate, overlap, or conflict with this proposed rule.

VI. Alternatives Considered

DOT has identified no significant alternative to the proposed rule which satisfies the mandate of SAFETEA–LU, related provisions of the Federal hazmat law, or meets the agency's objective in promulgating this rule, and that would minimize the economic impact of the proposed rule on small entities. As in all aspects of this IRFA, DOT requests comments on this finding of no significant alternative related to small entities.

The process by which this proposed rule was developed provided outreach to small entities. DOT held three public meetings (May 31-June 1, 2006, December 14, 2006, and March 30, 2007).[66] At each of the public meetings, DOT sought comment and input from small entities on issues related to the safe transportation of hazardous materials by railroad tank car and how the proposed concepts would impact small entities, as well as potential alternatives that might mitigate such impacts. Subsequent to publication of this notice of proposed rulemaking, DOT expects to hold additional public meetings to discuss all aspects of the proposed rule, including its potential impact on small entities, and DOT encourages the active participation of any small entity potentially affected.

F. Paperwork Reduction Act

This proposed rule may result in an increase in the information collection and recordkeeping burden due to the enhanced performance standards and operational restrictions for railroad tank cars that transport PIH materials. PHMSA currently has an approved information collection under OMB Control Number 2137–0559, ''(Rail Carriers and Tank Car Tanks Requirements) Requirements for Rail Tank Car Tanks—Transportation of Hazardous Materials by Rail,'' with 2,689 annual burden hours and an expiration date of May 31, 2008.

Pursuant to 5 CFR 1320.8(d), PHMSA is required to provide interested members of the public and affected agencies with an opportunity to comment on information collection and recordkeeping requests. This notice identifies a revised information collection request that PHMSA will submit to the Office of Management and Budget (OMB) for approval based on the requirements in this proposed rule.

PHMSA has developed burden estimates to reflect proposals in this NPRM. PHMSA estimates that the proposals in this rulemaking will result

[66] *See* 71 FR 30019, 71 FR 67015, 72 FR 12259.

in approximately 2,255 additional burden hours and $67,650.00 additional burden costs. PHMSA estimates that the total information collection and recordkeeping burdens for OMB Control Number 2137–0559, ''(Rail Carriers and Tank Car Tank Requirements) Requirements for Rail Tank Car Tanks-Transportation of Hazardous Materials by Rail,'' would be as follows:

Total Annual Number of Respondents: 400.

Total Annual Responses: 16,781.

Total Annual Burden Hours: 4,944.

Total Annual Burden Cost: $170,236.25.

Requests for a copy of the information collection should be directed to Deborah Boothe or T. Glenn Foster, U.S. Department of Transportation, Office of Hazardous Materials Standards (PHH–11), Pipeline and Hazardous Materials Safety Administration, 1200 New Jersey Avenue, SE., East Building, 2nd Floor, Washington, DC 20590–0001, Telephone (202) 366–8553.

All comments should be addressed to the Dockets Unit as identified in the **ADDRESSES** section of this rulemaking, and received prior to the close of the comment period identified in the DATES section of this rulemaking. In addition, you may submit comments specifically related to the information collection burden to the PHMSA Desk Officer, OMB, at fax number 202–395–6974. Under the Paperwork Reduction Act of 1995, no person is required to respond to an information collection unless it displays a valid OMB control number. If these proposed requirements are adopted in a final rule with any revisions, we will resubmit any revised information collection and recordkeeping requirements to OMB for re-approval.

We specifically request comments on the information collection and recordkeeping burden associated with developing, implementing, and maintaining these requirements for approval under this proposed rule.

G. Regulation Identifier Number (RIN)

A 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.

H. Unfunded Mandates Reform Act

Pursuant to Section 201 of the Unfunded Mandates Reform Act of 1995 (Pub. L. 104–4, 2 U.S.C. 1531), each Federal agency ''shall, unless otherwise prohibited by law, assess the effects of Federal regulatory actions on State, local, and tribal governments, and the private sector (other than to the extent that such regulations incorporate requirements specifically set forth in law).'' Section 202 of the Act (2 U.S.C. 1532) further requires that ''before promulgating any general notice of proposed rulemaking that is likely to result in the promulgation of any rule that includes any Federal mandate that may result in the expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of $120,700,000 or more (adjusted annually for inflation) in any 1 year, and before promulgating any final rule for which a general notice of proposed rulemaking was published, the agency shall prepare a written statement'' detailing the effect on State, local, and tribal governments and the private sector.

The proposed rule may result in the expenditure of more than $120,700,000 (adjusted annually for inflation) by the public sector in any one year. The analytical requirements under Executive Order 12866 are similar to the analytical requirements under the Unfunded Mandates Reform Act of 1995, and, thus, the same analysis complies with both analytical requirements.

I. Environmental Assessment

1. Background

The National Environmental Policy Act, 42 U.S.C. 4321–4375, requires that federal agencies analyze proposed actions to determine whether the action will have a significant impact on the human environment. The Council on Environmental Quality (CEQ) regulations order federal agencies to conduct an environmental review considering: (1) The need for the proposed action, (2) alternatives to the proposed action, (3) probable environmental impacts of the proposed action and the alternatives, and (4) the agencies and persons consulted during the consideration process. 40 CFR 1508.9(b). We are proposing regulations to enhance the safety of the transportation by rail of certain hazardous materials. We developed this assessment to determine the effects of this proposed rule on the environment and whether a more comprehensive environmental impact statement may be required.

2. Purpose and Need

Hazardous materials are transported by aircraft, vessel, rail, pipeline, and highway. The need for hazardous materials to support essential services means that the transportation of hazardous materials is unavoidable. However, these shipments frequently move through heavily-populated or environmentally-sensitive areas where the consequences of an incident could be loss of life, serious injury, or significant environmental damage. To address the safety and environmental risks associated with the transportation of hazardous materials by rail, rail tank cars must conform to rigorous design, manufacturing, and requalification requirements. The result is that tank cars are robust packagings, equipped with features such as shelf couplers, head shields, thermal insulation, and bottom discontinuity protection that are designed to ensure that a tank car involved in an accident will survive the accident intact.

In the last several years, however, there have been a number of rail tank car accidents in which the tank car was breached and product was lost on the ground or into the atmosphere. Of particular concern have been accidents involving PIH materials. The purpose of this NPRM is to adopt regulations to enhance the safety of transporting PIH materials by tank car. A primary safety concern is the prevention of a catastrophic release in proximity to populated areas, including urban areas and events or venues with large numbers of people in attendance. Also of major concern is the release of PIH materials in proximity to iconic buildings, landmarks, or environmentally-sensitive areas. Such a catastrophic event could be the result of an accident—such as the January 18, 2002 derailment near Minot, North Dakota, that resulted in the derailment of 31 cars of a 112-car train. Approximately 146,700 gallons of anhydrous ammonia were immediately released from five cars in the train set. As a result, a toxic vapor plume covered the derailment site and the surrounding area. As of March 15, 2004, over $8 million had been spent on environmental remediation from this one incident.

3. Alternatives Considered

The goal of this proposed rule is to enhance the safety of transporting PIH materials by rail. In developing this proposed rule, we considered three alternatives:

Alternative 1: Do nothing.

This alternative continues the status quo. In this alternative, we would not issue a proposed rule to enhance the accident survivability of tank cars (i.e., limiting the operating conditions of the tank cars transporting PIH materials and enhancing the tank-head and shell puncture-resistance systems), which represents the most efficient and cost-effective method of improving the accident survivability of these cars.

This is not an acceptable alternative. The transportation of PIH materials poses unique and significant safety threats that warrant careful consideration of measures to address safety vulnerabilities in existing authorized packagings. The January 6, 2005 derailment and release of chlorine in Graniteville, South Carolina, is an example of the serious consequences that can result from the unintentional release of a PIH material. Selection of this alternative could have a negative impact on the environment because it does not reduce safety vulnerabilities related to the transportation of PIH materials.

Alternative 2: Impose enhanced safety requirements for a limited list of PIH materials transported by rail.

Under this alternative, we would propose enhanced tank-head and shell-puncture resistance standards for tank cars used to transport a subset of PIH materials that pose the most significant safety risks, such as chlorine, but not for tank cars used to transport less hazardous materials, such as bromine or acrolein.

The HMR define hazardous materials by class. Any material, including a mixture or solution, that meets the definition of one of the nine defined hazard classes is considered a hazardous material and subject to the applicable regulatory requirements. This ensures that the regulations comprehensively address the hazards posed by many different types and formulations of materials. Employing this rationale, we determined that, for the purposes of this rulemaking, we would similarly address PIH materials as a class. Moreover, while some PIH materials may not pose as great a threat to the public or the environment as other PIH materials, it is in the public's best interest for all PIH materials to be transported in the safest manner possible. Nonetheless, selection of this alternative could have a positive impact on the environment because it would reduce safety vulnerabilities related to the transportation of certain PIH materials.

Alternative 3: Impose enhanced safety requirements for all PIH materials transported by rail.

Under this alternative, we would propose enhanced tank-head and shell-puncture resistance standards for tank cars used to transport all materials meeting the definition of a PIH material. This approach is consistent with the overall regulatory philosophy underlying the HMR in that it addresses the safety risks posed by all materials classed as PIH materials. This alternative represents the most efficient and cost-effective method of improving the accident survivability of tank cars transporting PIH materials. This alternative should have a positive impact on the environment because it would enhance the accident survivability of all rail tank cars used to transport PIHmaterials, thereby minimizing the possibility that PIH materials would be released.

4. Analysis of Environmental Impacts

The potential for environmental damage or contamination exists when packages of hazardous materials are involved in transportation accidents. The ecosystems that could be affected by a hazardous materials release during transportation include air, water, soil, and ecological resources (i.e.,wildlife habitats). The adverse environmental impacts associated with releases of most hazardous materials are short-term impacts that can be greatly reduced or eliminated through prompt clean-up of the accident scene.

Releases of PIH materials, such as chlorine and anhydrous ammonia, may result in serious health effects. High concentrations of ammonia (greater than 1,700 parts per million (ppm)) in the atmosphere cause compulsive coughing and death, while lower concentrations (lower than 700 ppm) cause eye and throat irritation. Ammonia is lighter than air so that it dissipates into the atmosphere, the rate of dissipation depending on the weather. Chlorine gas is more than twice as heavy as air. Therefore, it can settle in low lying areas in the absence of wind. Humans detect the presence of chlorine at concentrations as low as 1 to 3 ppm. At 30 ppm, coughing and pain result; at 430 ppm death results in as little as 30 minutes. Higher concentrations of chlorine can cause rapid fatality. Chlorine gas reacts with water in the air to form vapors of hydrochloric acid and liberate nascent oxygen, both of which cause massive tissue damage.

Releases of PIH materials may also result in adverse environmental impacts to soil and ground water. For example, when anhydrous ammonia is released into water, it floats on the surface, rapidly dissolving into the water as ammonium hydroxide while simultaneously boiling into the atmosphere as gaseous ammonia. In an aquatic or wetland environment, ammonium hydroxide can cause fish, planktonic, and benthic organism mortality in the vicinity of the release—the size depending on the volume of anhydrous ammonia that is released. The chemical can also strip protective oils from the feathers of shore birds, causing drowning or infection. Such die offs could spur high nutrient levels that could stimulate noxious blooms of algae. Terrestrial vegetation can also be either damaged or killed, depending on atmospheric concentrations.

Similarly, in an aquatic environment, chlorine gas reacts with water to form hypochlorous acid and hydrochloric acid. The breakdown of hydrochloric acid causes a decrease in the pH of the water, making it more acidic. These changes in water chemistry can cause widespread damage to aquatic environments, including fish kills. If chlorine gas is released into soil, chlorine will react with moisture, forming hypochlorous acid and hydrochloric acid, which can contaminate ground water.

If adopted, we expect that the tank car performance standards and operating limitations will minimize the loss of lading in the event of a derailment or train-to-train collision. Therefore, we have preliminarily determined that there are no significant adverse environmental impacts associated with the proposals in this NPRM and that to the extent there might be any environmental impacts, they would be beneficial given the reduced likelihood of a hazardous materials release.

5. Locomotive Emissions

The U.S. Environmental Protection Agency (EPA) finalized locomotive emissions standards in 1997, which became effective in 2000.[67] Three separate sets of emission standards were established, with applicability of the standards dependent on the date a locomotive is first manufactured. The first set of standards (Tier 0) apply to locomotives and locomotive engines originally manufactured from 1973 through 2001, at any time they are remanufactured. The second set of standards (Tier 1) apply to locomotives and locomotive engines originally manufactured from 2002 through 2004. The final, and most stringent, set of standards (Tier 2) apply to locomotives and locomotive engines manufactured in or after 2005. Tier 2 locomotives and locomotive engines will be required to meet the applicable standards at the time of original manufacture and at each subsequent manufacture.

As noted in the RIA to this NPRM, we expect the speed restrictions proposed in this rule to produce a net cost savings in the area of fuel. Accordingly, the use of less fuel, combined with the

[67] 40 CFR 92.8.

increasingly stringent locomotive emissions standards of the EPA will further reduce the emissions from railroad freight transportation for movements subject to the requirements of this proposal.

6. Consultations and Public Comment

As of March 2007, FRA and PHMSA have conducted three public meetings intended to solicit public, private, and government comments on alternatives (regulatory or otherwise) to address this serious issue. We invite commenters to address the possible beneficial and/or adverse environmental impacts of the proposals in this NPRM. We will consider comments received in response to this NPRM in our assessment of the environmental impacts of a final rule on this issue.

J. Privacy Act

Anyone is able to search the electronic form of any written communications and comments received into any of our dockets by the name of the individual submitting the document (or signing the document, if submitted on behalf of an association, business, labor union, etc.). You may review DOT's complete Privacy Act Statement in the **Federal Register** published on April 11, 2000 (65 FR 19477) or at *http://www.dot.gov/privacy.html.*

List of Subjects

49 CFR Part 171

Exports, Hazardous materials transportation, Hazardous waste, Imports, Incorporation by reference, 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, Rail carriers, Railroad safety, Reporting and recordkeeping requirements.

49 CFR Part 179

Hazardous materials transportation, Railroad safety, Reporting and recordkeeping requirements.

The Proposed Rule

On the basis of the foregoing, PHMSA proposes to amend title 49, Chapter I, Subchapter C, as follows:

PART 171—GENERAL INFORMATION, REGULATIONS, AND DEFINITIONS

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

Authority: 49 U.S.C. 5101–5128, 44701; 49 CFR 1.45 and 1.53.

2. In § 171.7, in paragraph (a)(3), in the Table of Material Incorporated by Reference, under the entry ''Association of American Railroads,'' add the entry ''AAR Standard S–286–2002, Specification for 286,000 lbs. Gross Rail Load Cars for Free/Unrestricted Interchange Service, revised as of September 1, 2005,'' to read as follows:

§ 171.7 Reference material.

(a) * * *

(3) *Table of material incorporated by reference.* * * *

Source and name of material	49 CFR reference
* * * * * *	*
Association of American Railroads	
* * * * * *	*
AAR Standard S–286–2002, Specification for 286,000 lbs. Gross Rail Load Cars for Free/Unrestricted Interchange Service, revised as of September 1, 2005.	179.13
* * * * * *	*

* * * * *

PART 173—SHIPPERS—GENERAL REQUIREMENTS FOR SHIPMENTS AND PACKAGINGS

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

Authority: 49 U.S.C. 5101–5128, 44701; 49 CFR 1.45, 1.53.

4. Amend § 173.31 as follows:

a. Revise paragraphs (a)(6) and (b)(3);

b. Revise paragraph (b)(6) introductory text;

c. Add paragraphs (b)(7) and (b)(8); and

d. Revise paragraph (e)(2)(ii).

The revisions and additions read as follows:

§ 173.31 Use of Tank Cars.

(a) * * *

(6) Unless otherwise specifically provided in this part:

(i) When the tank car delimiter is an ''A,'' offerors may also use tank cars with a delimiter ''S,'' ''J,'' ''M,'' ''N'' or ''T.''

(ii) When the tank car delimiter is an ''S,'' offerors may also use tank cars with a delimiter ''J,'' ''M,'' ''N'' or ''T.''

(iii) When the tank car delimiter is a ''T,'' offerors may also use tank cars with a delimiter of ''J'' or ''N.''

(iv) When the tank car delimiter is a ''J,'' offerors may also use tank cars with a delimiter of ''N.''

(v) When a tank car delimiter is an ''M,'' offerors may also use tank cars with delimiter of ''N.''

(vi) When a tank car delimiter is an ''N,'' offerors may not use a tank car with any other delimiter.

* * * * *

(b) * * *

(3) *Tank-head puncture-resistance requirements.* (i) Tank cars used to transport a Class 2 material, other than a material poisonous by inhalation, and tank cars constructed from aluminum or nickel plate used to transport any hazardous material must have a tank-head puncture-resistance system that conforms to the requirements of § 179.16(a) of this subchapter.

(ii) Tank cars used to transport material poisonous by inhalation must have a tank-head puncture-resistance system that conforms to the requirements of § 179.16(b) of this subchapter, as follows:

(A) Tank cars built after [INSERT DATE 2 YEARS AFTER EFFECTIVE DATE OF FINAL RULE] must have a tank-head puncture-resistance system conforming to the requirements of § 179.16(b) of this subchapter.

(B) Tank cars built on or before [INSERT DATE 2 YEARS AFTER EFFECTIVE DATE OF FINAL RULE] must have a tank-head puncture-resistance system conforming to the requirements of § 179.16(b) by [INSERT DATE 8 YEARS AFTER EFFECTIVE DATE OF FINAL RULE].

* * * * *

(6) *Scheduling of modifications and progress reporting.* The date of conformance for the continued use of tank cars subject to paragraphs (b)(4), (b)(5), and (f) of this section and § 173.314(j) is subject to the following conditions and limitations.

* * * * *

(7) *Tank shell puncture-resistance system.* Tank cars used to transport material poisonous by inhalation must have a tank shell puncture-resistance system that conforms to the requirements of § 179.24 of this subchapter, as follows:

(i) Tank cars built after [INSERT DATE 2 YEARS AFTER EFFECTIVE DATE OF FINAL RULE] must have a tank shell puncture-resistance system conforming to the requirements of § 179.24 of this subchapter.

(ii) Tank cars built on or before [INSERT DATE 2 YEARS AFTER EFFECTIVE DATE OF FINAL RULE] must have a tank shell puncture-resistance system conforming to the requirements of § 179.24 by [INSERT DATE 8 YEARS AFTER EFFECTIVE DATE OF FINAL RULE].

(8) *Tank-head and shell puncture-resistance systems implementation schedule and reporting requirement.* Each owner of a tank car subject to paragraphs (b)(3)(ii) and (b)(7) of this section must comply with the following implementation schedule and reporting requirements:

(i) No later than [INSERT DATE 5 YEARS FROM THE EFFECTIVE DATE OF THE FINAL RULE], each owner must have brought at least 50 percent of its tank car fleet used to transport material poisonous by inhalation into compliance with the requirements of §§ 179.16(b) and 179.24 of this subchapter.

(ii) After [INSERT DATE 5 YEARS AFTER EFFECTIVE DATE OF FINAL RULE], tank cars manufactured using non-normalized steel for head or shell construction may not be used for the transportation of material poisonous by inhalation.

(iii) No later than [INSERT DATE 5 YEARS AND TWO MONTHS FROM THE EFFECTIVE DATE OF FINAL RULE], each tank car owner must submit to the Federal Railroad Administration, Hazardous Materials Division, Office of Safety Assurance and Compliance, 1200 New Jersey Avenue, SE., Washington, DC, 20590, a progress report that shows the total number of in-service tank cars subject to paragraphs (b)(3)(ii) and (b)(7) of this section and of those tank cars, the number of cars in compliance with §§ 179.16(b) and 179.24 of this subchapter. In this report, the tank car owner must also certify that its fleet does not include any tank car subject to paragraph (b)(8)(ii).

* * * * *

(e) * * *

(2) * * *

(ii) *Tank-head and shell puncture-resistance systems.* As provided in paragraphs (b)(3)(ii) and (b)(7) of this section, each tank car transporting a material poisonous by inhalation must meet the tank-head and shell puncture-resistance system requirements of §§ 179.16(b) and 179.24 of this subchapter. Except as provided in paragraph (b)(8) of this section, a tank car that does not conform to these requirements may not be used to transport any material poisonous by inhalation after [INSERT DATE 8 YEARS AFTER EFFECTIVE DATE OF FINAL RULE].

* * * * *

5. Amend § 173.249 as follows:

a. Revise the last sentence of paragraph (a); and

b. Add new paragraph (g).

The revisions and additions read as follows:

§ 173.249 Bromine.

(a) * * * Tank cars must conform to the requirements in paragraphs (a) through (g) of this section.

* * * * *

(g) Except as provided in § 173.31(b)(8), for shipments offered for transportation or transported after [INSERT DATE 8 YEARS AFTER EFFECTIVE DATE OF FINAL RULE], each tank car must meet the tank-head and shell puncture-resistance system requirements of §§ 179.16(b) and 179.24 of this subchapter.

6. In § 173.314, revise paragraph (k) to read as follows:

§ 173.314 Compressed gases in tank cars and multi-unit tank cars.

* * * * *

(k) *Special requirements for chlorine.* (1) Tank cars built after September 30, 1991, and before [INSERT 2 YEARS AFTER EFFECTIVE DATE OF THE FINAL RULE] must have an insulation system consisting of 5.08 cm (2 inches) glass fiber placed over 5.08 (2 inches) of ceramic fiber. Tank cars built after [INSERT 2 YEARS AFTER EFFECTIVE DATE OF THE FINAL RULE] must have a thermal protection system conforming to § 179.18 of this subchapter, or have an insulation system with an overall thermal conductance of no more than 0.613 kilojoules per hour, per square meter, per degree Celsius temperature differential (0.03 B.t.u. per square foot, per hour per degree Fahrenheit temperature differential).

(2) Tank cars must have excess flow valves on the interior pipes of liquid discharge valves.

(3) Tank cars constructed to a DOT 105A500W specification may be marked as a DOT 105A300W specification with the size and type of reclosing pressure relief valves required by the marked specification.

(4) Except as provided in § 173.31(b)(8), for shipments offered for transportation or transported after [INSERT DATE 8 YEARS AFTER EFFECTIVE DATE OF FINAL RULE], each tank car must meet the tank-head and shell puncture-resistance system requirements of §§ 179.16(b) and 179.24 of this subchapter.

* * * * *

7. In § 173.323, revise paragraph (c)(1) to read as follows:

§ 173.323 Ethylene Oxide.

* * * * *

(c) * * *

(1) *Tank cars.* Class DOT 105 tank cars:

(i) Each tank car must have a tank test pressure of at least 20.7 Bar (300 psig); and

(ii) Except as provided in § 173.31(b)(8), for shipments offered for transportation or transported after [INSERT DATE 8 YEARS AFTER EFFECTIVE DATE OF FINAL RULE], each tank car must meet the tank-head and shell puncture-resistance system requirements of §§ 179.16(b) and 179.24 of this subchapter.

* * * * *

PART 174—CARRIAGE BY RAIL

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

Authority: 49 U.S.C. 5101–5128; 49 CFR 1.53

9. Add new § 174.2 to read as follows:

§ 174.2 Limitation on actions by states, local governments, and Indian tribes.

Sections 5125 and 20106 of Title 49, United States Code, limit the authority of states, political subdivisions of states, and Indian tribes to impose requirements on the transportation of hazardous materials in commerce. A state, local, or Indian tribe requirement on the transportation of hazardous materials by rail may be preempted under either 49 U.S.C. 5125 or 20106, or both.

(a) Section 171.1(f) of this subchapter describes the circumstances under which 49 U.S.C. 5125 preempts a requirement of a state, political subdivision of a state, or Indian tribe.

(b) Under the Federal Railroad Safety Act (49 U.S.C. 20106), administered by the Federal Railroad Administration (see 49 CFR parts 200–268), laws, regulations and orders related to railroad safety, including security, shall be nationally uniform to the extent practicable. A state may adopt, or continue in force, a law, regulation, or order covering the same subject matter as a DOT regulation or order applicable to railroad safety and security (including the requirements in this subpart) only when an additional or more stringent state law, regulation, or order is necessary to eliminate or reduce an essentially local safety or security hazard; is not incompatible with a law, regulation, or order of the United States Government; and does not unreasonably burden interstate commerce.

10. Revise § 174.86 to read as follows:

§ 174.86 Maximum allowable operating speed.

(a) 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 24 km/hour (15 mph) for shipments by rail.

(b) For trains transporting tank cars containing a material poisonous by inhalation, the maximum allowable operating speed may not exceed 80.5 km/hour (50 mph) for shipments by rail.

(c) (1) Prior to [INSERT DATE 8 YEARS AFTER EFFECTIVE DATE OF FINAL RULE], if a tank car that does not meet the tank-head and shell puncture-resistance system requirements of § 179.16(b) and § 179.24 of this subchapter is used to transport by rail a material poisonous by inhalation, the maximum allowable operating speed of the train may not exceed 48.3 km/hour (30 mph) for that tank car when transported over non-signaled territory. For purposes of this section, non-signaled territory means a rail line not equipped with a traffic control system or automatic block signal system that conforms to the requirements in part 236 of this chapter.

(2) As an alternative to complying with paragraph (c)(1) of this section, a railroad may provide for alternative risk mitigations and complete a risk assessment that includes appropriate data and analysis establishing that the operating conditions over the subject trackage provide at least an equivalent level of safety as a traffic control system that conforms to the requirements in part 236 of this chapter, including consideration of the contribution of the traffic control system to broken rail detection, provided:

(i) The risk assessment is submitted to FRA's Associate Administrator for Safety, for review; and

(ii) The Associate Administrator determines in writing that the risk assessment establishes that the requirement of paragraph (c)(2) is met.

PART 179—SPECIFICATIONS FOR TANK CARS.

11. The authority citation for part 179 continues to read as follows:

Authority: 49 U.S.C. 5101–5128; 49 CFR part 1.53.

12. Add a new § 179.8 to read as follows:

§ 179.8 Limitation on actions by states, local governments, and Indian tribes.

Sections 5125 and 20106 of Title 49, United States Code, limit the authority of states, political subdivisions of states, and Indian tribes to impose requirements on the transportation of hazardous materials in commerce. A state, local, or Indian tribe requirement on the transportation of hazardous materials by rail may be preempted under either 49 U.S.C. 5125 or 20106, or both.

(a) Section 171.1(f) of this subchapter describes the circumstances under which 49 U.S.C. 5125 preempts a requirement of a state, political subdivision of a state, or Indian tribe.

(b) Under the Federal Railroad Safety Act (49 U.S.C. 20106), administered by the Federal Railroad Administration (see 49 CFR parts 200–268), laws, regulations and orders related to railroad safety, including security, shall be nationally uniform to the extent practicable. A state may adopt, or continue in force, a law, regulation, or order covering the same subject matter as a DOT regulation or order applicable to railroad safety and security (including the requirements in this subpart) only when an additional or more stringent state law, regulation, or order is necessary to eliminate or reduce an essentially local safety or security hazard; is not incompatible with a law, regulation, or order of the United States Government; and does not unreasonably burden interstate commerce.

13. Revise § 179.13 to read as follows:

§ 179.13 Tank car capacity and gross weight limitation.

(a) Except as provided in paragraph (b) of this section, tank cars built after November 30, 1970, may not exceed 34,500 gallons (130,597 L) capacity or 263,000 pounds gross weight on rail. Existing tank cars may not be converted to exceed 34,500 gallons capacity or 263,000 pounds gross weight on rail.

(b) Tank cars meeting the tank-head and shell puncture-resistance requirements of § 179.16(b) and § 179.24 of this subchapter, may not exceed 34,500 gallons (130,597 L) capacity or 286,000 pounds (129,727 kg) gross weight on rail. Tank cars exceeding 263,000 pounds and up to 286,000 pounds gross weight on rail must meet the requirements of AAR Standard S–286–2002, SPECIFICATION FOR 286,000 LBS. GROSS RAIL LOAD CARS FOR FREE/UNRESTRICTED INTERCHANGE SERVICE (adopted November, 2002 and revised September 1, 2005) (IBR; see § 171.7 of this subchapter).

14. Revise § 179.16 to read as follows:

§ 179.16 Tank-head puncture-resistance systems.

When the regulations in this subchapter require a tank-head puncture-resistance system, the system must meet the following requirements:

(a) *Performance standard for tank cars transporting a hazardous material other than a material poisonous by inhalation.* (1) For rail tank cars required to have tank-head puncture-resistance systems pursuant to § 173.31(b)(3)(i) of this subchapter, the tank-head puncture-resistance system must be capable of sustaining, without any loss of lading, coupler-to tank-head impacts at relative car speeds of 29 km/hour (18 mph) when:

(i) The weight of the impact car is at least 119,295 kg (263,000 pounds);

(ii) The impacted tank car is coupled to one or more backup cars that have a total weight of at least 217,724 kg (480,000 pounds) and the hand brake is applied on the last "backup" car; and

(iii) The impacted tank car is pressurized to at least 6.9 Bar (100 psig).

(2) Compliance with the requirements of paragraph (a)(1) of this section must be verified by full-scale testing according to appendix A of this part.

(3) As an alternative to requirements prescribed in paragraph (a)(2) of this section, compliance with the requirements of paragraph (a)(1) of this section may be met by installing full-head protection (shields) or full tank-head jackets on each end of the tank car conforming to the following:

(i) The full-head protection (shields) or full tank-head jackets must be at least 1.27 cm (0.5 inch) thick, shaped to the contour of the tank head and made from steel having a tensile strength greater than 379.21 N/mm² (55,000 psi);

(ii) The design and test requirements of the full-head protection (shields) or full tank-head jackets must meet the impact test requirements in Section 5.3 of the AAR Specifications for Tank Cars (IBR, see § 171.7 of this subchapter); and

(iii) The workmanship must meet the requirements in Section C, Part II, Chapter 5, of the AAR Specifications for Design, Fabrication, and Construction of Freight Cars (IBR, see § 171.7 of this subchapter).

(b) *Performance standard for tank cars transporting material poisonous by inhalation.* For rail tank cars required to have a tank-head puncture-resistance system pursuant to § 173.31(b)(3)(ii) of this subchapter, the tank-head puncture-resistance system must be capable of sustaining an impact at 48.3 km/hour (30 mph) without loss of lading, as demonstrated by any of the methods of compliance specified in Appendix C of this part.

15. In § 179.22, add paragraphs (e) and (f) to read as follows:

§ 179.22 Marking.

* * * * *

(e) Each tank car conforming to the tank-head puncture-resistance system requirements prescribed in § 179.16(b) and the shell puncture-resistance system requirements prescribed in § 179.24, but with no thermal protection system, must have the letter ''M'' substituted for the letter ''A'' or ''S'' in the specification marking.

(f) Each tank car conforming to the tank-head puncture-resistance system requirements prescribed in § 179.16(b), the shell puncture-resistance system requirements prescribed in § 179.24, and with a thermal protection system, must have the letter ''N'' substituted for the letter ''A,'' ''J,'' ''M,'' ''S,'' or ''T'' in the specification marking.

16. Add a new § 179.24 to read as follows:

§ 179.24 Tank shell puncture-resistance systems; performance standard.

When the regulations in this subchapter require a tank shell puncture-resistance system, the tank shell puncture-resistance system must be capable of sustaining an impact at 40.3 km/hour (25 mph) without loss of lading, as demonstrated by any of the methods of compliance specified in Appendix C of this part.

17. In § 179.102–17, add a new paragraph (m) to read as follows:

§ 179.102–17 Hydrogen chloride, refrigerated liquid.

* * * * *

(m) Except as provided in § 173.31(b)(8) of this subchapter, each tank car must meet the tank-head and shell puncture-resistance system requirements of §§ 179.16(b) and 179.24 of this subchapter by [INSERT DATE 8 YEARS AFTER EFFECTIVE DATE OF FINAL RULE].

18. Add Appendix C to Part 179 to read as follows:

APPENDIX C TO PART 179—PROCEDURES FOR ENHANCED TANK-HEAD AND SHELL PUNCTURE-RESISTANCE SYSTEMS TESTS

This Appendix provides performance criteria for the impact evaluation of tank cars designed to carry material poisonous by inhalation. Each of the following criteria describes a collision scenario in which the integrity of the tank must be maintained. These performance criteria are intended to prevent loss of lading during train collisions and derailments.

(a) Tank Heads.

(1) *Objective.* The end structures of the tank car must withstand a frontal impact with a proxy object which is intended to approximate a loaded freight car, including the coupler with the knuckle removed. (see figure 1).

(2) *Fixed rigid punch characteristics and orientation.* The fixed rigid punch must have the following characteristics: It shall protrude at least 1.5 meters (60 inches) from its base and it shall be 0.5 meters (21 inches) above the lowest edge of the commodity tank. The fixed rigid punch must have cross-section of 15.2 centimeters (6 inches) high by 15.2 centimeters (6 inches) wide, with 1.3 centimeter (½ inch) radii on the edges of the impact face.

(3) *Tank car characteristics.* The tank car must be filled with no more than 10% outage with lading of the same density as the commodity the car type is intended to carry, and pressurized to at least 100 psi.

(4) *Impact.* The end structure of the tank car must withstand a 48.3 km/hour (30 mph) impact with the fixed rigid punch, resulting in the tank maintaining its integrity. At the instant of contact, the longitudinal centerline of the punch must be aligned with the longitudinal centerline of the tank.

(5) *Result.* There must be no loss of lading due to this impact. A test is successful if there is no visible leak from the standing tank car for at least one hour after the impact.

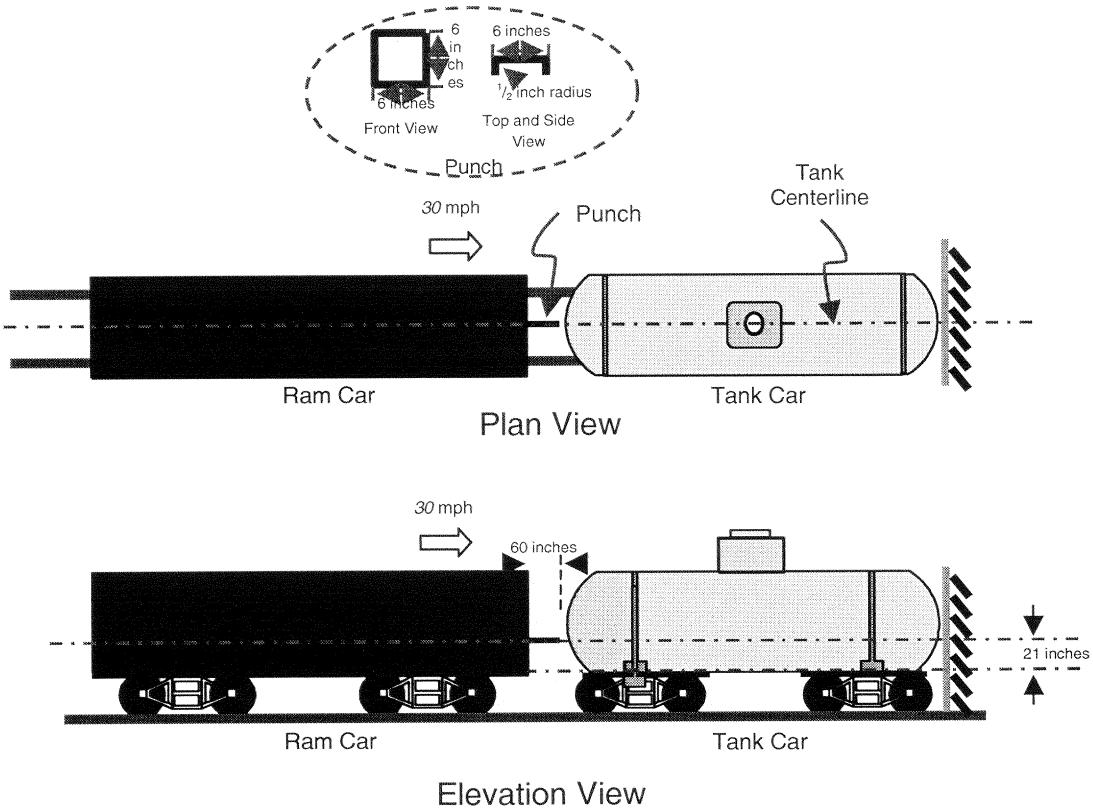

Figure 1. Head Impact

(b) Tank Shell.

(1) *Objective.* The shell structure of the tank car must withstand a side impact with a proxy object which is intended to approximate a loaded freight car, including the coupler with the knuckle removed (see figure 2).

(2) *Proxy object characteristics and orientation.* The proxy object must have the following characteristics: 286,000 pound minimum weight and rigid punch protruding at least 1.5 meters (60 inches). The rigid punch must have cross-section of 15.2 centimeters (6 inches) high by 15.2 centimeters (6 inches) wide, with 1.3 centimeter (½ inch) radii on the edges of the impact face.

(3) *Tank car characteristics.* The tank car must be filled with no more than 10% outage with lading of the same density as the commodity the car type is intended to carry, and pressurized to at least 100 psi. The tank car must be restrained in the direction of impact.

(4) *Impact.* The end structure of the tank car must withstand a 40.3 km/hour (25 mph) impact with the proxy object resulting in the tank maintaining its integrity. At the instant of contact, the longitudinal centerline of the punch must be aligned with the lateral centerline of the tank.

(5) *Result.* There must be no loss of lading due to this impact. A test is successful if there is no visible leak from the standing tank car for at least one hour after the impact.

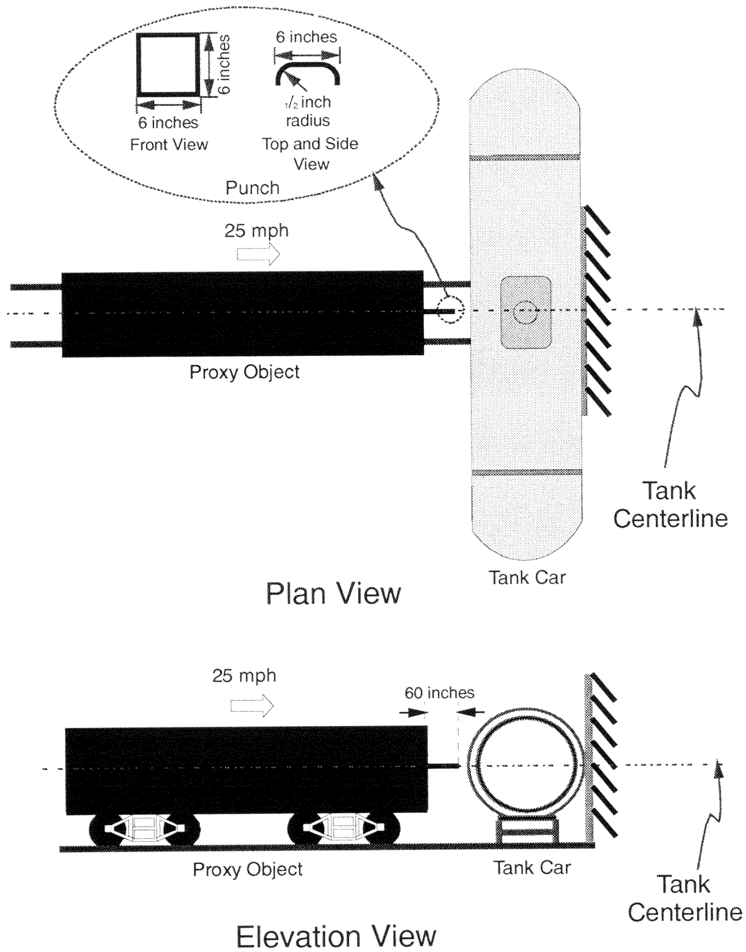

Figure 2. Shell Impact

(c) Demonstration of Compliance.—Compliance with the tank-head and shell puncture-resistance system requirement tests above must be demonstrated by any of the methods prescribed in this paragraph, or by a combination of these methods. Before a design is implemented based on the methods in (2) through (5) below, the party seeking to comply must submit all relevant documentation and analysis to FRA and FRA will acknowledge in writing that compliance with the requirements has been met.

(1) Full-scale testing.

(2) Performance of the test with substructures or models of appropriate scale incorporating those features that are significant with respect to the item under investigation, when engineering experience has shown results of those tests to be suitable for design purposes. When a scale model is used, the need for adjusting certain test parameters must be taken into account.

(3) Calculations, computer simulation, or substructure testing using reliable and conservative procedures and parameters;

(4) Reference to a previous satisfactory design of a sufficiently similar nature; or

(5) A combination of any of the methods set forth in paragraphs (2) through (4) above.

Issued in Washington, DC on March 26, 2008, under the authority delegated in 49 CFR Part 106.

Theodore L. Willke,

Associate Administrator for Hazardous Materials Safety.

[FR Doc. E8–6563 Filed 3–31–08; 8:45 am]

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