BEFORE THE
PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION

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DOCKET NO. PHMSA-2012-0082 (HM-251)

# HAZARDOUS MATERIALS: ENHANCED TANK CAR STANDARDS AND OPERATIONAL CONTROLS FOR HIGH-HAZARD FLAMMABLE TRAINS

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COMMENTS OF THE GREENBRIER COMPANIES, INC.

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The Greenbrier Companies, Inc. ("Greenbrier") submits these comments in response to the notice of proposed rulemaking ("NPRM") issued by the Pipeline and Hazardous Materials Safety Administration ("PHMSA"), in coordination with the Federal Railroad Administration ("FRA"), on August 1, 2014 (79 FR 45016). In the NPRM, PHMSA is proposing revisions to the Hazardous Materials Regulations that establish requirements for a high-hazard flammable train ("HHFT").[1] The proposed rules would require: (1) better classification and characterization of mined gases and liquids; (2) rail routing risk assessment; (3) notification to State Emergency Response Commissions ("SERCs"); (4) reduced operating speeds; (5) enhanced braking; and (6) enhanced standards for both new and existing tank cars.

**About Greenbrier**

Greenbrier is one of the leading designers, manufacturers and marketers of railroad freight car equipment in North America and Europe. Greenbrier manufactures a broad array of railcar types in North America and Europe which includes most railcar types other than coal cars. More specifically, Greenbrier produces a variety of tank cars that are designed for the

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[1] HHFT is defined as a train comprising of 20 or more carloads of a Class 3 flammable liquid.

transportation of products such as caustic soda, urea ammonium nitrate, vegetable oils, bio-diesel, ethanol and crude oil for the North American and European markets.

Greenbrier recently entered into a joint venture with Watco Companies, LLC called GBW Railcar Services, LLC ("GBW") that owns and operates the railcar repair, refurbishment, and maintenance businesses formerly operated separately by Greenbrier and Watco. GBW is devoted exclusively to railcar maintenance and repair and operates the largest independent railcar repair network across North America including 38 locations, featuring 14 certified tank car shops.[2] These comments are focused primarily on enhanced standards for new tank cars.[3] Comments on necessary modifications to existing tank cars to improve safety performance in the movement of flammable liquids have been filed contemporaneously with PHSMA on behalf of GBW.

**Tank Cars Need New Standards**

The Lac-Mégantic disaster resulted in the loss of 47 human lives and inflicted tremendous emotional and physical damage. Its cause was grievous human error - in particular, the failure to properly operate, maintain and secure the train. In the hours after the accident, Greenbrier dispatched our chief engineer, Greg Saxton, to the scene because several of our cars were involved in the accident. Mr. Saxton arrived while the wreckage of the unattended freight train and its terrible ruins were still smoldering. He observed Lac-Mégantic's first responders as they engaged in their horrific but necessary search and recovery mission for those unable to

[2] All of GBW's facilities are certified by the Association of American Railroads ("AAR"). Federal regulations require that tank car repair shops must have a quality assurance program approved by the AAR. The 14 tank car facilities have the additional certifications that qualify them to work on tank cars.

[3] Nevertheless, Greenbrier is concerned that unduly restrictive speed limits will have an adverse impact on the Nation's economy. While rail shipments of flammable liquids comprise only a small portion of total rail shipments, speed limitations on flammable liquids will reduce the velocity of all rail traffic across the entire rail network.

escape the conflagration that occurred when 1.5 million gallons of crude escaped from the tank car wreckage that weighed nearly 10,000 tons. He immediately commenced his analysis to understand what happened, to learn from it, and to ensure that Greenbrier does all it can to prevent such a tragedy from happening again. Over 4 days at Lac-Mégantic, Mr. Saxton witnessed a steady stream of mourners attend funerals and memorialize loved ones as they searched to understand the chaos that had descended into their lives seemingly out of nowhere during the dark of a warm summer night. Our resolve to prevent a future tragedy by mitigating the consequences of train accidents through improved tank car design is Greenbrier's prime objective in offering this submission.

The derailment in Lac-Mégantic brought international attention to a question that many in our industry and the U.S. government have been grappling with for years: are new regulations necessary to make tank cars operating in North America safer? The NPRM is unequivocal and answers this question affirmatively. Through this rulemaking, accompanied by PHMSA's and Secretary Foxx's stated commitment to finalize rules before the end of this calendar year, the U.S. government has demonstrated resolve to get the right tank car design for the transportation of flammable materials by rail established clearly in law. We underscore the importance of having clear standards both for new tank car design and the retrofitting of the existing tank car fleet that currently hauls flammable materials by rail. .

**Greenbrier Leads the Call for Safer Tank Car Design Standards**

Greenbrier has been active in this rulemaking since the publication of the advance notice of proposed rulemaking on September 6, 2013. We have visited officials at PHMSA, FRA, Office of Management and Budget (OIRA), and Congress. We have consulted with Governors, state and local elected officials and emergency responders. Additionally, we have assisted the National Transportation Safety Board ("NTSB") which has targeted tank car safety design since

1991. Indeed, Mr. Saxton was the only representative of an individual tank car builder that appeared before the NTSB's public forum on Rail Safety: Transportation of Crude Oil and Ethanol on April 22-23, 2014

*GREENBRIER INTRODUCES OUR TANK CAR OF THE FUTURE*

In the wake of Lac-Mégantic and several other high-profile tank car derailments, it has become clear PHMSA must mandate a tank car with features that exceed even the more robust CPC-1232 standard voluntarily adopted by North American railroads in 2011. As further analyzed below, this new tank car design must feature a 9/16 inch thick steel tank, a high capacity pressure relief valve to protect the tank from internal pressure resulting from a fire, 1/2 inch thick full-height head shields at both ends of the tank car, a bottom outlet valve handle that disengages so it does not unintentionally open during derailment, a ceramic thermal jacket around the tank shell and an outer steel jacket around the car to additionally protect against punctures and fire.

At Greenbrier, we call this the "Tank Car of the Future" *See* Exhibit 1. Others in our industry have endorsed it as well. Greenbrier builds tank cars at a rate of 4,000 cars per year, and we are increasing our production capacity to meet higher demand for tank cars related to the energy renaissance in America. Greenbrier is investing with a goal of doubling our capacity over the next 12 months to support strong demand for our Tank Car of the Future.

Customer response for our Tank Car of the Future has been favorable. Greenbrier currently has more than 3,500 awards for tank cars with 9/16 inch shell thickness and will begin production of tank cars with the thicker shell and other enhanced safety features before the end of 2014. The design is known, materials are available, and we have received and continue to receive orders for a tank car with these features.

Responsible stakeholders in the marketplace have responded to our enhanced understanding of what it takes to transport flammable materials in a tank car that lessens the consequences from a train accident and are placing orders for this safer car in anticipation of PHMSA's final rule. Other potential customers of new tank cars, wary of regulatory uncertainty, are hesitant to place orders given the current uncertainties as to PHMSA's final rule. It is time, therefore, for PHMSA to adopt higher tank car design standards to require all other participants in the tank car market to join those who have already invested their time, money and spirit to design, build, purchase and own safer tank cars.

**Unworkable HHFT Definition Creates Unacceptable Risk to Public Safety**

The definition of HHFT presents an unacceptable public safety risk by permitting the transportation of Class 3 flammable liquids in blocks of 19 or less legacy tank cars that PHMSA otherwise deems unsafe. The derailment of 19 or less DOT-111 tank cars carrying Class 3 flammable liquids still exposes the general public to an unreasonable and unwarranted potential hazard. This loophole in the use of safer tank cars will remain indefinitely since there is no phase-out provided for the non-HHFT trains. Beyond this, HHFT trains create confusion for both the rail carriers and shippers of Class 3 flammable liquids since it is highly unlikely that shippers know the precise consist of a train in deciding which type of tank car to order. Also, train consists do not dependably remain static from origin to destination.

PHMSA's suggested approach of having the number of tank cars in a train dictate the tank car design frustrates commerce. In an HHFT scenario, tank cars will remain in a plant or a siding until the railroad has space in a train to accept a legacy car. Instead Greenbrier suggests that PHMSA focus on the commodities being transported in determining the car type to be utilized and not on the number of tank cars in a train set. The HHFT definition applies to all tank cars containing a flammable liquid (and not just crude oil and ethanol). Thus, the requirement applies to both manifest trains and unit trains.

**<u>PHMSA Should Adopt the Option 2 Tank Car Featuring a 9/16 inch Shell</u>**

PHMSA proposes three options for new tank cars constructed after October 1, 2015, if those tank cars are used as part of an HHFT.

Greenbrier fully supports the Option 2 tank car, since it has all of the features of the "Greenbrier Tank Car of the Future". Most importantly, the Option 2 tank car has a 9/16 inch thick shell to resist punctures.

Conditional Probability of Release (CPR) was developed as part of the Railway Supply Institute (RSI) – AAR Tank Car Safety Research and Test Project Database, which contains damage and release information for more than 40,000 tank cars involved in derailments over the last 40+ years. Users access this information determine the CPR in an incident involving a tank car, including derailments. It has been utilized to provide estimated reductions in the CPR for a number of tank car retrofit and design scenarios. The methodology that produces the CPR measures for various tank car design and retrofit options has been analyzed and tested by parties independent of RSI and AAR and it has been determined to be reliable. The CPR[4] data shows

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[4] CPR, and not 12 x12 indenters, should be the standard for determining whether a car has equal safety. See 79 FR 45054, note 58. The chaotic nature of train wrecks makes CPR a far more suitable tool. The three major drawbacks of 12 x 12 indenters are: (1) they are never seen at train wrecks; (2) indenters are modeled and tested by putting the tank rigidly up against a solid (concrete) wall and then striking the tank squarely with the indenter (solid walls are never present in the real world and square blows from striking objects are less likely than blows coming from at least a bit of an angle); and (3) indenters cannot take into account such factors as releases from top and bottom fittings sheared off or opening up.
The advantages of CPR are: (1) it provides numbers that can be used to measure the effectiveness of a feature on a tank car; (2) it will tell us about the effectiveness of thicker steel but also takes into account all of the real world conditions such as what was the size and shape of the indenter, what angle did it strike at, and how was the car restrained; and (3) CPR is not limited to the thickness of the shell, but will tell us what the effect of a half-height head shield is

about a 20 percent improvement for each 1/16 inch increase in shell thickness. For example, CPR (9/16 inch compared to ½ inch) = 19.2 percent [(0.052-0.042/0.052].

*PLAYING "CATCH-UP BALL" TO ACHIEVE A SAFER TANK CAR DESIGN*

Considering that we are in a "catch up" situation with respect to safety where the exact volatility of certain types of crude is still in dispute and the fact that tank cars are forty or fifty year assets, Greenbrier believes a safer car with some margin is required. Failure to accommodate a margin for safety means we will revisit this problem long before we should. Adding 1/16 inch of thickness to the shell adds about 2,900 pounds to the light weight of the car. That translates an added steel cost of about $1,500 per 1/16 inch of shell thickness. Greenbrier recommends this safer 9/16 inch tank car.

The following table demonstrates the impact of shell thickness and CPR, both as an absolute measure and as measured by probability of more than 100 gallons of liquid released (a common secondary view of CPR).

| SHELL THICKNESS | CPR | CPR>100 gal. |
|---|---|---|
| 7/16 inch | 0.064 | 0.046 |
| ½ inch | 0.052 | 0.037 |
| 9/16 inch | 0.042 | 0.029 |

On page 4 of the Railway Association of Canada's ("RAC") comments to Transport Canada's proposed TC-140 Tank Car, RAC asserts that increasing the shell thickness to 9/16 inch from ½ inch decreases the 100 gallon CPR by 0.8 percent. This calculation is based on the CPR Table set forth on page 5 of the RAC comments and repeated in the table above. RAC, however, misunderstands its own numbers. For example, if over a certain number of years a

compared to a full height head shield or no head shield and tell us the effectiveness of top fittings protection.

total of 1,000 tank cars derail, for CPR greater than 100 at ½ inch shell thickness, the prediction is that 37 cars will leak more than 100 gallons. At the same time, for CPR greater than 100 at 9/16 inch shell thickness, the prediction is that 29 cars will leak more than 100 gallons. In other words, the 9/16 inch shell thickness produces a 21.6 percent reduction in the conditional probability of release and not the 0.8 percent reduction suggested by RAC.

*IMPROVE CPR BY MORE THAN 8X WITHOUT LOSING CAPACITY*

At a derailment speed of 50 mph, CPR improves from 45 percent in bare DOT-111 legacy tank cars to just over 5 percent with the Tank Car of the Future. This improves CPR by more than **8 TIMES** from the least protected tank car to the most protected tank car. *See* Exhibit 2. Also when measured by CPR, the Tank Car of the Future is twice as safe as the current state-of-the-art tank car for transporting hazardous materials -- a fully jacketed and insulated CPC-1232.

PHMSA estimates no decrease in tank car capacity from the increased weight of Options 1 and 2. There are, however, those who suggest that a 9/16 inch shell thickness will significantly lower the volume capacity of the tank car. The legacy DOT-111 tank cars were limited to 263,000 pounds total weight on rail. Recently, the AAR and FRA increased that limit to 286,000 pounds, or a 23,000 pound increase. Greenbrier's legacy 263,000 pounds, 30,000 gallon, tank cars weigh 68,000 pounds (light weight) and have a load limit of 195,000 pounds. Greenbrier's proposed tank car of the future with a 9/16 inch shell weighs 90,500 pounds, has a volume capacity of 30,100 gallons and a load limit of 195,500 pounds. In other words, while the weight of the proposed car increases by 22,500 pounds, the volume capacity actually increases by 100 gallons and the weight capacity increases by 500 pounds.

Greenbrier also supports the other suggested features of the Option 2 tank car: bottom outlet handles removed or designed to prevent unintended actuation during a train accident;

286,000 pounds GRL; full-height ½ inch thick head shields; reclosing pressure relief device; minimum 11-gauge jacket constructed from A1011 steel or equivalent; TC-128 Grade B normalized steel for tank material; top fittings protection; thermal protection system in accordance with Section 179.18; and distributive power ("DP") or end-of-train ("EOT") braking devices.

**Dependable Braking and Top Fitting Protection from Established Technology**

Greenbrier also supports Option 1, the PHMSA and FRA designed tank car, except in two material respects. First, Greenbrier does not support mandatory electronically controlled pneumatic ("ECP") brakes for Class 3 flammable liquids as prescribed by the NPRM's Option 1 design. Class I railroads are currently using two-way EOT on most trains traversing main line tracks. These devices will trigger an emergency brake application from the end of the train resulting in faster brake application. In the NPRM, PHMSA correctly points out that EOT brake performance is the same as DP brake performance.[5] Figure 1 and Figure 2 of the NPRM[6] demonstrate that ECP brakes are not appreciably superior to DP brake performance. As Figure 1 demonstrates, the kinetic energy for the 10$^{th}$ DP car is virtually the same as the 10$^{th}$ ECP car. Consequently, there is no advantage for ECP over EOT for the first 10 cars. Even at the 20$^{th}$ car, the kinetic advantage for ECP is about 18 percent when compared to an EOT device.

Greenbrier supports the idea that better brakes on freight cars are desirable. The difficulty with ECP brakes is that they will only work in train sets made up entirely of ECP equipped cars. Thus, in a typical mixed train that includes other car types, there will be no improvement in braking performance. Furthermore, PHMSA greatly underestimates the cost of

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[5] 79 FR 45048
[6] 79 FR 45049.

ECP brakes. PHMSA estimates the increased cost of ECP brakes on new cars as $3,000.[7] Greenbrier, however, has received cost estimates for ECP parts for new cars. With labor and materials, the cost of ECP brakes for new cars will be over $7,000 per car.[8] The overlay system that is now codified adds more costs which Greenbrier believes will make the installation prohibitive from a cost standpoint. Greenbrier recommends that the U.S. Department of Transportation ("US DOT") encourage development of an electronic emulation standard. Such a system would do away with pneumatic control valves. It would have a faster, better performance with increased reliability and lower costs. For all the above reasons, i.e., installation challenges, the need for a less complex system, dubious near term safety advantages, and high costs, Greenbrier believes mandating ECP brakes as currently prescribed in this rulemaking proceeding would be counterproductive. Greenbrier urges DOT and FRA, separate from the current proceeding, to work toward an ECP braking system that achieves greater safety with less complexity and lower costs applicable to freight trains.

Second, Greenbrier does not support TIH Rollover Protection for the top fittings as indicated in the Option 1 design. The TIH Rollover Protection standard is a fairly new and unproven standard. Perhaps as a result, even PHMSA did not extend this requirement to two of its three options for new tank car standards as well as its performance standard for the existing tank car fleet. It is very difficult to computer model the standard. To date, no one has been able to devise and run a test that validates the standard. Also, the standard may not perform as desired on a 0.5625 inch thick shell tank, as it is designed for a minimum shell thickness of 0.787 inches. Rather, Greenbrier supports AAR specification M-1002, Appendix E, Paragraph 10.2

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[7] 79 FR 45051.

[8] Diverting $7,000 of limited retrofit dollars to equipment or systems that do not appreciably enhance safety could limit the number of cars that will be retrofitted or delay the retrofit of tank cars.

Top Protection. This is because this form of top protection has a proven track record of reliable performance in the "roll over and drag" scenarios that occur commonly during tank car accidents. Again, diverting limited retrofit resources to an unproven technology with no clearly established safety benefits could significantly impinge on the ability and willingness of fleet owners to retrofit these cars expeditiously.

Finally, Greenbrier finds the Option 3 tank car vastly inferior to the Option 2 tank car because it has a minimum shell thickness of only 7/16 inch.

**All Class 3 Flammable Liquids Require Safer Tank Car Design**

PHMSA proposes separate tank car design standards for Class 3 materials based on Packing Group. Flammable liquids in Packing Groups I and II would require the use of the proposed Class 117 tank car; whereas flammable liquids re-classed to a combustible liquid would continue to be transported in Class DOT 111 or AAR 211 tank cars. Under these circumstances, it is extremely possible that the difference between the use of a robust DOT tank car and a legacy AAR 211 tank car is a mere 1 degree Fahrenheit in flash point (i.e., a material with a flash point of 100 degrees F and a material with a flash point of 101 degrees F would go into completely different tanks). The basis of the current regulatory structure separating Class 3 materials into Packing Groups and combustible liquids assumes "*normal transportation*" based on the maximum temperature the material may reach in transportation from the effects of solar radiation. With the exception of compressed gases shipped in tank cars, the current regulatory structure does not account for temperature effects of the material resulting from fire exposure. Given the basis of the current rulemaking to address large blocks of cars exposed to fire, the nature of the Class 3 materials to liberate vapors when heated, PHMSA should consider the use of a more robust tank car for all Class 3 materials.

**<u>Greenbrier Recommends a Triage Approach to Retrofitting Existing Tank Cars</u>**

Greenbrier suggests that PHMSA adopt a staged approach to the retrofitting of the existing fleet of tank cars. Tank cars intended for the transportation of crude oil should be upgraded first followed by tank cars intended for the transportation of ethanol. After the tank cars for those two commodity groups are upgraded, tank cars for the balance of the Class 3 materials should be upgraded. In adopting such a staged approach, PHMSA would be prioritizing the commodities that present the greatest potential danger to the public and the environment.

**<u>Harmonization with Canada</u>**

The United States must remember the tragic losses suffered by Canada at Lac-Mégantic and respect Canada's desire for an integrated North American rail network that prioritizes safety. Canada has proposed that all dangerous goods (the Canadian corollary to hazardous materials in the U.S.), including but not limited to flammable liquids, should be transported in a more robust tank car. Greenbrier agrees with the Canadian proposal. The North America Free Trade Agreement requires Canada, Mexico and the United States to make compatible their regulations governing the transportation of hazardous materials. Since 1994, the Dangerous Goods Working Group, known as Working Group 5 of the Land Transportation Subcommittee, has advanced harmonization of its regulations governing hazardous materials. The compatibility of the current regulatory scheme is a direct result of the three governments and the regulated industries participating in formal and informal rulemaking proceedings.

Given the high volumes of tank car traffic moving across the U.S.-Canadian border, it is imperative that the two nations harmonize their regulations governing the transportation of Class 3 materials in tank cars particularly as the regulations address the construction and retrofitting of the tank cars. Harmonized regulatory systems will promote regulatory efficiency, facilitate trade, reduce costs and promote better emergency response to hazardous material incidents.

**Conclusion**

It is critical that PHMSA issue a final rule as soon as possible. Greenbrier currently is producing 16 tank cars per day, and it is safe to assume that our competitors, collectively, are also releasing at least an additional 50 new tank cars per day. Excluding our Tank Car of the Future which enters production later this year, all tank cars are currently built by Greenbrier and its competitors to the voluntary CPC-1232 standard. This is despite the fact that our industry knows the tank car design standard is destined to change. Adopting Option 2 as the fixed and final standard for new tank cars, combined with establishing clear standards and timelines for the retrofits of existing cars, will produce a safer North American tank car fleet in the shortest possible time. Ensuring that limited capital is targeted to the appropriate tank car designs and modifications—those that maximize the safety benefits accruing to the public—and that this happens expeditiously and it should be a core priority of PHMSA as it completes this rulemaking. While it is important that PHMSA get this done quickly, it also must "get it right". PHMSA's great effort toward enhanced safety will be grossly compromised if limited funds, time and attention are diverted to unnecessary requirements such as ECP brakes, TIH Rollover Protection for the top fittings, or other technologies that are either unproven or ill-suited to this rulemaking on the safer transport of flammable materials by rail. These efforts on collateral enhancements, while undoubtedly well-intentioned, add significant, unnecessary costs to the proposed design and provide questionable assurances of increased safety. In the current rulemaking, Greenbrier emerged as an early advocate of improved tank car design standards both for new cars and the retrofit of existing cars. We are making major capital investments in new facilities and equipment to respond rapidly to PHMSA's new standards. We strongly encourage

PHMSA to finalize a rule for new cars and retrofits of existing cars that permits the industry to make these changes as rapidly as possible.

Greenbrier appreciates the opportunity to submit these comments to PHMSA.

Respectfully submitted,

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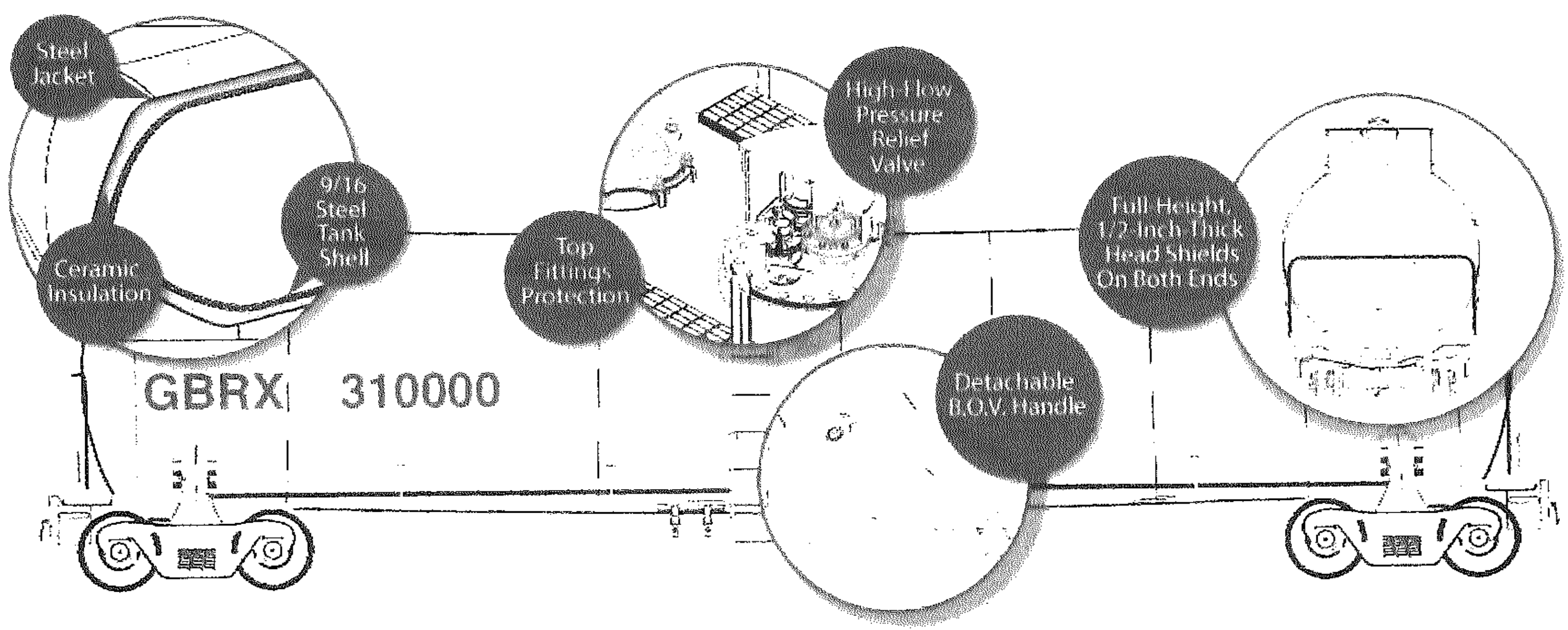
# Greenbrier's Tank Car of the Future




Greenbrier's Tank Car of the Future is engineered to the highest safety standard and has been designed in collaboration with significant input from industry leaders and our customers.

THE GREENBRIER COMPANIES

**EXHIBIT 1**

EXHIBIT 2

# CONDITIONAL PROBABILITY RELEASE STUDIES (CPR)

Conditional probability release studies (CPR) measure the likelihood of tank car spills by different speeds and car types. This chart shows the likelihood of spilling more than 100 gallons of liquid at variable rates of speed.