RAILWAY INVESTIGATION REPORT
R01E0009

DERAILMENT

CANADIAN PACIFIC RAILWAY
TRAIN NO. CP 966-02
MILE 95.6, RED DEER SUBDIVISION
RED DEER, ALBERTA
02 FEBRUARY 2001

Railway Investigation Report

Derailment

Canadian Pacific Railway
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Mile 95.6, Red Deer Subdivision
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Report Number R01E0009

Summary

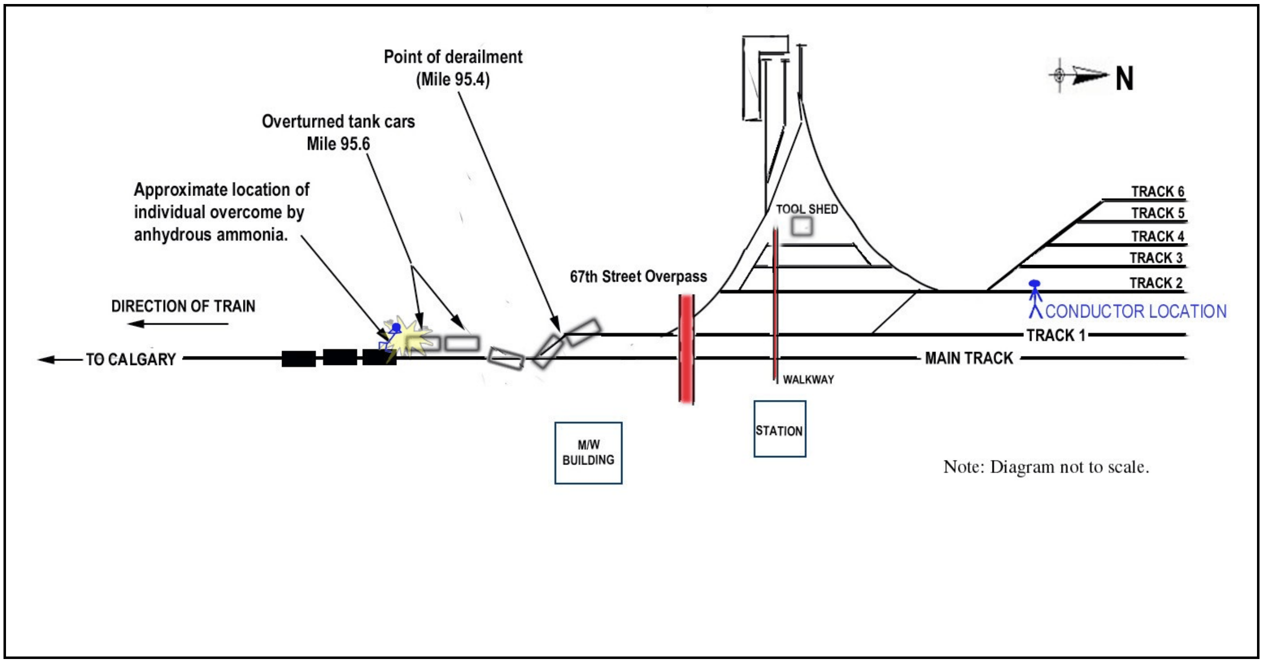
At approximately 2023, on 02 February 2001, Canadian Pacific Railway train CP 966-02 was being prepared for departure in the Red Deer Yard. As part of this process, it was traveling south at about 3.9 miles per hour when an emergency brake application occurred and the train movement stopped. Five loaded tank cars containing anhydrous ammonia had derailed at Mile 95.4 of the Red Deer Subdivision. Two of the derailed tank cars were overturned and 71.74 tonnes (the entire load) of anhydrous ammonia leaked from one of the overturned cars. This leak resulted in the evacuation of approximately 1300 local residents and businesses. Thirty-four people checked into the Red Deer hospital for exposure concerns, where they were treated and released. There was one fatality, a person who had been overcome by the anhydrous ammonia vapours while crossing the railway right-of-way.

Ce rapport est également disponible en français.

Other Factual Information

The Accident

At approximately 2023 mountain standard time (MST)[1] on 02 February 2001, Canadian Pacific Railway (CPR) train CP 966-02 was being prepared for departure in the Red Deer yard. Part of the preparation involved the movement of 61 cars from Track 1 to set off one car to Track 5 and to pick up 12 cars from Track 2 to fill out the train. Figure 1 is a schematic diagram showing the south end of Red Deer yard.



While performing the first switch movement, the train was traveling south at about 3.9 miles per hour (mph) when a train-initiated emergency brake application occurred, stopping the movement. The locomotive engineer then tried to release the train brakes but was unsuccessful. He advised the conductor of this and began to walk back along the cut of cars to find the reason for the emergency brake application and noticed a "steam like" cloud along the track. The locomotive engineer did not get close enough to ascertain the extent of the derailment, but returned to the locomotive and advised the conductor by radio. The conductor consulted the train list and advised that the cloud could be anhydrous ammonia.

The locomotive engineer consulted the *2000 Emergency Response Guidebook* for the properties of and the proper response to anhydrous ammonia. Upon identifying the potential hazards, he disconnected the locomotive from the rail cars and departed from the scene. The conductor immediately went to the CPR yard office, located approximately 1500 feet from the overturned cars, to alert management and employees to the situation. Figure 2 shows the derailed and overturned ammonia tank cars.

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[1] All times are MST (Coordinated Universal Time [UTC] minus seven hours) unless otherwise stated.

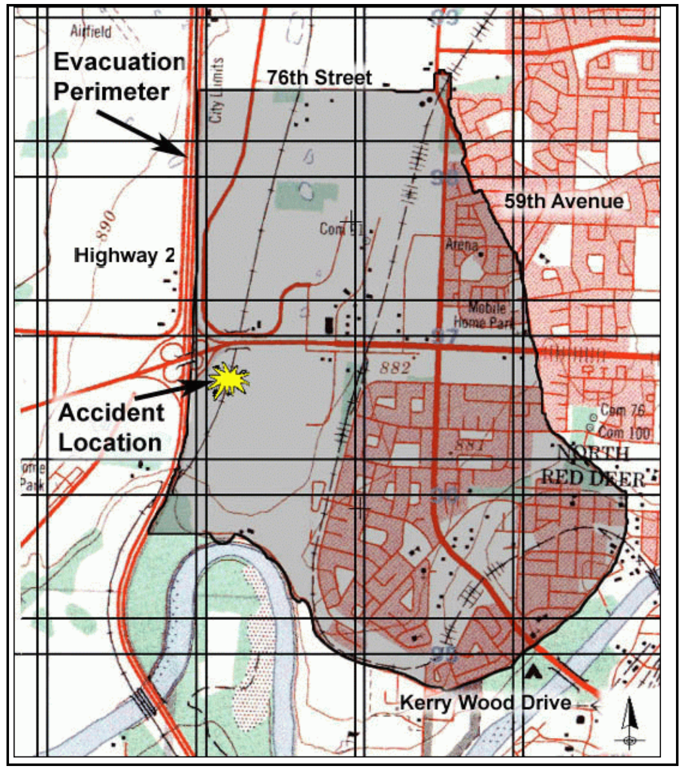
At 2030, the Red Deer city emergency response was activated. The CPR network operations centre notified the Red Deer Fire Department at 2045, Transport Canada at 2120, and the manufacturer and shipper of the product, Agrium Inc. (Agrium) from Red Water, Alberta, at 2130. These agencies responded to the occurrence. Agrium sent two emergency response units and their dangerous goods (DG) response team to assist in the handling of the spilled product. The Agrium team, CPR management, and the CPR DG officer were all on the scene by 2330.

Evacuation

When the local fire department arrived, they detected a strong odour of ammonia in proximity to the derailment site. They immediately commenced evacuating nearby public facilities and sent an emergency team to the derailment to determine the source of the odour. Initially the leaking product was identified, based on the placarding, and stenciling on the overturned tank cars. The fire dispatch centre contacted Transport Canada's Canadian Transport Emergency Centre (CANUTEC) for information on the potential hazards of the product and instructions to deal with the product as first responders.

At 2040, the Royal Canadian Mounted Police established a safety perimeter, blocking all road entrance to the site, and assisted with the evacuation of nearby residents. On 03 February 2001, at approximately 0600, the City of Red Deer established an emergency operations centre. At 0830, a state of emergency was declared by the City of Red Deer in response to the leaking anhydrous ammonia car and, at 0900, officials established the evacuation perimeter. All residents and businesses in the evacuation zone, approximately 1300 persons, were evacuated. The evacuation order was in effect for about 37½ hours. There were no injuries as a result of the evacuation. Figure 3 indicates the derailment location and evacuation area.

Injuries



When the first responding fire captain arrived on the scene, he was exposed to anhydrous ammonia fumes and within seconds his eyes were swollen shut. In addition, two other firefighters suffered minor inhalation injuries before they activated their breathing apparatus. The ambulance attendants who transported the casualty to the hospital were also exposed to the fumes from the anhydrous ammonia.

In the course of establishing the safety perimeter, three constables were exposed to ammonia vapour and reported to the hospital for examination. The constables did not have any emergency respiratory protection against toxic gases available for their use nor did they have the necessary training in how to effectively respond to this type of chemical spill. Two returned to work while the third constable, who suffered from extreme headache, sore eyes and a sore throat, was sent home to recover. There were no subsequent adverse effects reported.

In a 1999 railway occurrence (TSB Report R99T0256) near Britt, Ontario, an Ontario Provincial Police officer who also did not have any emergency respiratory protection available, was taken to hospital suffering from exposure to anhydrous ammonia during the initial evacuation of the safety perimeter.

While assessing the site on 03 February 2001 at approximately 0140, the DG teams from CPR and Agrium discovered an unconscious man beside the rail cars in the midst of the ammonia vapour cloud. He was taken by ambulance to the hospital in Red Deer, and diagnosed with first-degree chemical burns to the face, second-degree burns to other areas of the body, and damage to the interior of the mouth and the upper airway system due to the inhalation of anhydrous ammonia. Three days later, the patient experienced respiratory failure due to these injuries and was successfully revived. On 08 February 2001, the patient was diagnosed with marked inflammation of the airway, trachea, primary carina and right and left bronchi of the lung. This medical condition continued until May when he succumbed to pneumonia, attributed to irreparable chemical damage to the respiratory tract from anhydrous ammonia exposure.

Additional Information

The operating crew comprised a locomotive engineer and a conductor. They were qualified for their respective positions and met fitness and rest standards established to ensure the safe operation of trains.

At the time of the derailment, there was scattered cloud, the temperature was about 0°C with the wind from the west at approximately 10 knots. Around 2200, the winds switched and came from the southwest, reducing to about eight knots with the temperature falling to around minus 5°C . This weather pattern remained constant for the balance of the evening until early the next morning.

Track Particulars

The yard track was built in 1991. The rail at this location was Algoma 115-pound, rolled in 1986 in various lengths. Lengths of rails were joined using splice bars with six track bolts. The subgrade, ballast, and track fasteners were in good condition. A post derailment inspection of the track ties revealed that there was approximately 2½ inches lateral movement in the spike hole and tie plate at the point of derailment. Deformations in the spike holes indicated that the ties were deteriorated and could not hold the proper gauge of

the rails. Figure 4 shows the lateral movement at the spike hole.
Wheel marks on the track crossties and fastenings indicated that the first derailed car of five loaded tank cars containing anhydrous ammonia had derailed at a location where 2¼ inch-wide gauge was measured. The derailed car traveled approximately 90 feet and then diverged from the rails at a frog. When the leading derailed wheel contacted the wing rail of the frog, the resultant lateral force on the opposite rails corresponding guard rail to running rail joint resulted in the complete fracture of the rail. The break was found to have originated from a damaged bolt hole where a guard rail was connected to the running rail (Figure 5).

The TSB Engineering Branch analyses revealed that the primary mode of failure was overstress originating from pre-cracks located on either side of a bolt hole. The pre-cracks were heavily oxidized, indicating long-term growth. One pre-crack measured 26 mm in length and had penetrated through the 17 mm thick web to the other side. The other pre-crack measured 18 mm in length and was 9 mm through the thickness of the web. Both pre-cracks coincided with significant prior damage to the bolt hole from rubbing by a loose bolt. The rubbing had resulted in deformation of the bore of the hole, and extrusion of the metal forming a lip on the outside surface.

Neither the track evaluation car, which tests and provides information on the geometry of the track, including wide gauge, nor the rail flaw testing car, which tests the rails for internal defects, including bolt hole cracks, were utilized on this section of track.

A turnout located in the derailment area was last inspected by the track maintenance foreman on 01 February 2001 with no anomalies noted. The track maintenance supervisor performed the required monthly inspection on 18 January 2001 and the required six-month inspection on 29 November 2000. No anomalies were noted on either of these inspections.

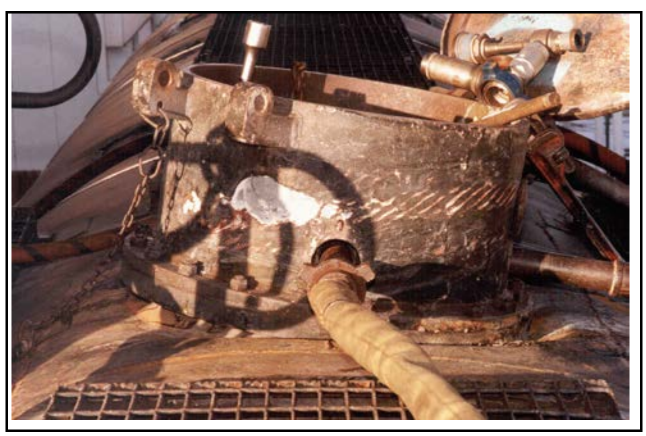
Transport Canada's *Track Safety Rules*, Part II, Section XI (a) prescribes in part: "In turnouts and track crossings, the fastenings must be intact and maintained so as to keep the components securely in place." CPR's Standard Practice Circulars - Track (SPC) No. 33 (effective 01 April 2000) stipulates that the turnout is to be inspected monthly by foot and a detailed inspection is to be performed on foot every six months. These visual inspections are performed while walking the turnout on foot. Both of these inspections require that the turnout bolts be checked for tightness. The SPC outlines that the bolts "must be tight and should be re-torqued approximately six weeks after initial installation and every six months after installation." These instructions also include a reference table which prescribes the torque to be maintained for each size of bolt.

Tank Cars

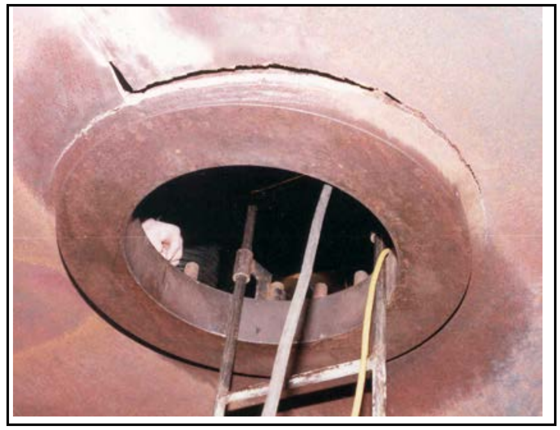
All tank cars intended for service in North America are required to be built in accordance with the *Manual of Standards and Recommended Practices*, Section C, Part III, "Specifications for Tank Cars, Specification M-1002". This standard is published by the Association of American Railroads (AAR). Important parts of the manual, in light of this investigation, are "Appendix M - Specifications for Materials" and "Appendix W - Welding of Tank Car Tanks".

Tank car, PROX 88421 was built in 1968 to specification DOT 112J340W. The construction of the car was approved under the AAR Certificate of Construction No. 21924. The material prescribed by the certificate was AAR TC128, grade B high tensile steel. At the time of the construction, TC 128 steel of fine grain quality was required. In 1989, it became mandatory to use only normalized steel for the construction of pressurized tank cars. This additional requirement provides for higher ductility of steel and therefore for better cold temperature performance of the car.

Three cars remained upright, but the two leading cars (PROX 88421 and PROX 37981) had rolled over falling into the ditch, with the manway nozzles of these cars striking the frozen ground. The entire contents of PROX 88421 were lost due to impact damage (Figure 6). No product was released from the other derailed cars.



TSB Engineering Branch Report LP009/2001 indicates that the manway nozzle of tank car PROX 88421 was subjected to a significant overstress during the derailment and falling over which led to a brittle fracture opening of some 5.125 square inches in the heat-affected zone of the weld between the manway nozzle and the shell of the tank (Figure 7). The car also sustained a shear fracture of the metal at the sill area which initiated from a small pre-crack located in the toe of the sill-to-pad weld on the outside of the sill. The ammonia was released into the atmosphere gradually, which prevented the formation of a large cloud of gas at the time of the occurrence. Liquid ammonia was still slowly leaking from the car 24 hours after the occurrence.



The report also revealed that there were three shallow pre-cracks, ranging from 11 mm to 45 mm in length, on the inner surface of the plate steel, which probably formed as a result of thermal stresses induced at the time of construction. There was no evidence of pre-impact growth and the surfaces of these cracks were covered with thick oxide layers (rust), indicating that they had been present and lain dormant for some time. A review of the running history and maintenance of this car (PROX 88421) proved uneventful as no significant repair history was indicated. The report also indicated that the structural failure was a brittle fracture due to the impact forces of the loaded tank car nozzle contracting the frozen earth. The kinetic analysis determined that the impact on the tank car nozzle was several times greater than that required to exceed the design strength of the car structure.

The reported total yearly number of tank car loads of anhydrous ammonia in Canada and the United States is 60 463, of which 23 802 originated in Canada. Procor Ltd., the tank car manufacturer, has approximately 2019 Class 112 cars of similar design in its fleet which are used to transport either liquefied petroleum gas (LPG) or anhydrous ammonia. These cars represent a small percentage of the total number of rail tank cars that are in service to transport these two products.

Hazards of Anhydrous Ammonia

At the time of the accident, five cars, including PROX 88421, were carrying anhydrous ammonia. Anhydrous ammonia cars in transit are required to display;

1. First the words "ANHYDROUS AMMONIA" must appear in letters at least 100 mm high on each side of the tank;

2. Second, the words "Inhalation Hazard" or "Inhalation Hazard/Dangereux à inhaler" must appear in letters at least 100 mm high on each side of the tank;

3. Third, a placard must be visible on both sides and also on both ends to indicate the class assigned to anhydrous ammonia. The placard was diamond-shaped, white in color, with silhouette design of a compressed gas cylinder.

The AAR Bureau of Explosives, in the latest published report, *Annual Report of Hazardous Materials Transported by Rail,* ranks anhydrous ammonia as the seventh most commonly transported hazardous commodity (transported by rail) in Canada and the United States. This ranking has been consistent since 1999.

The manufacturer's Material Safety Data Sheet (MSDS) describes the product as 99.8 per cent ammonia by weight and 0.2 per cent water. It stipulates that anhydrous ammonia gas or liquid is very corrosive to body tissues, reacting with body moisture on contact. Other health hazards identified by the MSDS include, inter alia:

> Eyes: May cause severe eye irritation with corneal injury and permanent vision impairment.
>
> Skin: Contact may cause severe skin irritation, chemical burns, and blistering. Contact with vaporizing liquid may cause frostbite due to rapid evaporative cooling. Cooling effect may mask the extent of corrosive injury received.
>
> Inhalation: Irritating to entire respiratory tract. Excessive overexposure may cause severe irritation to the upper respiratory tract and potential lung damage.
>
> Ingestion: Ingestion is not a likely route of exposure due to the physical state of the substance (a compressed, liquefied gas).

At the time of this occurrence, the Canadian *Transportation of Dangerous Goods* (TDG) *Regulations* classified anhydrous ammonia as a Class 2, Division 4, corrosive gas, with product identification number UN 1005.[2] Placards to be used for "Gases - Corrosive" are designed in a white diamond-shape with a picture of a compressed gas cylinder. Also, the *2000 Emergency Response Guidebook* identifies anhydrous ammonia with UN 1005 and lists this product as "Gases - Corrosive". The health hazards associated with this are listed as:

> TOXIC; may be fatal if inhaled; Vapours are extremely irritating and corrosive; Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite; Fire will produce irritating, corrosive and/or toxic gases; and Runoff from fire control may cause pollution.

Transport Canada did attempt to have a special classification for anhydrous ammonia of Class 2.4 accepted at the United Nations, and within North America, but was unsuccessful. In Europe, anhydrous ammonia is classified as flammable, toxic, corrosive, and dangerous to the environment.

On 15 August 2002, new TDG Regulations were implemented in Canada. Changes included the reclassification of anhydrous ammonia, UN 1005, to "Class 2.2, Non-flammable and Non-toxic Gases" pursuant to Section 2.14(b) of the regulations. This harmonized Canadian and U.S. classifications. The placard designated for the movement of this product will be green in colour with a silhouette design of a compressed gas cylinder.

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[2] United Nations (UN) dangerous goods identification number.

The new TDG Regulations state, in part:

> 2.14 Divisions
> (c) Class 2.3, Toxic Gases, which consist of gases that
> (i) are known to be toxic or corrosive to humans according to CGA P-20, ISO Standard 10298 or other documentary evidence published in technical journals or government publications, or
> (ii) have an LC50 value less than or equal to 5000 mL/m^3.[3]

Anhydrous ammonia has potentially acute health effects. The manufacturer's MSDS[4] lists this product as "Eye and throat irritation is more pronounced between 100 and 400 ppm. Above 400 ppm skin irritation and coughing will result. The U.S. National Institute for Occupational Safety and Health has established 300 ppm as the concentration immediately dangerous to life and health, which is defined as the concentration above which self-rescue may be difficult or impossible due to physiological effects. At concentrations between 1000 ppm and 2500 ppm, increasing chest tightness, bronchospasm and severe eye and skin irritation will result. Delayed effects, such as chemical pneumonitis and pulmonary edema, may develop several hours after exposure. At concentrations above 2500 ppm, laryngeal spasm may occur, resulting in rapid asphyxia."

Analysis

The derailment was initiated when the lateral force of the train on the rail caused the rail to shift, gauge widening to occur, and the wheels on the opposite rail to leave the track. The derailed car traveled 90 feet until it came into contact with the wing rail of the frog, causing a lateral stress on the opposite rail at a point where a guard rail was connected to the running rail with a bolt, which then caused the fracture of the rail. This analysis will focus on the wide gauge track condition, the cause of the fractured rail, the tank car failure, the classification of anhydrous ammonia, and the identification and placarding of tank cars carrying anhydrous ammonia.

The wide gauge condition of the track at the point of derailment was not detected by regular inspection since gauge widening occurred only when the track was subjected to the heavy load of a railcar or an engine. This section of track had not been tested by the track evaluation car. However, if the track had been tested, the likelihood of a wide gauge condition going undetected would have been reduced.

The bolt hole in the web of the rail had significant long term damage caused by the bolt rubbing against the hole, indicating that, at some point in time, the bolt had not been adequately tightened. As the nut of the bolt on the field side of the rail, and a spacer block on the gauge side, completely concealed the bolt hole, visual turnout inspections did not detect the damage. Monthly visual turnout inspections and detailed semi-annual turnout inspections, as outlined in CPR's Standard Practice Circulars - Track (SPC) No. 33 (effective 01 April 2000), may not be adequate to ensure the detection of damage to bolt holes in high risk sections of the track.

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[3] 5000 mL/m^3 (millilitres per cubic metre) is equal to 5000 ppm (parts per million).

[4] Agrium Material Safety Data Sheet - Product Name/Trade Name Anhydrous Ammonia.Agricultural Grade 82-0-0; Revision 5.3; Prepared on August 15, 2002

The damage to the bolt holes caused two pre-cracks to form in the rail. Their location was such that they too would not have been detected during the monthly turnout inspections. Both pre-cracks were large enough to reduce the strength of the rail to such an extent that the lateral stresses caused by the derailed car hitting the frog were great enough to fracture the rail.

This section of track had not been tested by a rail flaw detector car, used to detect internal rail flaws such as bolt hole cracks. However, if the rail flaw detector car had been used, the likelihood of an internal rail flaw going undetected would have been reduced. Main track sidings are tested at least twice a year, however, yard track was not tested as they did not meet CP's minimum testing standards.

Tank car PROX 88421 had three shallow pre-cracks on the inner surface of the manway plate. It is likely that they were formed as a result of thermal stresses induced by the welding of the manway nozzle to the shell of the tank at the time of construction. Although cracks of this nature would not normally be expected to weaken the load-bearing ability of the plate, they do provide an imperfection in the surface metal and can act as points of stress concentration and provide origins for brittle failure. Therefore, while these pre-cracks may exist for many years without compromising the integrity of the plate under normal operating conditions, a brittle failure may occur when exposed to abnormally high stress levels at low ambient temperatures. The stresses caused by the impact to the manway nozzle exceeded the structural design capabilities of the tank, resulting in a brittle fracture and the gradual release of ammonia. The brittle fracture was confined to the heat-affected zone of the weld between the nozzle and the tank shell.

In August 2002, revised TDG regulations came into effect. These amendments reclassified anhydrous ammonia as "non-flammable, non-toxic gas, Class 2.2". At the same time, however, anhydrous ammonia diluted with up to 50 per cent water, was reclassified as "toxic gas, Class 2.3". Paradoxically, based on the encyclopedic data and the method set out in the regulations to calculate the inhalation toxicity of the mixtures, a toxic designator will be applied to a compound which is less toxic than another compound classed as a "non toxic" gas. Anhydrous ammonia, being immediately asphyxiating at 2500 ppm, falls below the regulatory threshold of 5000 ppm, and should be classified as a "toxic gas, Class 2.3".

Medical and other published research on anhydrous ammonia demonstrates how it affects the life and health of individuals. The nature of this chemical, as illustrated by the resultant fatality in this occurrence, indicates that the description as "non-flammable and non-toxic" is not accurate. The research further indicates that emergency response personnel should be aware of the actual hazards associated with this product and that the hazards reflected by the placarding of vessels, as prescribed by the latest regulations, are not appropriate for this product.

First responders rely upon visual information displayed by the dangerous goods placards on the car to protect themselves and the general public. Cars displaying misleading information may lead first responders to take inappropriate action, jeopardizing the general public's first line of defence. Police are often first responders and have demonstrated that they are not equipped with adequate protective equipment, as noted in TSB Investigation Report R99T0256, where a police officer was adversely affected by anhydrous ammonia gas.

The reclassification of anhydrous ammonia raises emergency response issues. Placarding associated with the new reclassification level does not adequately warn of the full extent of the risks. For example, first responders would encounter its flammable and toxic nature, even though the new classification does not classify it as such a product. In addition, first responders such as police and volunteer firefighters in small communities, with little knowledge of dangerous goods, may make their first estimates of danger based on the colour and shape of the displayed placard. Therefore, the reclassification of anhydrous ammonia from a corrosive gas, Class 2.4, to a non-flammable and non-toxic gas, Class 2.2, and the associated placarding, obscures the risks posed to the first responders and the general public by a release of large quantities of concentrated anhydrous ammonia. The new Class 2.2 placard is green in colour, a colour frequently interpreted to mean a product with lower risk, whereas the current Class 2.3 and 2.4 placard indicates a toxic or corrosive substance. First responders would exercise more caution in their initial approach to those products in those latter categories.

Different jurisdictions require different information to be included in the Material Safety Data Sheet (MSDS). Any producer of regulated material must provide this information. The safety issue arises from the fact that each jurisdiction has its own interpretation of the meaning of common, everyday words. This leads to a situation where ammonia is considered flammable and slightly explosive by fire authorities but non-flammable by transportation and environmental authorities. Environmental authorities have considered it as either corrosive, toxic, or non-toxic, depending on the particular authority. Along similar lines, the product is considered to be stable by some and extremely reactive by others. However, the manufacturer of the product is obliged to somehow include all this conflicting information on the same MSDS. Having anhydrous ammonia classified differently in different jurisdictions increases the risk of misunderstandings and errors of perception by the general public and first responders when identifying the dangers of an accidental release.

All emergency responders in this occurrence performed in a professional manner, providing effective coordination and a clear action plan to address this emergency situation. Their performance mitigated the risks of the emergency and expedited the cancellation of the evacuation notice. The organization and coordination of the emergency responders, as initiated under the Red Deer Emergency Operation Plans, demonstrated that municipalities can provide an effective response to the accidental release of dangerous commodities and avert the potentially catastrophic consequences.

Findings as to Causes and Contributing Factors

1. The train derailed because of a wide gauge condition at the point of derailment that went undetected by regular inspection as the gauge widening would only occur when under the heavy load of a rail car or engine.

2. The undetected but pre-existing cracks, at a location which precluded their detection by other than rail flaw detection methods of inspection, significantly reduced the strength of the rail at the deteriorated bolt hole. The extra lateral force of the derailed car wheel was sufficient to cause the final rail fracture and divergence of the rail cars.

3. Stresses caused by the impact to the manway nozzle of the ammonia tank car exceeded the structural design capabilities of the tank, resulting in brittle fracture and gradual release of ammonia. The brittle fracture was confined to the heat-affected zone of the weld between the nozzle and the tank shell.

Findings as to Risk

1. Having anhydrous ammonia classified differently in different jurisdictions increases the risk of misunderstandings and errors of perception by the first responders and general public when identifying the dangers of an accidental release.

2. The new Transport Canada Dangerous Goods classification system increases the risks of adverse consequences from anhydrous ammonia leaks as anhydrous ammonia is classified in a class and division that does not clearly identify the dangers posed by that product.

3. The risk of wide gauge conditions on this track going unnoticed would have been reduced if a track evaluation car had tested this trackage.

4. The risk of internal rail flaw conditions on this track going unnoticed would have been reduced if a rail flaw detector car had tested this trackage.

5. The police involvement in this occurrence, as in TSB Occurrence R99T0256 when a police officer was adversely affected by anhydrous ammonia gas, revealed again that the first responders most likely to save the general public from harm are not equipped with any personal protective equipment for themselves.

Other Findings

1. The organization and coordination of the emergency responders, as initiated under the Red Deer Emergency Operation Plans, demonstrated that municipalities can provide an effective response to the accidental release of dangerous commodities and avert the potential catastrophic consequences.

Safety Action

1. Within the first week after the derailment, the Procor company undertook mapping of the distorted area of the car PROX 88421 as well as the other derailed and overturned car, PROX 37981. Furthermore, Procor acquired a non-linear finite element analysis capability. The results of the distortion mapping were analyzed by using this newly acquired capability to learn the distribution of the stresses to which the cars were exposed. In addition, designs of the manway area of other tank cars are being analyzed in similar fashion. This work may ultimately lead to improvements in car design applicable to the whole North American fleet. In addition, Procor performed material testing over and above that performed by the Transportation Safety Board of Canada, in order to confirm the material properties of the tank and welds.

2. Procor's representative on the Tank Car Committee of the American Association of Railroads (AAR) advised other members concerning the Red Deer accident and associated issues. The AAR Task Force on top fitting protection will be made aware of the results of the ongoing Procor analysis, as they become available, and will undertake a review of the magnitude of the design loads as a part of its ongoing work. Procor data will help in assessing the vulnerability of the nozzle to tank connection.

3. Transport Canada has worked closely with Procor and with AAR's Tank Car Committee on the tasks described in points 1 and 2 above. Through the participation at the AAR Tank Car Committee, upon conclusion of the design analysis work, Transport Canada will continue to work closely with Procor, other car owners, and the Tank Car Committee to ensure the integrity of top fitting protection.

4. Canadian Pacific advises that, in addition to testing main track sidings at least twice a year, they are now testing all sidings, including the No. 1 yard track in Red Deer.

Classification of Anhydrous Ammonia

As a result of the 1999 derailment involving the release of anhydrous ammonia from a derailed car (TSB Report R99T0256), the Board was concerned that first responders such as firefighters and police in small communities, with little exposure to dangerous goods, may incorrectly make their first estimates of danger based in part on the colour and shape of a placard, instead of relying on the specific characteristics of the product. The Board recommended that:

> The Department of Transport review the classification and safety marks for anhydrous ammonia to ensure that it is in a class and division consistent with the risks it poses to the public.

R02-01, issued June 2002

The Department responded that it will further consider the classification of anhydrous ammonia. It has raised the matter with the Federal-Provincial Task Force, as well as the Minister's Advisory Council on the Transportation of Dangerous Goods.

The Department advised that, under the United Nations process, the substance would be Classification 2.3 and requested stakeholder feedback.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 05 December 2002.