

SUMMARY OF FE-24-02
SELECTED AND POSSIBLE CONTRIBUTING FACTORS

SELECTED FACTORS

Railroad: Illinois Central Railroad, a subsidiary of Canadian National Railroad

Location: Stevens Point, Wisconsin

Region: 4

Month: September

Date: Sept. 19, 2002

Time: 10:55 a.m., CST

Data for All Fatally Injured Employee(s)

Carman

44 years old

12 years of service

Last rules training: Jan. 15, 2002

Last safety training: July 27, 2002

Last physical: Unknown

Data for All Employees (Craft, Positions, Activity)

Craft: Maintenance of Equipment

Positions:

Repair Job: Freight Car No. CN 56034

Carman A (fatally injured)

Carman B (seriously injured)

Working on Adjacent Track

Carman

Activity: Repairing a freight car's defective cylinder

EVENT

A Carman was fatally injured by an explosion while trying to repair a freight car's defective cylinder.

SUMMARY OF FE-24-02 CONTINUED

POSSIBLE CONTRIBUTING FACTORS

PCF No. 1

Just prior to the incident, the fatally injured Carman was leaning over the freight car's defective cylinder, holding a pair of pliers with the nut, while the seriously injured Carman was attempting to weld the nut in place. Investigators concluded that prior to the explosion, one of the Carman had cleaned the piston head with Penray Gum-solve, a highly flammable substance. The welding process provided the source of ignition necessary to cause the fatal explosion.

The investigators' conclusions were supported by testing all rags in the area, the two Carman's clothing, and the cylinder for levels of substances such as Acetone, Toluene, and Xylene found in Gum-solve. Levels were very high.

Note

As a result of the post-accident investigation's findings, CN implemented a policy requiring that all defective air side dump cars with air cylinders were to be repaired by a private contractor in Winnipeg, Canada.

REPORT: FE-24-2002

RAILROAD: Illinois Central Railroad (IC), a subsidiary of Canadian National Railroad (CN)

LOCATION: Stevens Point, Wisconsin

DATE & TIME: Sept. 19, 2002; 10:55 a.m., CST

EVENT¹: The Carman was fatally injured by an explosion while trying to repair a freight car's defective cylinder.

EMPLOYEE:

Craft:	Maintenance of Equipment (MOE)
Activity:	Repairing car
Occupation:	Carman
Age:	44 years old
Length of Service:	12 years
Last Rules Training:	Jan. 15, 2002
Last Safety Training:	July 27, 2002
Last Physical:	Unknown

CIRCUMSTANCES PRIOR TO THE ACCIDENT

For the purpose of identification in this report, Carman A was fatally injured, and Carman B was seriously injured.

On Sept. 19, 2002, two Carman reported for duty at approximately 6:30 a.m. to the Canadian National Railroad's car shop in Stevens Point, Wisconsin in CN's Wisconsin Central Division. The two Carman were assigned to work on Track No. 5 in the car shop. Their shift began at 7 a.m., at which time a 10-minute safety briefing was conducted with the reading of the safety rule of the day. The two Carman then went to work.

¹ "Event" is defined as "occurrence that immediately precedes and directly results in the fatality." Possible contributing factors are identified in the following report and attached summary.

The sky was cloudy, and the temperature was 55° F.

THE ACCIDENT

After repairing a couple of freight cars, the Carmen spotted Freight Car No. CN 56034 for repair. It was an air-actuated, side dump car used by the MOW Department to haul and dump ballast along the railroad right-of-way. Because the car was loaded, one of the air dump cylinders had to be removed from the car to repair the broken bolts in the small cylinder head. Carman B removed the bolts that secured the air dump cylinder to the car. Carman A returned with the fork lift. The cylinder was placed on the fork lift, then on the fork of the fork truck, and moved to a location between Tracks Nos. 4 and 5 inside the car shop.

The Carmen placed the cylinder on blocks to avoid damage to the air pipe on its bottom. They discovered that of the four bolts that attached the small cylinder head to the car, three were broken and one was missing. The two Carmen were attempting to weld a nut to the broken portion of one of the three broken bolts. This was their second attempt to weld the nut on the broken bolt, as the nut had come off the broken bolt on their first attempt. They used this procedure so a wrench could be used to back out the broken bolt.

Carman A was leaning over the cylinder holding a pair of pliers with the nut, and Carman B was attempting to weld the nut in place. As Carman B started to weld the nut, an explosion occurred within the cylinder, causing the large portion of the 2-stage cylinder to extend upward at a rapid pace. Carman A was struck in the upper chest and head with the large portion of the cylinder. The impact threw him against freight car CN 56034; he bounced off of the car and came to rest between Tracks Nos. 4 and 5 beside a building support beam and large floor fan. Carman B was struck in the face and was found hunched over near the west truck on CN 56034 with facial bleeding. The first responder to the accident scene was the Stevens Point Police, followed shortly by the Stevens Point Fire Department EMT Team. Carman A was transported to Saint Michael's Hospital where he was pronounced dead at 11:15 a.m. by the Portage County Coroner.

POST-ACCIDENT INVESTIGATION

The car was bad-ordered for a broken connection lug assembly on the top of one of the pistons used to tilt the car to dump the load. CN 56034 was equipped with four 2-stage, air dump cylinders, two on each side near the ends of the car. The 2-stage air dump cylinders comprised a housing approximately 39 inches tall by 32 inches in diameter. Inside the cylinder were two pistons, one large piston 26 inches in diameter, and a smaller piston 5 ½ inches in diameter. As air pressure was introduced into the cylinder housing, the larger piston deployed first to a height of two feet. Then the smaller piston deployed also to a height of two feet, to complete the dumping cycle of the car. The connection lug that attached the cylinder to the side of the car sat on top of the small piston and was held in place by four ½-inch by 2-inch bolts. On this particular cylinder, three of the four retaining bolts were broken and the fourth bolt was missing.

According to statements of employees in the vicinity, the first attempt at welding on the broken bolt failed, so the two Carman attempted to re-weld another bolt or nut to the broken portion. At this time, an explosion occurred. According to the other employees in the area, the explosion sounded like a shotgun blast, and one employee working on the next track thought that a freight car had fallen off its jacks.

During an investigation of the accident site, investigators found an aerosol spray can of carburetor and fuel injector cleaner on the brake step of the side dump car. On September 25, FRA viewed the air cylinder and accident site. Close examination of the connection lug cap revealed an accumulation of grease and oil on the bottom side that attached to the small piston head. They examined the top of the small piston which was found to be completely grease and oil free. This indicated the piston head had been wiped clean with rags and some sort of solvent.

During the interviews, a Carman who was working on adjacent Track No. 4 stated that he smelled something like paint or paint thinner. He said he was going to complain because he was very sensitive to these types of vapors. If indeed the solvent was used to clean the piston head, the one missing open bolt hone would have allowed the excess solvent to enter the cylinder chamber. Thus, the vapors would have had an enclosed area in which to accumulate and create a hazardous situation. In this case, when the second attempt was made to weld on the piston head, a spark would have entered the cylinder chamber through the open bolt hole and caused an explosion to force the large piston upwards.

All the rags in the area, the two Carman's clothing, and the cylinder along with the mate cylinder on the same side of the car were packaged and sent to Rail Sciences in Omaha, Nebraska for testing. The second cylinder was sent along to be tested in case there was some other foreign substance in the cylinder that could have caused the explosion.

The initial Portage County Coroner's report stated that along with blunt trauma injuries to Carman A, there were first and second degree burns to his head along with singed hair. This would indicate that an explosion had occurred.

On Dec. 20, 2002, a meeting was conducted at the CN offices in Rosemont, Illinois to discuss the results of the tests of the cylinders. The President of Rail Services gave a presentation, stating that the MIG welder and argon tank that was used for welding the nut on the broken bolt had been analyzed and found to be normal. The contents of the Penray Gum-solve cans were analyzed, along with the rags and clothing found at the accident site. The contents of both the suspect can of Gum-solve found on the car's crossover platform and an exemplar can of gum-solve were consistent with the labeling and the Material Safety Data Sheet (MSDS). The major ingredients of Gum-solve are Acetone, Toluene, and Xylene.

The findings of the comparison analysis of the failed cylinder and the exemplar cylinder were that residue in the failed cylinder had 300 times the level of Toluene compared to the exemplar cylinder. The failed cylinder had nine times the Acetone levels and 200,000 times the level of

Xylene. The failed cylinder also had 60,000 times the level of Ethyl-benzene, and the exemplar cylinder had none. In addition, the rags and clothing from the site were also found to have the same ingredients from the Gum-solve on them.

In conclusion, the use of Penray Gum-solve on the side dump air cylinder resulted in the solvent entering the enclosed cylinder where it began vaporizing. The welding process on the cylinder's piston provided the source of ignition which caused the vaporized Gum-solve to combust, and the cylinder to extend rapidly, causing the fatality and injury to the Carman. This also would be consistent with the statement of the Carman working on the adjacent track that he smelled something which caused him irritation. The vapors from the Gum-solve are heavier than air. The Carman was working in a pit on the next track near the location where the two Carman had placed the air cylinder. The vapors hugged the ground and caused him to experience an irritation. In interviews, Carman B consistently denied that he used or saw Carman A use the Gum-solve.

The toxicological tests on Carman A were negative.

As a result of the post-accident investigation's findings, CN issued a safety flash report stating that all defective air side dump cars with air cylinders needing repair were to be home-shopped to Winnipeg, Manitoba, Canada, where a private contractor would perform the repairs to the air cylinders.

APPLICABLE RULES

CN has not issued any type of safety rule violation against the Carman. However, Safety Rule M-33, Welding and Cutting, of the CN, U.S. Mechanical Safety Rule Book states:

4. Do not cut, weld, or perform work involving ignition sources on containers that may contain flammable or poisonous solid liquids or vapors.