

ADOPTED: 2/12/90



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

I-90A

Date: March 23, 1990

In reply refer to: I-90-2 through -4

Mr. Darrel Reifschneider
President and Chairman of the Board
Manchester Tank and Equipment Company, Inc.
2880 Norton Avenue
Lynwood, California 90262

About 11:30 a.m., on November 30, 1988, a tractor-flatbed semitrailer operated by Hy Yield Bromine Company overturned at the intersection of two farm roads in a sparsely populated area of Collier County, Florida. The semitrailer was loaded with 32 cylinders of a poisonous and toxic by inhalation mixture, 98 percent methyl bromide and 2 percent chloropicrin. Eleven of the cylinders were full, each containing about 1,500 pounds of the poisonous mixture, and the remainder of the cylinders were partially full or empty except for residue. The driver had completed the second of four scheduled stops when the accident occurred.¹

As the vehicle overturned onto its left side, the front of the tractor struck a tree and some of the cylinders and sidepanels on the semitrailer were ejected from the vehicle. Several cylinders struck trees in the wooded area adjacent to the accident site and one cylinder was punctured. Several emergency response personnel reported symptoms associated with exposure to methyl bromide and chloropicrin as a result of their activities on and near the accident scene, and were provided medical treatment.

Ten of the 32 Department of Transportation (DOT) 4BW cylinders were manufactured by the Manchester Tank and Equipment Company, Inc., (Manchester), of Lynwood, California, at its facility in Lubbock, Texas. All 10 Manchester cylinders were from a lot of 200 cylinders manufactured in July 1988. The cylinder punctured during the accident was a Manchester cylinder, serial number G-479. Serial numbers for the other nine Manchester cylinders were G-512, G-517, G-540, G-567, G-615, G-639, G-616, G-656, and G-661.

¹For more detailed information, read Hazardous Materials Accident Report--"Puncture of a Cylinder Containing a Mixture of Methyl Bromide and Chloropicrin Following the Overturn of a Tractor/Semitrailer, Collier County, Florida, November 30, 1988" (NTSB/HZM-90/01).

In the summer of 1988, Manchester was using Terra Testing, Inc., of Lubbock to perform the testing required by Section 178.61-15. However, Terra Testing lacked equipment necessary to conduct the tests required and sent the test specimens to the Texas Technical University's Civil Engineering Laboratory in Lubbock. Yield and ultimate strength tests were conducted using the "halt-of-pointer" method,² which is not an authorized method under DOT regulations. Terra Testing documents dated May 5, 1988, and August 10, 1988, recorded yield and ultimate tensile strength values for two sets of top head, bottom head, and side body specimens. The values were subsequently recorded on a Manchester form, "Record of Physical Tests of Material for Cylinders," dated July 1988, as representing the results of the physical tests required under 49 CFR 178.61-15. The values taken from the May 5 tests were reported for cylinders G-474 through G-600, and the values taken from the August 10 tests were reported for cylinders G-600 through G-673. (All Manchester cylinders involved in the accident are marked tested July 1988; shipping records show that some of the cylinders were shipped to Hy Yield Bromine Company August 3, 1988, 7 days before some required physical tests were performed.)

According to Research and Special Programs Administration (RSPA) representatives, test specimens must be prepared to one of the three following gauge lengths,³ prescribed in 49 CFR 178.61-15(b):

- o gauge length 8 inches with width not over 1.5 inches;
- o gauge length 2 inches with width not over 1.5 inches; and
- o gauge length at least 24 times thickness with width not over 6 times thickness when cylinder wall is not over 3/16-inch thick.

Manchester's "Record of Physical Tests of Material for Cylinders" notes that the specimens were prepared to a "gauge length at least 24 times thickness with width not over 6 times thickness." However, according to Manchester's foreman at Lubbock who oversees DOT-required physical testing, specimens were not prepared to this dimension. Instead, Manchester used a gauge length of 2.4 inches. A gauge length of 2.4 inches is not authorized by Section 178.15(b). Elongation measurements for the test specimens for the

² The "halt-of-pointer" method is determined by applying an increasing load to the specimen at a uniform deformation rate. When the yield point of the material is reached, the increase of the load stops. At that time, there is a halt or hesitation of the load-indicating mechanism.

³ A gauge length is the distance between two marks placed on a specimen.

cylinders involved in the accident were also recorded on Manchester's record of physical tests form.

Although the Manchester cylinders involved in the accident were marked as DOT specification 4BW cylinders, neither physical test procedures nor specimen gauge lengths required by Federal regulations were used to conduct the physical tests. Therefore, construction compliance with minimum yield strength requirements and minimum elongation requirements cannot be determined from the physical tests performed, and the use of tensile strength results in determining minimum wall thickness requirements would be invalid. Nevertheless, those tests were used by Manchester to "certify that all these cylinders proved satisfactory in every way and comply with the requirements of Department of Transportation specification No. 4BW."

The results of postaccident tests on the punctured cylinder demonstrate that the side body material could have passed the test requirements for elongation depending on which of the three allowable specimen sizes had been chosen. The 2-inch gauge length specimen failed to meet minimum elongation requirements, while the 8-inch and 24T-6T size specimens passed. Because the 24T-6T size specimen was determined to be the most likely to generate elongation values that meet requirements, that size specimen was selected for physical tests on the bottom head specimen taken from the punctured cylinder. The elongation value generated was significantly below the minimum required for specification 4BW cylinders.

In further reviewing Manchester's testing procedures, tests conducted on 4BW cylinders in different lots were examined. On those cylinders, authorized specimen sizes and authorized physical test procedures were used. However, the three test specimens, taken from the side body, top head, and bottom head, all failed to meet minimum elongation requirements. Additionally, the tensile strength for the top head was less than that required for the stated minimum wall thickness. Nevertheless, Manchester certified that the cylinders met DOT specification requirements.

The DOT has procedures for addressing problems when cylinders fail required tests. Those procedures require that if a sample cylinder or specimen taken from a lot of cylinders fails the prescribed test, then two additional specimens must be selected from the same lot and subjected to the same prescribed tests, and that if either of these fail the test then the entire lot must be rejected. Therefore, the Safety Board believes that Manchester should identify all DOT specification cylinders that were not tested and inspected in accordance with regulatory requirements, and those that were properly tested but failed to meet regulatory requirements; retest randomly selected cylinders from each lot of these identified cylinders in accordance with DOT regulatory procedures; notify owners of cylinders in lots failing tests to cause them to be removed from hazardous materials service and remove DOT specification marking from those cylinders; and provide RSPA a listing of all cylinders affected by the test results. The Safety Board also believes that Manchester should develop and implement a quality control program for conducting Federally mandated tests and inspections on newly manufactured cylinders and rejecting cylinders failing to meet any of the minimum regulatory requirements.

The Safety Board investigated an accident that occurred near Gretna, Florida, on August 8, 1971, involving an automobile and a tractor/semitrailer transporting 20 full cylinders of a mixture of methyl bromide and chloropicrin.⁴ As a result of the accident, nine unrestrained cylinders penetrated the front wall of the semitrailer and were ejected. One cylinder sustained a punctured head, believed to have been made by an angle bar skid (foot) attached to another cylinder, and a second cylinder sustained a punctured sidewall, possibly from an angle bar skid also. Additionally, four cylinders sustained damage to the valves resulting in the loss of product. As a result of that accident, four persons in the automobile died from the inhalation of methyl bromide.

Following its investigation of the Gretna accident, the Safety Board concluded that the principal hazard associated with the cylinder skids, the configuration of the ends of the skids, was not adequately addressed by 49 CFR 178.51 and 178.61. The Board further concluded that there was a need to design cylinder skids to reduce the likelihood of puncturing adjacent cylinders by the elimination of sharp projections or edges, or the use of relatively softer skid materials.

Manchester cylinder G-479 was punctured by a sharp object externally impacting the side body, most likely by the corner of a saddle-type foot on another cylinder, after the vehicle overturned and ejected the cylinders. While there is no regulation that prohibits the attachment of feet with sharp projections, feet with rounded corners and edges or made of softer materials would have reduced the potential for puncture. Therefore, the Safety Board believes that Manchester should modify the design of attachments to cylinders to reduce to a minimum the risk of an attachment puncturing other cylinders during transportation.

Therefore, the National Transportation Safety Board recommends that the Manchester Tank and Equipment Company, Inc.;

Identify all Department of Transportation (DOT) specification cylinders that were not tested and inspected in accordance with regulatory requirements, and those that were properly tested but failed to meet regulatory requirements, and retest randomly selected cylinders from each lot of these identified cylinders in accordance with DOT regulatory procedures; notify owners of cylinders in lots failing tests to cause them to be removed from hazardous materials service; remove DOT specification markings from those cylinders; and provide the Research and Special Programs Administration a listing of all cylinders affected by the test results. (Class II, Priority Action) (I-90-2)

⁴ Highway Accident Report NTSB-HAR-72-3.

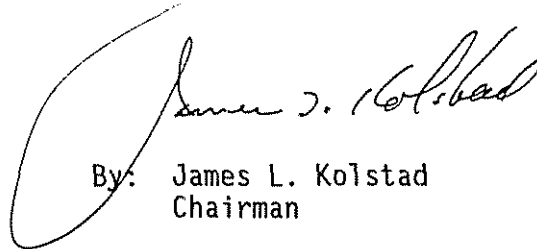
Implement a quality control program for conducting Federally mandated tests and inspections on newly manufactured cylinders and rejecting cylinders failing to meet the minimum regulatory requirements. (Class II, Priority Action) (I-90-3)

Modify the design of attachments to Department of Transportation specification cylinders to reduce to a minimum the risk of an attachment puncturing other cylinders during transportation. (Class II, Priority Action) (I-90-4)

The National Transportation Safety Board is an independent Federal agency with the statutory responsibility "... to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (Public Law 93-633). The Safety Board is vitally interested in any action taken as a result of its safety recommendations. Therefore, it would appreciate a response from you regarding action taken or contemplated with respect to the recommendations in this letter. Please refer to Safety Recommendations I-90-2 through -4 in your reply.

Also, the Safety Board issued Safety Recommendations H-90-8 and -9 and I-90-1 to the Hy Yield Bromine Company; I-90-5 through -12 to the Research and Special Programs Administration of the U.S. Department of Transportation; I-90-13 through -15 to Collier County, Florida; and I-90-16 and -17 to the Florida Highway Patrol.

KOLSTAD, Chairman, COUGHLIN, Acting Vice Chairman, and LAUBER and BURNETT, Members, concurred in these recommendations.



By: James L. Kolstad
Chairman