NATIONAL TRANSPORTATION SAFETY BOARD
Office of Research and Engineering
Materials Laboratory Division
Washington, D.C. 20594

June 5, 2017

MATERIALS LABORATORY FACTUAL REPORT Report No. 17-046

A. ACCIDENT INFORMATION

Place	:	Money, Mississippi
Date	:	April 30, 2017
Vehicle	:	Crude oil tank car
NTSB No.	:	DCA17SH002
Investigator	:	Paul Stancil, RPH-20

B. COMPONENTS EXAMINED

Piece of tank car CBTX 718470.

C. DETAILS OF THE EXAMINATION

Overall views of the examined pieces from tank car CBTX 718470 are shown in figure 1 as viewed at the Canadian National Railway (CN) rail yard in Memphis, Tennessee. The examination was led by the NTSB at the CN rail yard, and participants in the examination included representatives from CN, the Greenbrier Companies, Transportation Safety Board of Canada, and the Federal Railroad Administration.

Tank car CBTX 718470 was built before the Department of Transportation (DOT) -117 classification was issued and was registered as a DOT-111A. However, the tank car was designed with features that would become required for the DOT-117 classification including a thicker minimum shell thickness, a thermal protection system, full head shields, a bottom outlet valve designed to prevent unintended actuation, and top fittings protection.

The tank car pieces shown in figure 1 were from the B-end of the tank car. Prior to the examination, the jacket and appliances for tank car CBTX 718470 had been removed from the tank, and the tank was cut into the pieces shown in figure 1. The remainder of the tank car not shown in figure 1 including the draft sills were scrapped. The tank car had been involved in a collision that resulted in a release of crude oil from the adjacent tank car. Based on a review of photographs provided by CN, the draft sill at the B-end of tank car CBTX 718470 fractured nearly completely from the tank car and buckled under the tank as it was displaced toward the A-end of the tank. Tank car CBTX 718470 remained upright, and the B-end was then exposed to a pool fire.

The tank shell pieces showed areas of discoloration consistent with heat damage. The head on the tank was dented inward in an area corresponding to the location of the

brake wheel on the head shield. The lower side of the tank was dented inward with the largest depth of denting located above the draft sill attachment location near the tail end of the stub sill.

Wall thickness was measured in several locations in the dented areas of the tank shell using an ultrasonic thickness gauge. The thinnest wall section measured was 0.511 inch. In an area where no deformation was detected, the measured wall thickness was 0.568 inch. The specified nominal wall thickness for the tank shell was 9/16 inch.

After an initial examination of the tank piece in the position shown in figure 1, the tank piece was rotated 180 degrees to view the underside of the tank. Views of the draft sill attachment areas are shown in figure 2. The head brace and most of the draft sill fractured from the sill pad as shown in figure 2. Small pieces of the draft sill remained attached at the tail end of the draft sill attachment as indicated in the lower image in figure 2. The sill pad remained attached at the head end and at the tail end of the pad but was fractured from the tank wall along a length extending from the A-end edge of the body bolster pads.

Additional views of pad fractures and areas where the pads separated from the tank shell are shown in figures 3 and 4. At the left side of the tank car shown in figure 3, the left body bolster pad was fractured around part of the circumference at the bolster web attachment weld, and the inboard end to the A-end side of the body bolster pad was missing. The inboard end of the body bolster pad was also fractured from the edge of the sill pad, and the inboard end of the remaining left bolster pad piece had a twisting deformation where the corner defined by the inboard and circumferential fractures was displaced downward relative to the other inboard corner.

Views of the fractured right body bolster pad are shown in figure 4. The right body bolster pad was fractured circumferentially at the attachment location for the body bolster web, and the inboard end was fractured from the draft sill. The fractured section of right body bolster pad was missing. A gap was present between the right body bolster pad and the tank shell which was greatest at the inboard, A-end corner of the pad. The circumferential edge of the pad closer to the head remained attached to the shell.

In general, the pad and draft sill attachment welds appeared to be well formed and uniform. Spot checks of fillet weld dimensions were conducted by the representative from Greenbrier using a Fibre-Metal fillet weld gage, and the reported measurements were consistent with drawing requirements. Welds at the inboard edges of the body sill pads were specified as zero root opening bevel welds, which is expected to produce little or no penetration into the tank wall at those locations. As shown in figures 3 and 4, the inboard ends of the body bolster pads were not welded to the tank shell, consistent with the weld configuration specified at those locations. A zero root opening bevel weld is also specified for the transverse weld in the sill pad as indicated in figure 2. No attempt was made to

determine if the tank wall was also free from weld penetration at the location of the zero root opening bevel weld indicated in figure 2.

Matthew R. Fox
Senior Materials Engineer

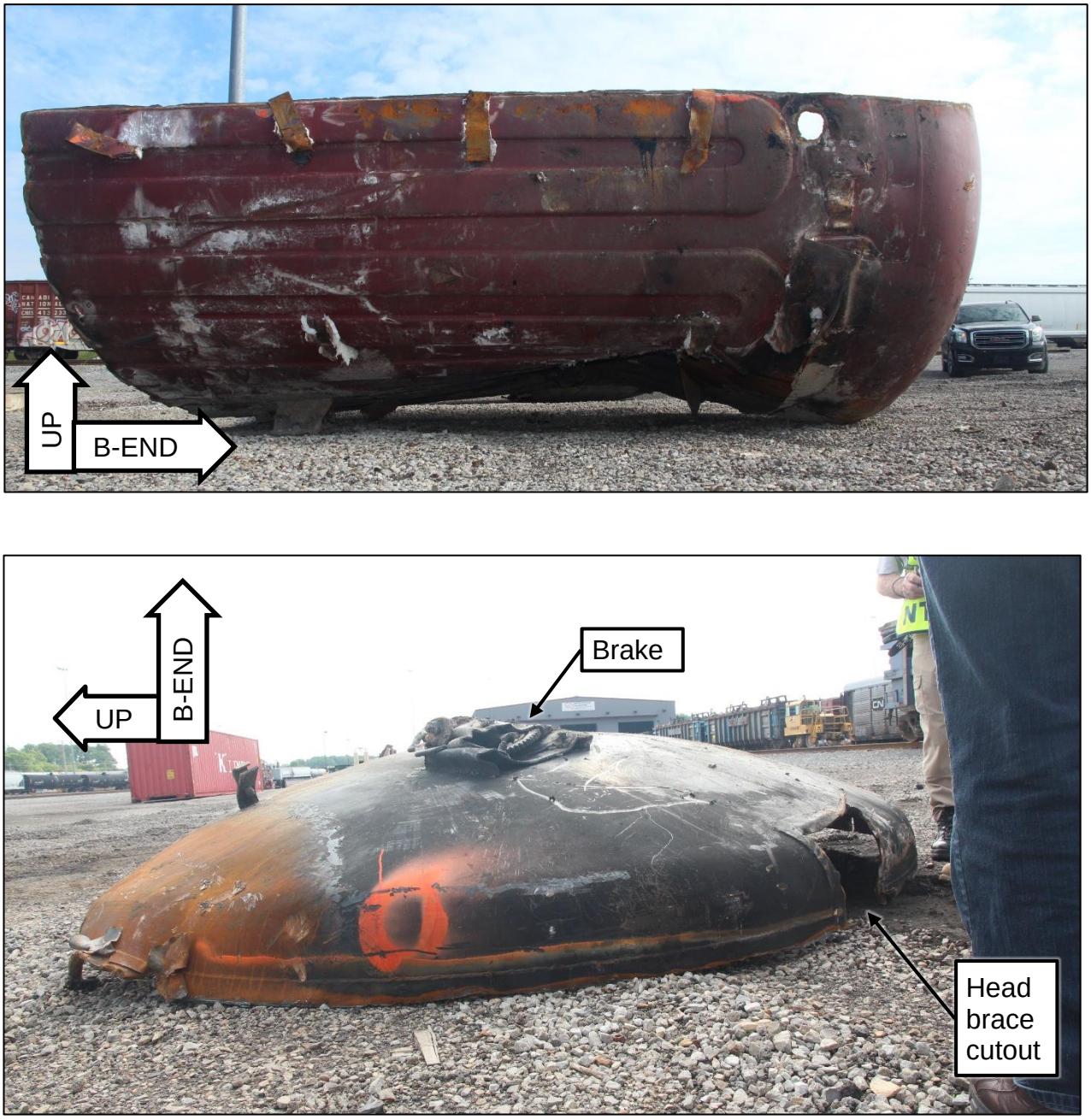

Figure 1. Overall views of the tank car pieces showing the left side of the tank section (upper image) and the head shield (lower image).

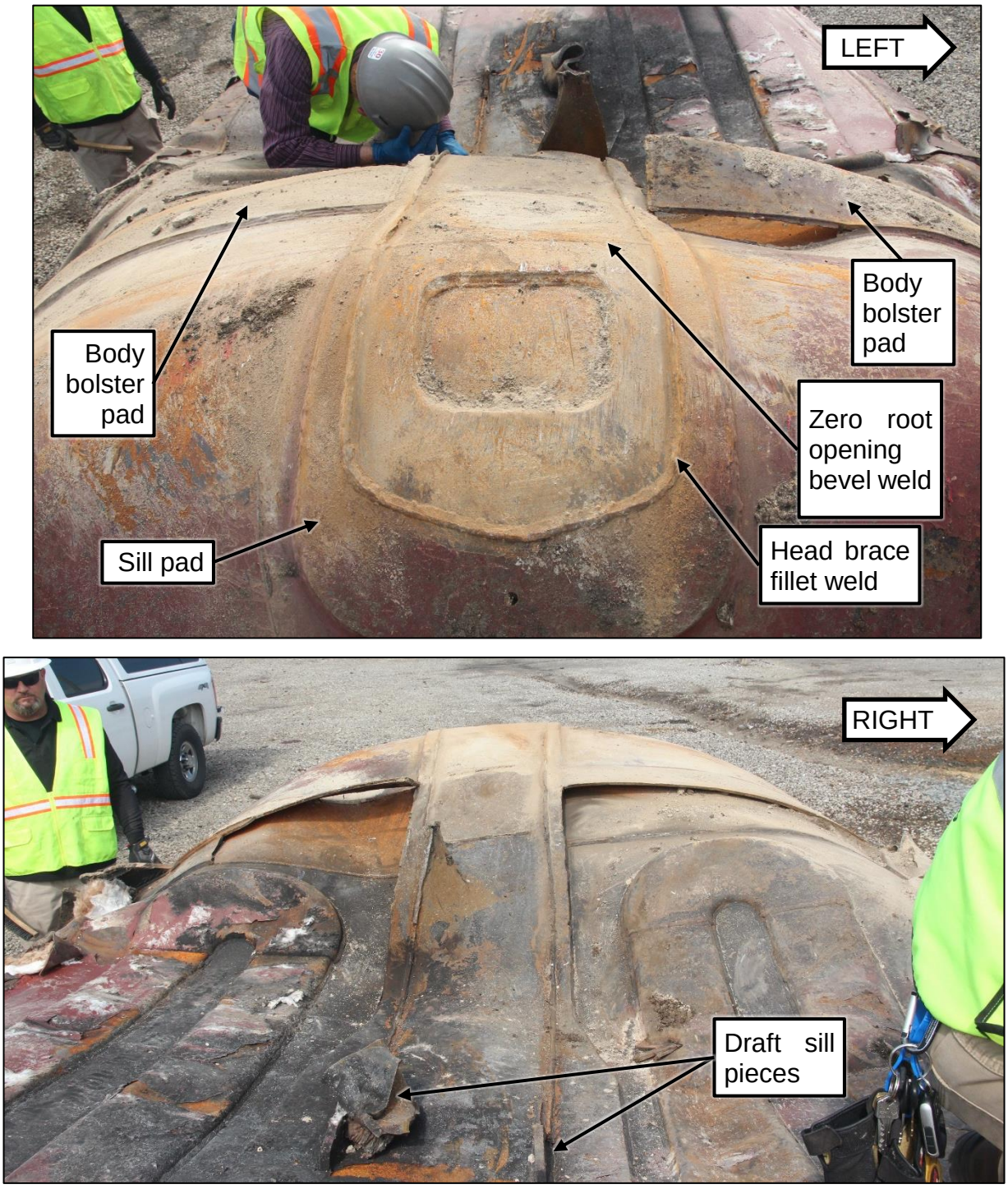

Figure 2. Views of the lower side of the tank car as viewed facing toward the A-end (upper image) and toward the B-end (lower image).

Figure 3. Views of deformation at the left side of the sill pad where it intersected the body bolster pad. No weld penetration into the tank was observed where the body bolster pad was welded to the sill pad, consistent with the zero root opening bevel weld specified at the inboard end of the body bolster pad.

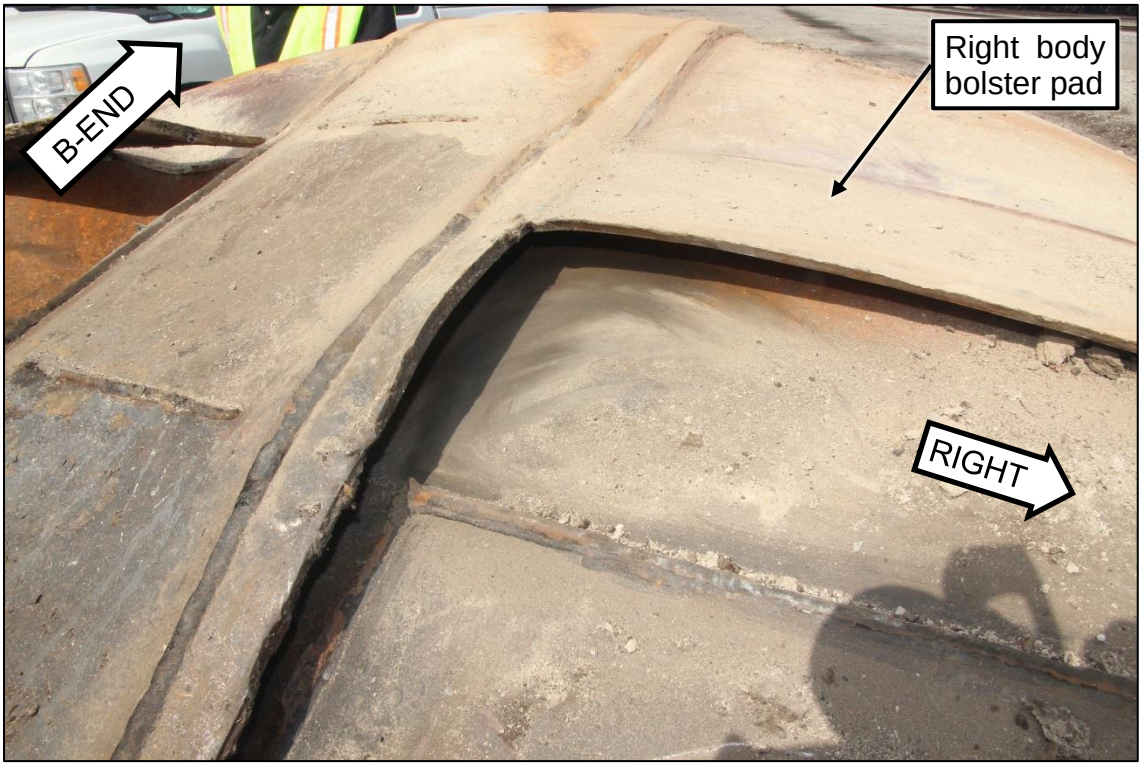

Figure 4. Views of deformation at the right side of the sill pad where it intersected the body bolster pad. No weld penetration into the tank was observed where the body bolster pad was welded to the sill pad, consistent with the zero root opening bevel weld specified at the inboard end of the body bolster pad.