MATERIALS LABORATORY GROUP CHAIRMAN'S FACTUAL REPORT

Oxnard, CA

HWY15MH006

(07 pages)

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

Approval Date

MATERIALS LABORATORY FACTUAL REPORT Report No. 15-093

A. ACCIDENT INFORMATION

Place	:	Oxnard, California
Date	:	February 24, 2015
Vehicle	:	Metrolink Passenger Car SCAX 206
NTSB No.	:	HWY15MH006
Investigator	:	Joey Rhine, RPH-10

B. COMPONENTS EXAMINED

Type H Tightlock Coupler from B-end of SCAX 206, P/N: 42H7310, S/N: 202, supplier: Meridian Rail, casting vendor: National Castings Div., Cicero.

C. DETAILS OF THE EXAMINATION

The B-end coupler from Metrolink Passenger Car SCAX 206 was found fractured on the scene of the accident. It was crated and sent to the NTSB Materials Laboratory for examination. The coupler was a Type H-Tightlock Grade C coupler and was manufactured in accordance with APTA PR-M-RP-003-98.[1] The APTA specification incorporates material and coupler acceptance criteria in Association of American Railroads (AAR) Specifications M-201 and M-211, part of AAR Manual of Standards and Recommended Practices: Section S.[2]

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The as-received coupler is shown in figure 1. The coupler was fractured through the shank approximately 2 inch from the body. There were no indications of left/right bending deformation in the shank, as shown in figure 2a. In contrast, when viewed from the side, the lower portion of the shank exhibited downward plastic bending deformation, as indicated in figure 2b. The deformation pattern was consistent with the fracture starting in the upper portion of the shank and ending in the lower portion of the shank.

Examination of the fracture surfaces indicated that there was a pin embedded in the casting on the coupler body-side of the fracture on the top side of the coupler. On the mating shank-side of the fracture there was a matching cylindrical hole in the top center of the fracture, as indicated in figures 3a and 3b. Two additional porosity features

[1] APTA PR-M-RP-003-98: Recommended Practice for Purchase and Acceptance of Type H-Tightlock Couplers, American Public Transportation Association, Washington, DC, 1998.
[2] AAR Manual of Standards and Recommended Practices: Section S – Casting Details, Association of American Railroads, Washington, DC, 2007.

were identified on the fracture and are also indicated in figure 3a. The cross sectional area of the porosity features was approximately 0.10 inch^2 and 0.13 inch^2 as measured on a calibrated image. Remnant gate stubs were visible on the inside of the shank rising approximately 1 inch to 1.5 inch above the inside surface, as seen in figures 3a and 3b.

The fracture around the casting pin hole is shown in greater detail in figure 4. There were two casting discontinuities, one on either side of the hole as indicated by the white dotted lines. The discontinuity on the right side of the image was entirely subsurface. The discontinuity on the left side of the image tapered toward a point as it approached the outer surface but did not reach the surface. Instead, it ended at a surface weld repair, as indicated in figure 4 by the yellow dotted line. The weld repair was identified by a change in the appearance of the fracture and the presence of small gas porosity, consistent with an arc welding procedure. There were no preexisting cracks emanating out of the discontinuities or the surface repair weld. Outside of the discontinuities the fracture had a rough appearance, indicative of an overstress fracture. The combined cross sectional area of the pin hole and the discontinuities was approximately 0.24 inch^2, as measured on a calibrated image.

The nominal wall thickness of the shank, according to the manufacturer's drawing, was 11/16 inch (0.688 inch). Standard wall thickness tolerances per M-211 were -3/32 inch (0.594 inch) and +1/8 inch (0.813 inch). The four walls of the shank were measured with a flat micrometer and were 0.575 inch, 0.755 inch, 0.608 inch, and 0.756 inch for the top, left (viewed from body to yoke), right, and bottom sides, respectively.

The allowed Brinell hardness of the cast steel ranged from 179 HB to 241 HB. The hardness of the coupler material was measured on a section cut from the shank. The top and bottom surfaces were ground flat and the hardness was measured using a Brinell hardness tester with a 10 mm tungsten carbide ball and 3,000 kg load. The three hardness measurements were 210 HBW 10/3000, 210 HBW 10/3000, and 213 HBW 10/3000.

Donald Kramer, Ph.D.
Sr. Materials Engineer

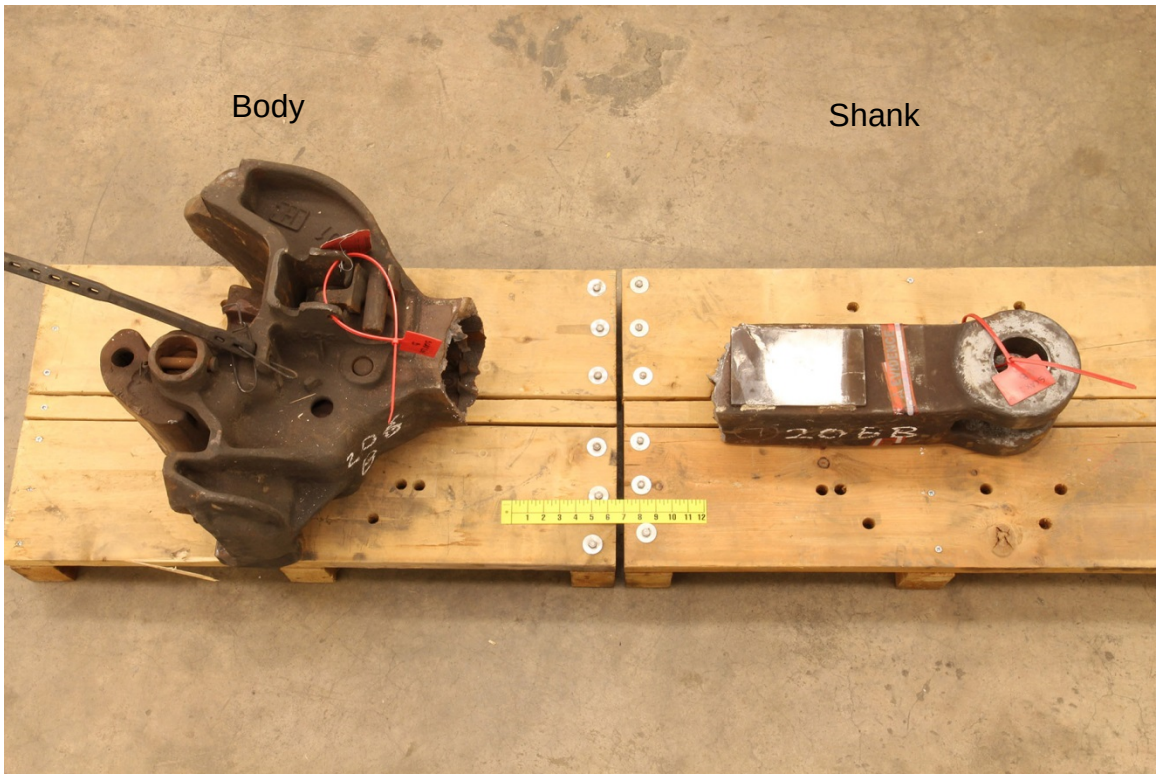


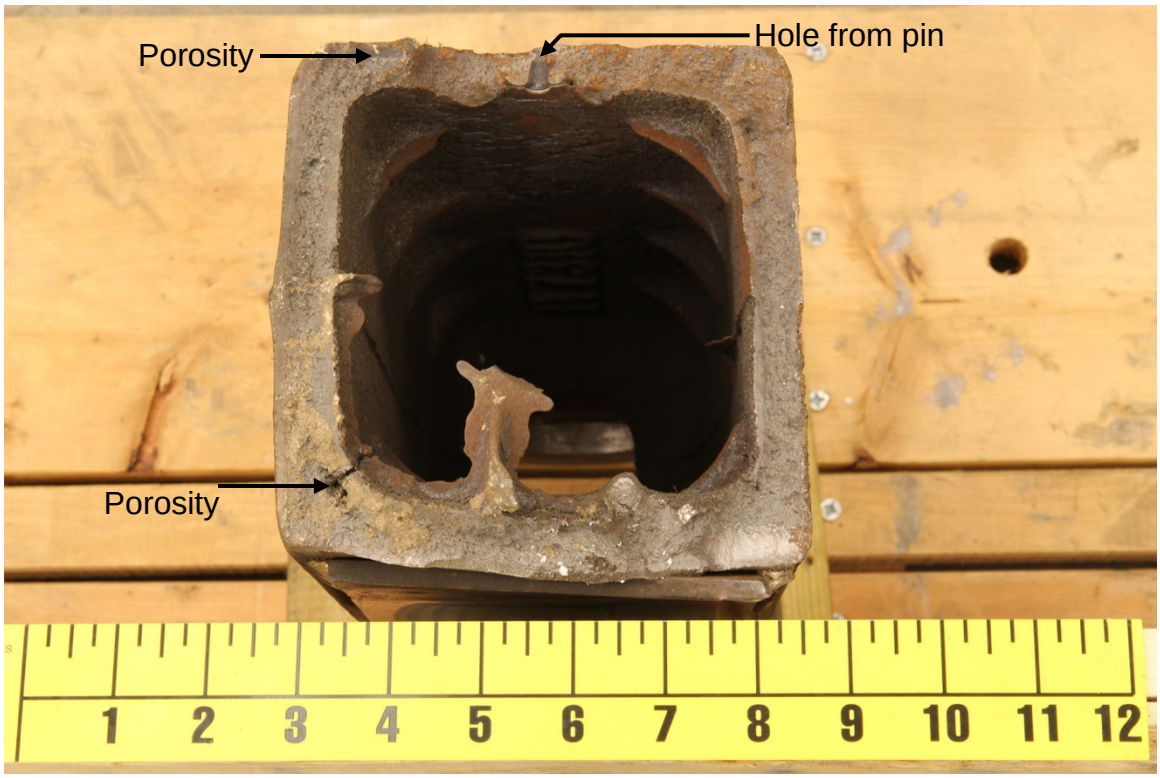
Figure 1: Image of the underside of the fractured B-end coupler. The coupler was fractured through the shank approximately 2 inch from the body.

a)

b)

Figure 2: a) Top down view of the fractured coupler shank and b) side view of coupler shank.

a)



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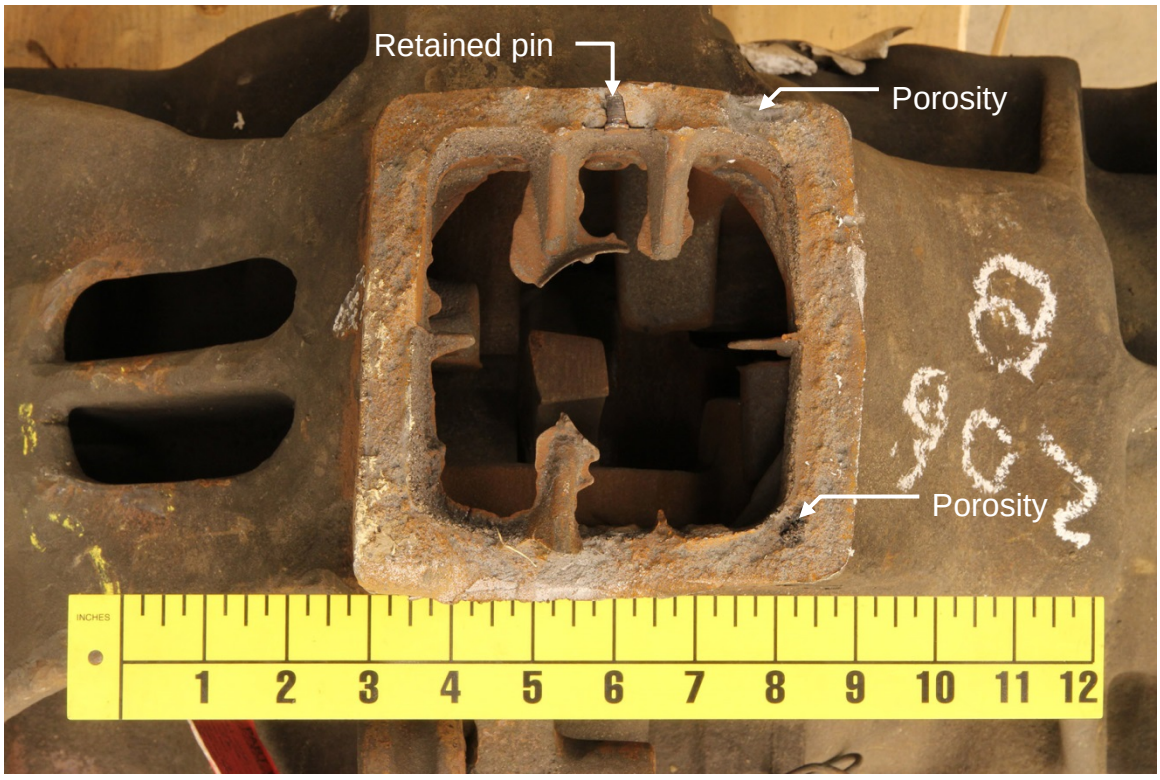

Figure 3: Images of the mating coupler fracture surfaces: a) shank-side fracture surface and b) body-side fracture surface.

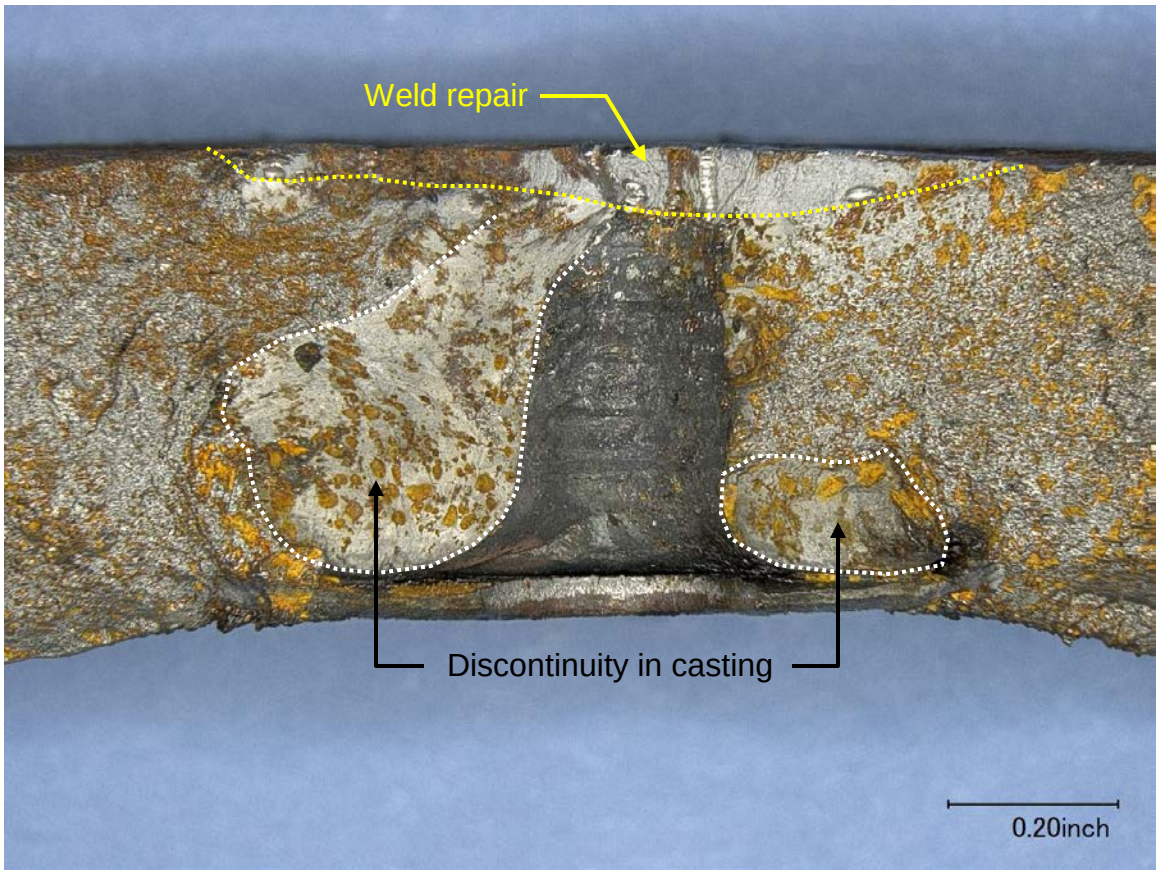

Figure 4: Higher magnification image of the pin hole in the shank. Discontinuities in the casting are outlined with white dotted lines and a weld repair is indicated by a yellow dotted line.