NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Materials Laboratory Division
Washington, D.C. 20594

May 8, 2018

MATERIALS LABORATORY FACTUAL REPORT Report No. 18-007

A. ACCIDENT INFORMATION

Place : Millersville, Pennsylvania
Date : July 2, 2017
Vehicle : Natural gas mechanical tapping tee
NTSB No. : DCA17FP006
Investigator : Roger Evans (RPH)

B. COMPONENTS EXAMINED

A Permalock® mechanical tapping tee assembly that was attached to a 2-inch nominal diameter "Aldyl" polyethylene main. The inner surface of the main contained a longitudinal crack that intersected the cutter tool portion of the tee assembly. This tee assembly and main were excavated from a gas line that was operated by Pacific Gas & Electric Company (PG&E), the result of a gas leak was reported on December 5, 2015, Vacaville, California. It was not involved in the Millersville, Pennsylvania accident. This tee assembly was submitted to the NTSB for documentation of the longitudinal crack that was found in the inner wall of the main.

C. DETAILS OF THE EXAMINATION

As-received

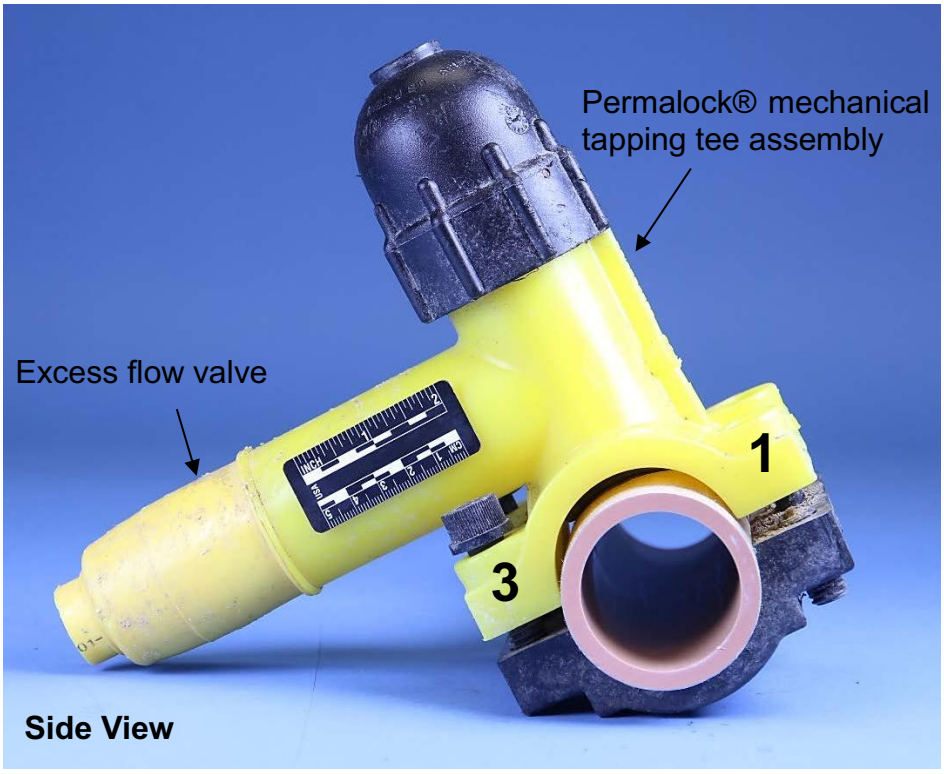
Figure 1 shows photographs of the as-received Permalock® mechanical tapping tee assembly and main.[1] As indicated earlier, the tee assembly was not involved in the Millersville accident. It was excavated from a site that was different from that of the accident, and installed on a main that was operated by PG&E (no association with UGI Incorporated). As compared to the mechanical tee assembly addressed in this report, the mechanical tee assembly involved in the Millersville accident was of a different tapping and locking design, with different installation instructions and different parts (see Appendix A for the installation instructions and diagram showing the cross section of the tee assembly). For example, the tee assembly addressed in this report has an older version of the cutter assembly and cap than the tee assembly located at the Millersville accident site, and it does not include the depth tube as part of the assembly. The tee assembly in Appendix A does not have a locking sleeve feature.

Preliminary examination of the submitted tee assembly revealed the tower and base portions were manufactured on February 1997, according to identification marks found on

[1] Permalock is a tradename for a mechanical tapping tee that was manufactured by Perfection Corporation, later known as Elster-Perfection, and now currently owned by Honeywell – Global Gas Components.

the parts. The main contained a longitudinal crack at the inner wall that intersected the pierced hole in the main (see figures 2 and 3). The length of the longitudinal crack on the inner wall surface measured approximately one inch. The mating faces of the fracture (crack) appeared flat. The tower portion was disassembled from the main and a longitudinal deformation pattern associated with the crack was noted on the outer face of the main. Figure 4 shows a photograph of the pierced hole that was made by the cutter tool. The pierced hole contained fine circular cut marks. The top portion of the main contained scratches that for the most part were circumferentially oriented relative to the length of the main and intersected the pierced hole in the main (see figures 5 and 6). Two of the four attachment bolts fractured at the threaded shank portion. The head portion of the two fractured bolts were not submitted and presumed missing. Figure 7 shows a photograph of the fracture face from bolt “2”.

Frank Zakar
Senior Metallurgist



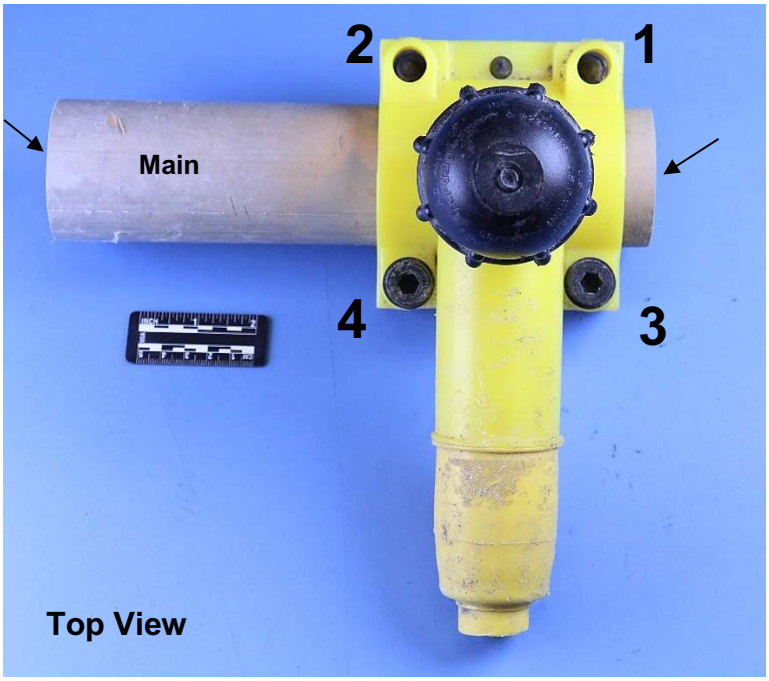


Figure 1. Photographs of the as-received mechanical tapping tee and identification numbers that were arbitrarily assigned to the attachment bolts, “1” through “4”. Bolts “1” and “2” fractured at the thread portion. Arrows indicate cut portions of the main.

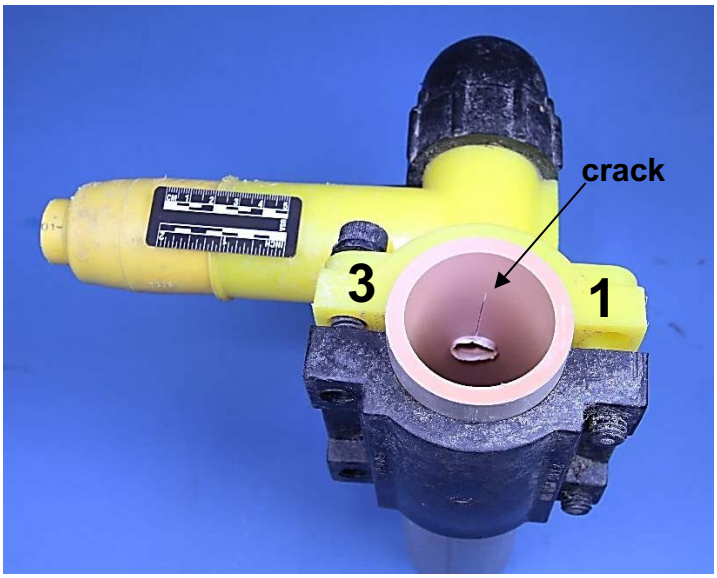


Figure 2. Photograph of the tee assembly showing the exposed inner wall of the main in the area where the cutter tool pierced the main. The wall of the pierced hole was bare.

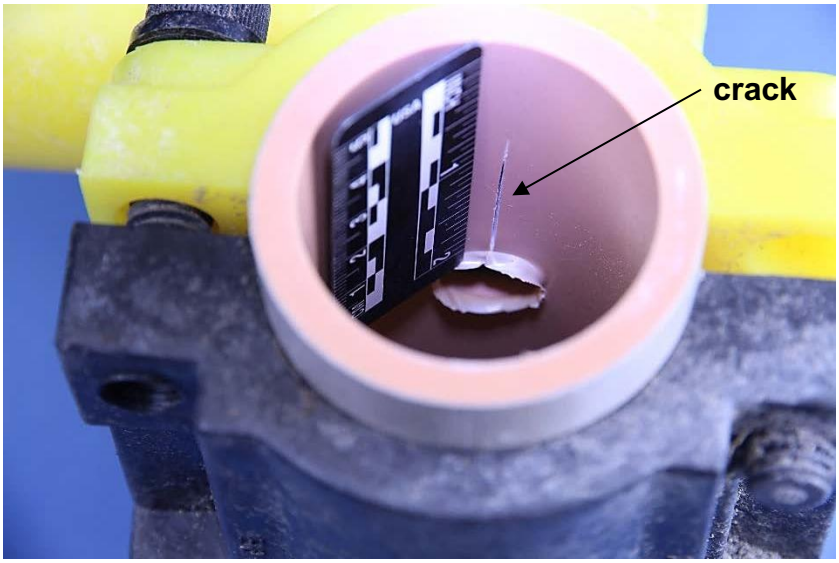


Figure 3. Another view of the inner wall of the main showing the longitudinal crack that intersected the pierced hole in the main.

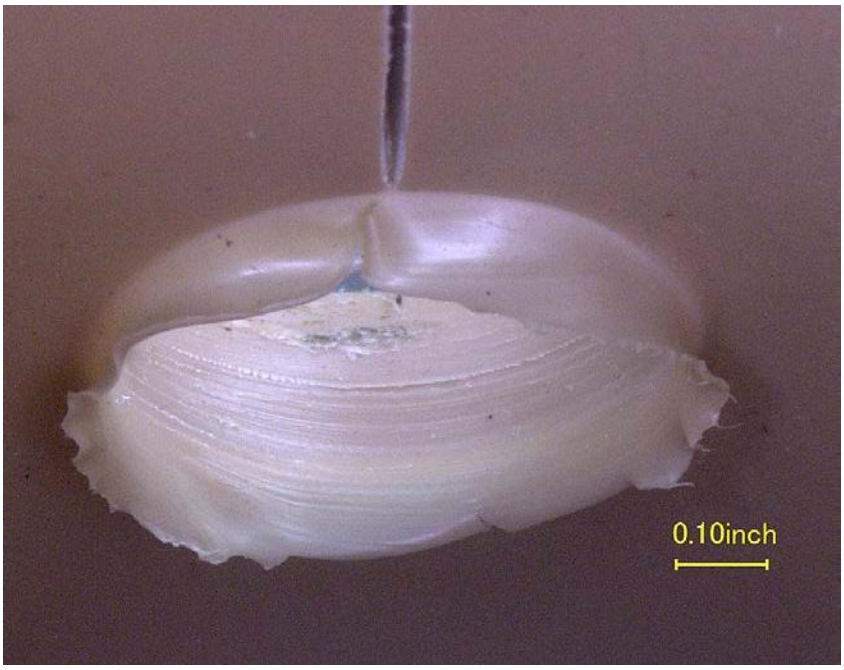


Figure 4. Photograph of the exposed inner surface of the main after disassembly of the tee showing the pierced hole made by the cutter tool. Note the fine circular cut marks within the pierced hole.

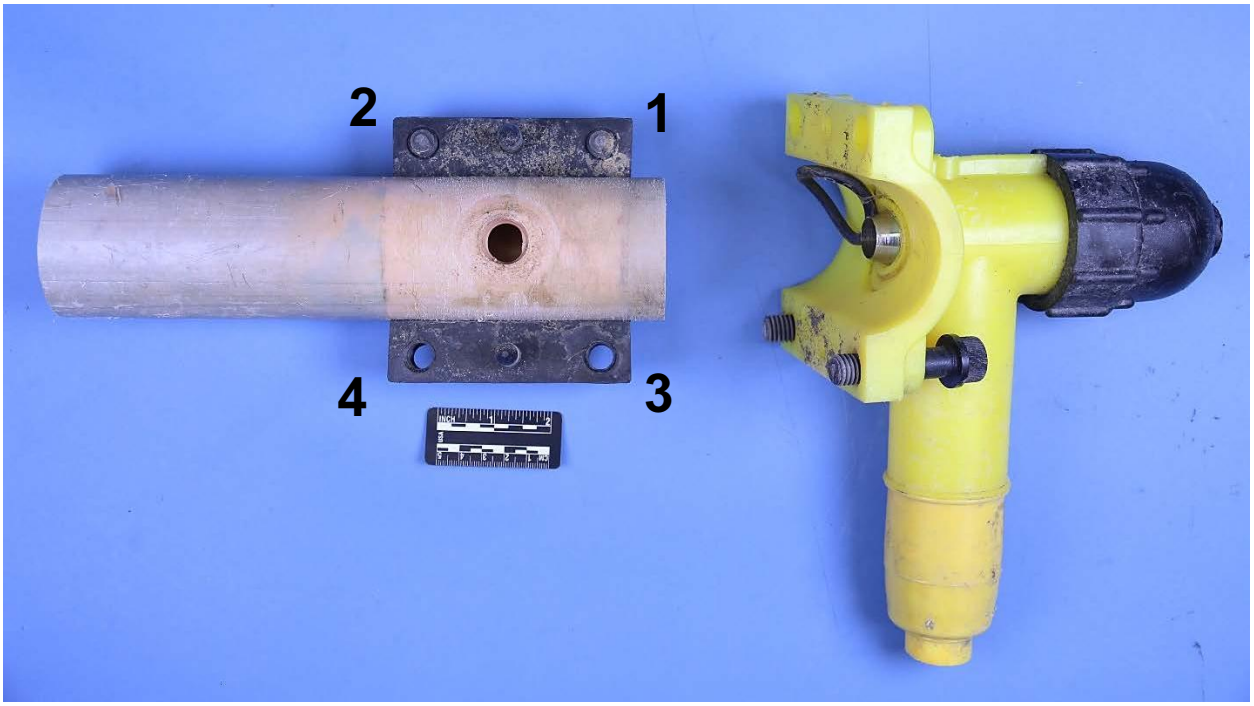


Figure 5. Photograph of the disassembled tee assembly showing the exposed outer top surface of the main and pierced hole (after removal of the tower portion). The top portion of the main contained scratches that for the most part were circumferentially oriented relative to the length of the main and intersected the pierced hole in the main.

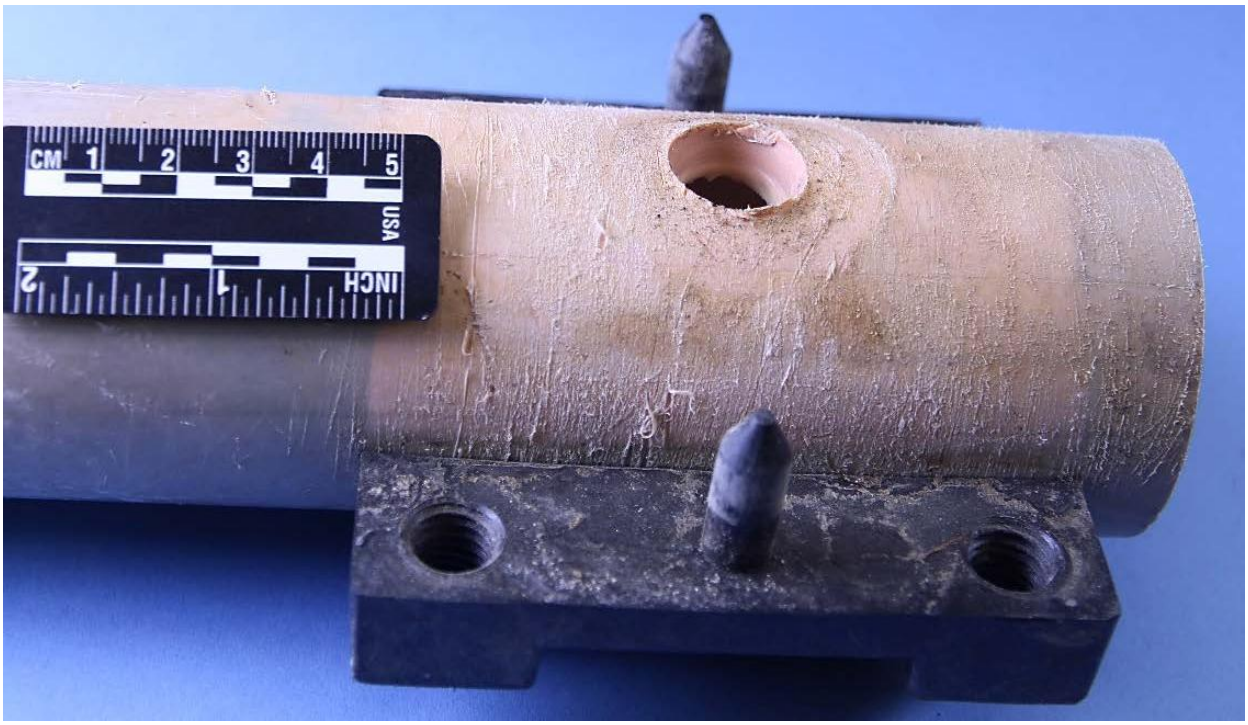


Figure 6. Photograph of the exposed outer top surface of the main after disassembly of the tower portion showing the pierced hole made by the cutter tool. The top portion of the main contained scratches that, for the most part, were circumferentially oriented relative to the length of the main and intersected the pierced hole in the main.

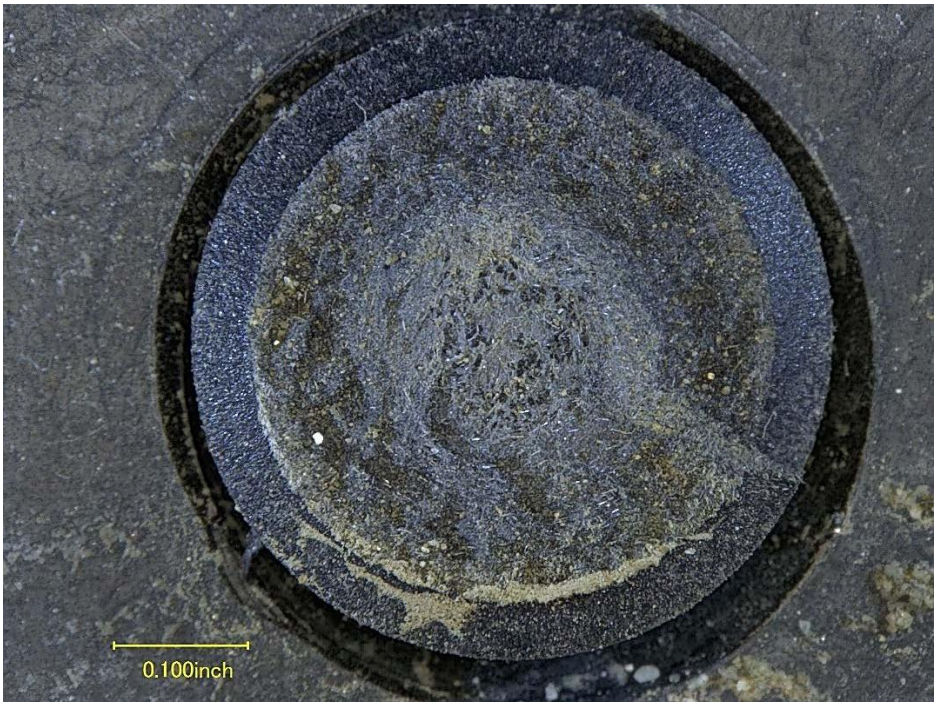


Figure 7. Fracture face of bolt “2”.

APPENDIX A

Part Number 53947 Rev. D

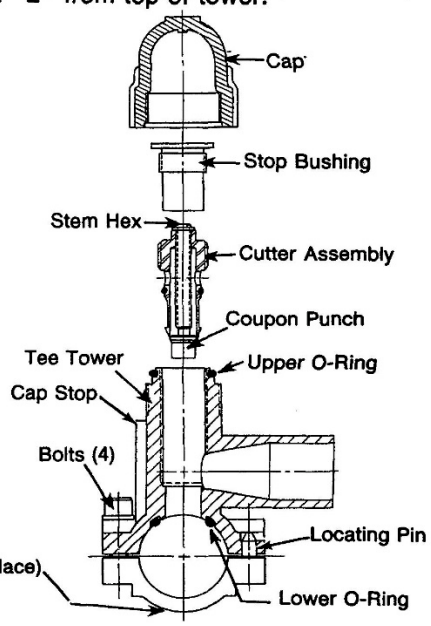
Perfection Installation Instructions

PERFECTION PERMALOCK™ TEE

U.S. PATENT #4,730,636 & #4,809,735

U.K. PATENT #2199271 & #2234693

1. Remove TEE TOWER, tee base and component kit from large bag (check tee for upper and lower O-RING).
2. Clean surface of main where tee is to be installed. Avoid areas that are gouged or damaged. LUBRICATE LOWER O-RING AND MAIN SURFACE WITH LEAK TEST SOAP SOLUTION OR SILICONE GREASE.
3. BOLT TEE ONTO PE MAIN AND TIGHTEN UNTIL THE CORNERS TOUCH USING A CROSS OVER TIGHTENING PATTERN. (A GAP BETWEEN THE FLANGES IN THE LOCATING PIN AREA IS ACCEPTABLE.)
4. Connect service to TEE TOWER outlet.
5. Test tee/service assembly in accordance with your company's standard leak test procedures.
6. Assure COUPON PUNCH is fully extended as shown in the diagram (The STEM HEX should be turned COUNTERCLOCKWISE. NOTE: This is a left handed thread).
7. Insert the CUTTER ASSEMBLY into the TEE TOWER and using a 5/8" hex socket, thread downward (clockwise) until positive stop is reached. Top of hex should be about 2" from top of tower.
8. Install STOP BUSHING; tighten firmly (by hand).
9. Thread CUTTER ASSEMBLY upward (counterclockwise) until top of CUTTER ASSEMBLY bottoms out against STOP BUSHING and turning becomes snug. Stop turning if STOP BUSHING begins to turn.
10. To gassify service, fit a 5/32" HEX wrench in the STEM HEX and turn CLOCKWISE until stop is reached (this is a left handed thread).
11. Install CAP on tower, hand tighten to CAP STOP.



NOTE: This product is designed to be installed by qualified installers. Qualification training manuals are available by writing or calling the Gas Sales Department of Perfection Corporation.

*Tee Base
(Base must be bolted in place)

Perfection Corporation
A Subsidiary of American Meter Company
222 Lake Street
Madison, Ohio 44057-3189
Fax 216-428-7325
1-800-544-6344
216-428-1171

Appendix A. Installation instructions for the Permalock® mechanical tapping tee assembly involved in the Vacaville, California incident, that has an older version of the cutter assembly and cap than the tee assembly located at the Millersville accident site, and it does not include a depth tube as part of the assembly. Courtesy of Honeywell.