Gas Development Laboratory
Failure Analysis Report

Examination of 6” IPS PE pipe and 1¼” IPS Tapping Tee
Address: 340 Elwood Ave., Hawthorne, NY

Report Number: GT-11-029

Date: 2/15/2011
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Reviewed By: Dennis Mirda

Laboratory Report – GT – 11 - 029

Gas Incident Number: GCE-1209

Service Leak Location: 340 Elwood Avenue, Hawthorne, NY

Ticket Number: WL11001354

Background:

On January 31, 2011, at approximately 1900 hrs, the GERC received a call from GDS Planner Frank Wassil stating that an ERF crew was working on a Type 1 leak at 340 Elwood Avenue. The crew had experienced blowing gas when excavating over a 6" HP PE main. At approximately 1929 hrs, GDS shut off main valves 36146 and 51587 to secure the leak. This shutdown interrupted gas service to five customers. GDS gained access to all five addresses and turned off and locked the HOS valves. ERF continued excavating and exposed a 1 ¼" PE tee that was disconnected from the 6" HP PE main. ERF then repaired this section of main and gas was back on line at 0155 hrs on 2/1/11.

The service to 340 Elwood Avenue consisted of 1¼" PE pipe, 60' in length, installed in 2008. This 1¼" PE pipe then connected to a curb valve which in turn connected to the main via a 6' length of 1" PE pipe. The service was high pressure, 60psi, and was supplied by a 6" PE main that was installed in 2010.

Sample Description:

The sample consisted of a 20" length of 6" IPS Performance pipe. Separated from the 6" pipe was a 1 ¼" IPS x 1" IPS Central Plastics Tapping Tee. Electrofused onto this tapping tee was a 1¼" x 1" EF Reducer that was connected to a 6" length of 1" IPS Performance pipe. (See Figure 1)

Lab Visual Observation:

Upon initial visual inspection, the fusion area on the 6" pipe, where the Tapping Tee connected to the main, showed obvious signs of cold fusion. The fused area on both the main and the tapping tee was very smooth and showed signs of poor adhesion between the two components. (See Figures 2-3) It is likely that during the fusion process, excessive pressure was applied to the tapping tee, thereby not allowing the two materials to form the proper molecular bonding between the 2 heated surfaces. In addition, only two melt beads were observed partially along the edge of the fused area on the pipe. It is typical of a sound fuse to have three melt beads present at the edge of the entire fusion area. (See Figures 4-5) In addition, upon further inspection of the 6" pipe, no scraping patterns were observed around the fusion area. (See Figure 6) In order to ensure a good fuse, the fusion area must be properly prepared to remove the oxide layer on the surface of the pipe to promote good adhesion. This preparation involves scraping the pipe where the fusion will take place. The absence of scrape marks around the fusion area further reveals the quality of the installed fuse.

The 1¼" x 1" EF Reducer along with the 6" length of 1" pipe was also inspected for any irregularities. Upon inspection, the EF Reducer and the 1" pipe were not installed perpendicular to the tapping tee. They were positioned downward and appeared to have been misaligned during installation. (See Figure 7) It is imperative that these components are properly aligned during the electrofusion process to ensure successful fusion of the plastic. Furthermore, the 1¼" outlet of the tapping tee showed signs of rotational scraping that appeared to have been done properly. The scraping on the 1" pipe, however, was not performed uniformly and sections of unscraped

pipe were present in the fused area. (See Figure 8) This inadequate scraping further reveals the poor craftsmanship involved in the installation of this tapping tee.

In addition, the cap on the 1 ¼" IPS x 1" IPS Central Plastics Tapping Tee was damaged on the caps outer edge. A ½" section of material was observed to be cut from the cap. (See Figure 9) This damage was only present on the outside surface of the cap and was not the source of a leakage. This damage may have been caused by the pickup digger during the excavation of the tee. If the pickup digger did hit the tee during excavation, this force on the tee would explain why the tee dislodged from the main. With the tee insufficiently fused onto the main, any slight force would have knocked the tee from the main. However, according to the Field Supervisor, 90% gas readings were found when bar holing for the leak. When the leak was pinpointed, leak detector was sprayed inside the bar hole and the solution began to bubble immediately. This substantial leak would suggest that the tee was almost completely removed from the main prior to any excavation.

Lab Testing:

In order to determine whether the EF reducer experienced any leakage during its service life, the sample was subjected to a pressure test. Parker brass fittings were first installed on the 1" PE pipe and a ½" steel plug was inserted into the opening on the base of the tapping tee. A pressure of 90psi was then gradually applied to the sample and leak detector solution was applied to the sample to identify any leakage. After approximately 15min of testing, no leak locations were identified. Despite the bent pipe and reducer, and the poorly scraped 1" pipe, the sample did not experience any leakage.

Conclusion:

The lab has determined that the probable cause for the leakage of the sample was the cold fuse present between the 6" PE main and the Central Plastics Tapping Tee. The Lab did not witness the occurrence of the leak in the field, and therefore cannot definitively state where the leakage originated. However, due to the installation of the Tapping Tee occurring within the prior year and the observation of the cold fuse present on the sample, it is likely that the leak originated at the cold fuse. This cold fuse was the result of poor preparation and poor installation of the tapping tee onto the main. The fusion area on both components did not appear to be scraped and showed little sign of adhesion. Additionally, only two melt beads were present at the edge of the fusion area instead of the correct three beads, and no scraping was observed on the 6" pipe around the fusion area. Further signs of poor workmanship were noted on the EF Reducer and 1" pipe attached to the tapping tee. Both components were positioned at a downward angle suggesting that they were misaligned during installation. Also, the portion of 1" pipe that had been inserted into the EF Reducer was not sufficiently scraped during installation. All of these findings suggest that the necessary steps were not taken during the installation of the subject components.

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Figure 1 –Overall picture of sample

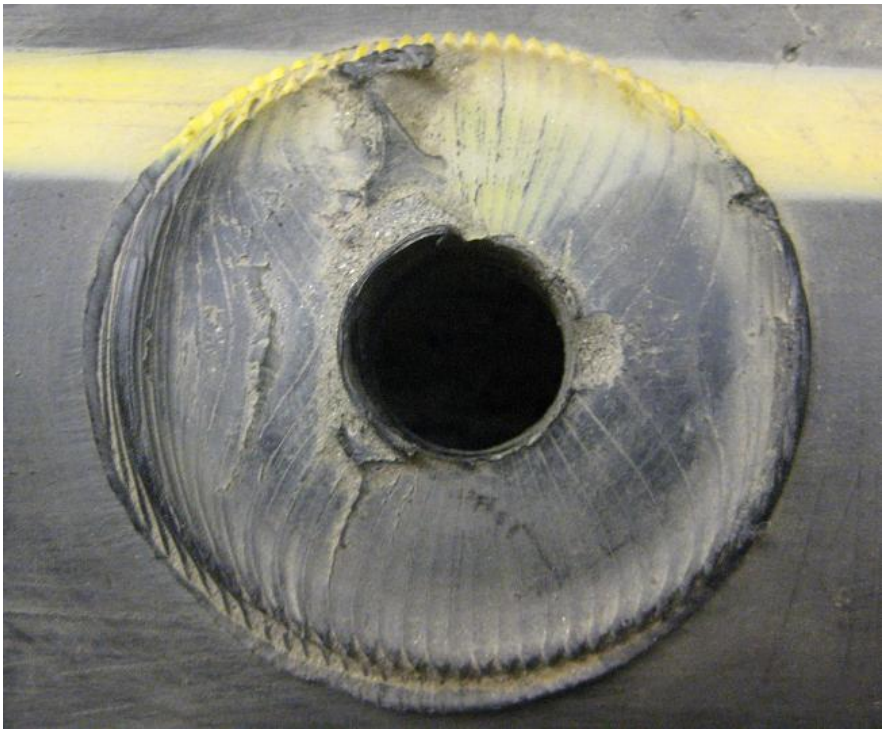

Figure 2 – Picture of fusion area on 6” PE main

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Figure 3 – Picture of fusion area on Tapping Tee

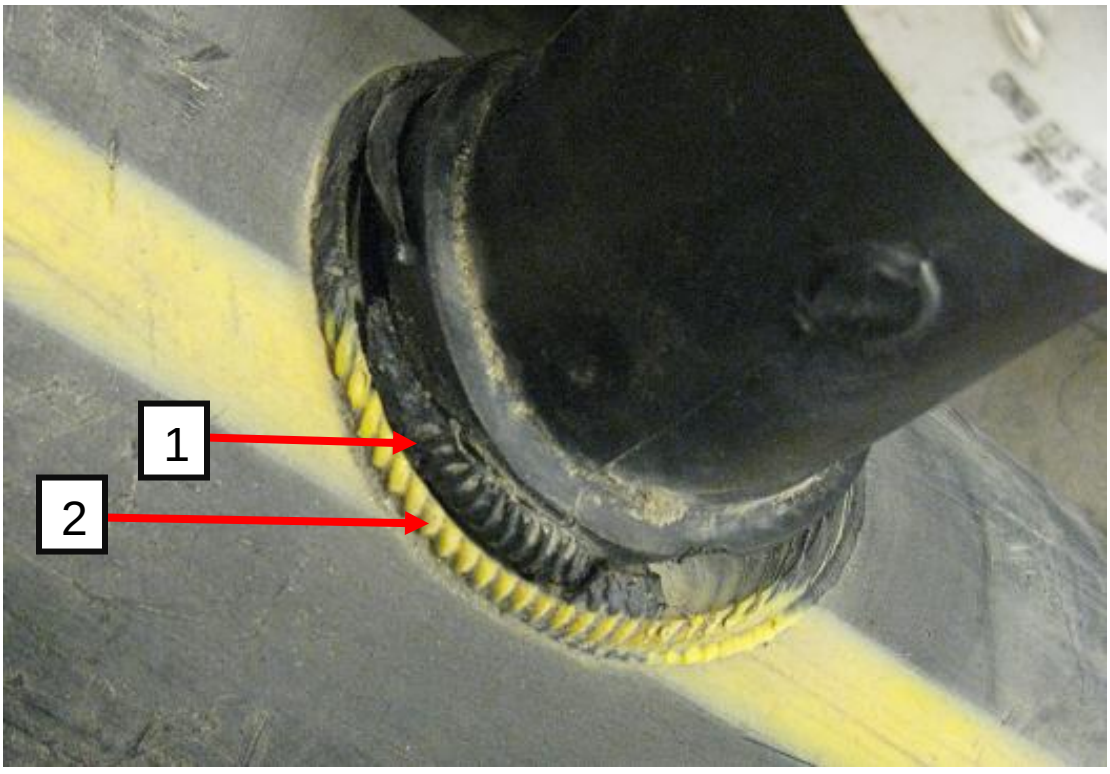

Figure 4 – Picture of two bead melt pattern on subject sample

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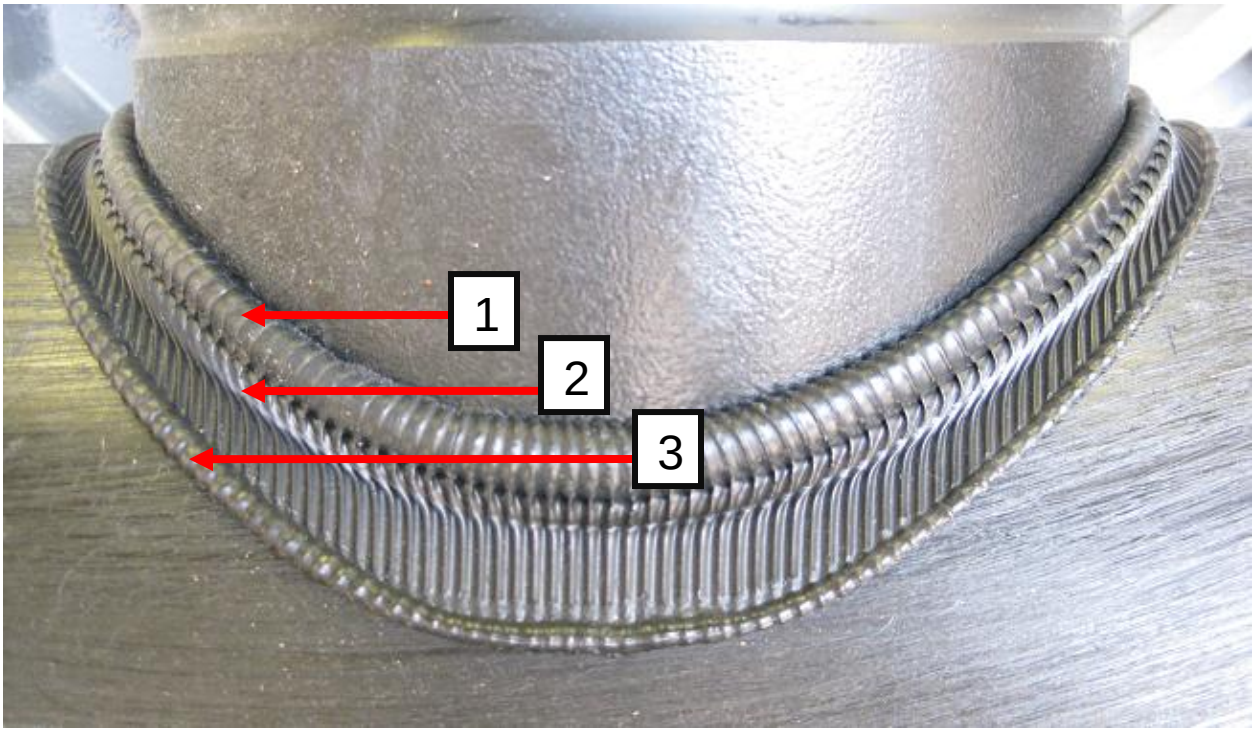

Figure 5 – Picture of correct three bead melt pattern
(Fuse performed by Development Lab)

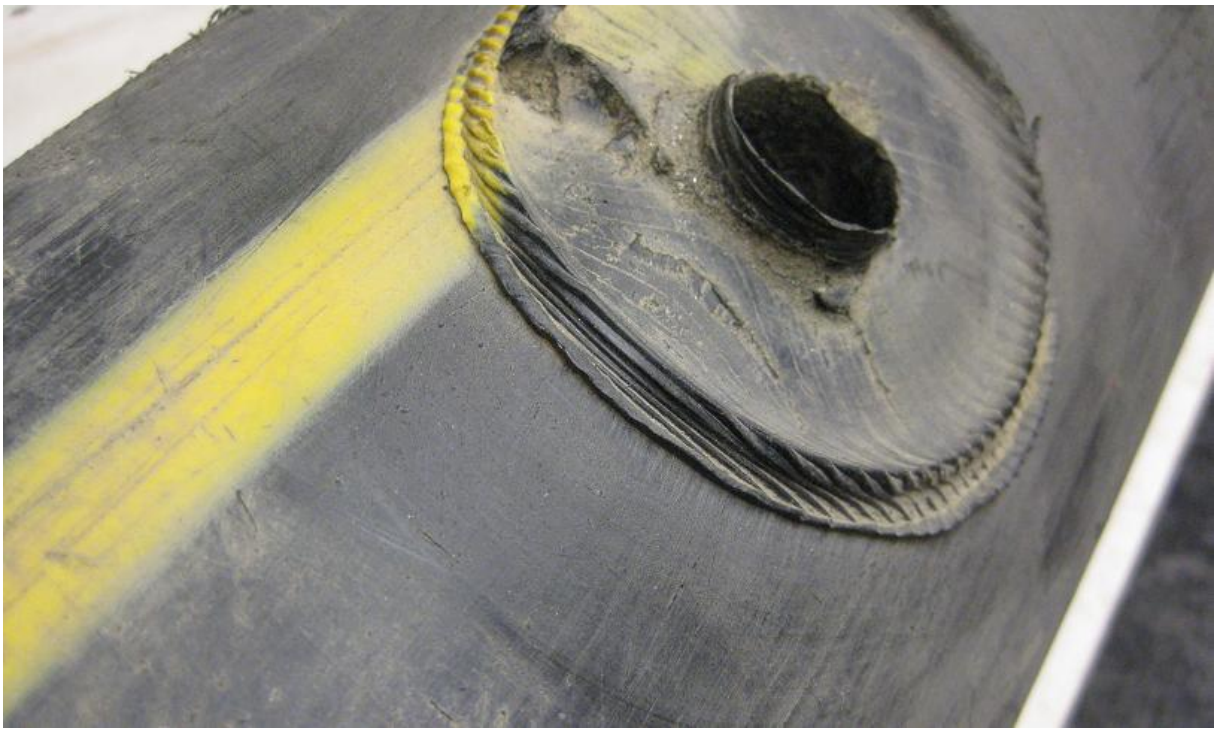

Figure 6 – Picture of pipe surrounding fusion area with no signs of scraping

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Figure 7 –Picture of misaligned pipe and reducer on tapping tee

Figure 8 –Picture of insufficiently scraped 1” PE pipe

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Figure 9 –Picture of damaged cap on Tee