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

April 4, 2019

MATERIALS LABORATORY FACTUAL REPORT Report No. 19-022

A. ACCIDENT INFORMATION

Place	:	Firestone, Colorado
Date	:	April 17, 2017
Vehicle	:	Pipeline
NTSB No.	:	DCA17FP005
Investigator	:	Chuck Koval (RPH-20)

B. COMPONENTS EXAMINED

Three pieces of pipe (two each 2-inch steel pipe and one each 1-inch black plastic pipe piece), One 12-inch hacksaw blade and two metal plugs (not examined).

C. DETAILS OF THE EXAMINATION

Three pieces of pipe are show in figure 1 in various stages of unwrap. Both 2-inch steel pipe pieces were packed solid with a soil-clay material from one end of the pipe to the other. The focus of this examination is the black plastic 1-inch pipe piece shown in the bottom of each of the images in figure 1. All pipe pieces in figure 1 are arranged so the basement foundation ends are toward the left and the cut-at-site ends are toward the right. Figure 2 is of the cut-at-site end of the 1-inch black plastic pipe showing deep groves along with tear and cut-off burrs. Presence of the groves and burrs are consistent with using a hacksaw, a reciprocating saw, or some other power blade tool to cut this side of pipe.

Figure 3 shows the basement foundation cut-end of the 1-inch black plastic pipe comparing the cut surface prior to and after cleaning with a non-ionic detergent and water solution. Figures 4 and 5 are representative closer views showing the cut surface of the basement foundation cut-end plastic pipe piece. In figure 3b, the cut surface shows tear and cut-off burrs on one side of the pipe located partially around the inside diameter while on the opposite side, the burrs are on the outside diameter. Much of the cut surface is relatively smooth and without deep grooves or gouges. The smooth cut surface is consistent with being cut using a blade-like plastic pipe cutting tool, either a manual type or ratcheting action type. It appears from the shallow grooves (figure 4 top) and tears (figure 5 bottom) that the tool did not cut through the pipe on its first attempt. The images in figure 6 are oblique side views of the cut basement end of the black plastic pipe piece.

A small piece of the black plastic pipe was removed and examined using a Fourier Transform Infrared (FTIR) spectrometer with a diamond attenuated total reflectance (ATR) accessory in accordance to ASTM E1252-98 (American Society for Testing

Materials E1252-98: *Standard Practice for General Techniques for Obtaining Infrared Spectra for Qualitative Analysis and American Society for Testing Materials*). The spectrometer was used to collect and process infrared wavelength absorbance spectra of the unknown material.

The sample spectrum contained the following combination of spectral peaks corresponding to functional groups found within molecular structure. The presence of a strong doublet peak between ~2900 $cm^{-1}$and ~2850 cm^{-1} is indicative of a carbon-hydrogen (C-H) single stretching bond. The presence of a single peak ~1470 cm^{-1} is indicative of a carbon-hydrogen$_2$ (C-H_2) bending bond. The presence of a single peak ~700cm^{-1} is indicative of multiple carbon-hydrogen$_2$ (C-H_2) bending bonds. A spectral library search was performed on the pipe material spectrum. The search found that the sample was a very strong match to polyethylene (PE).

A distinct but faint mercaptan-like odor was noted from the inside of the 1-inch black plastic pipe piece.

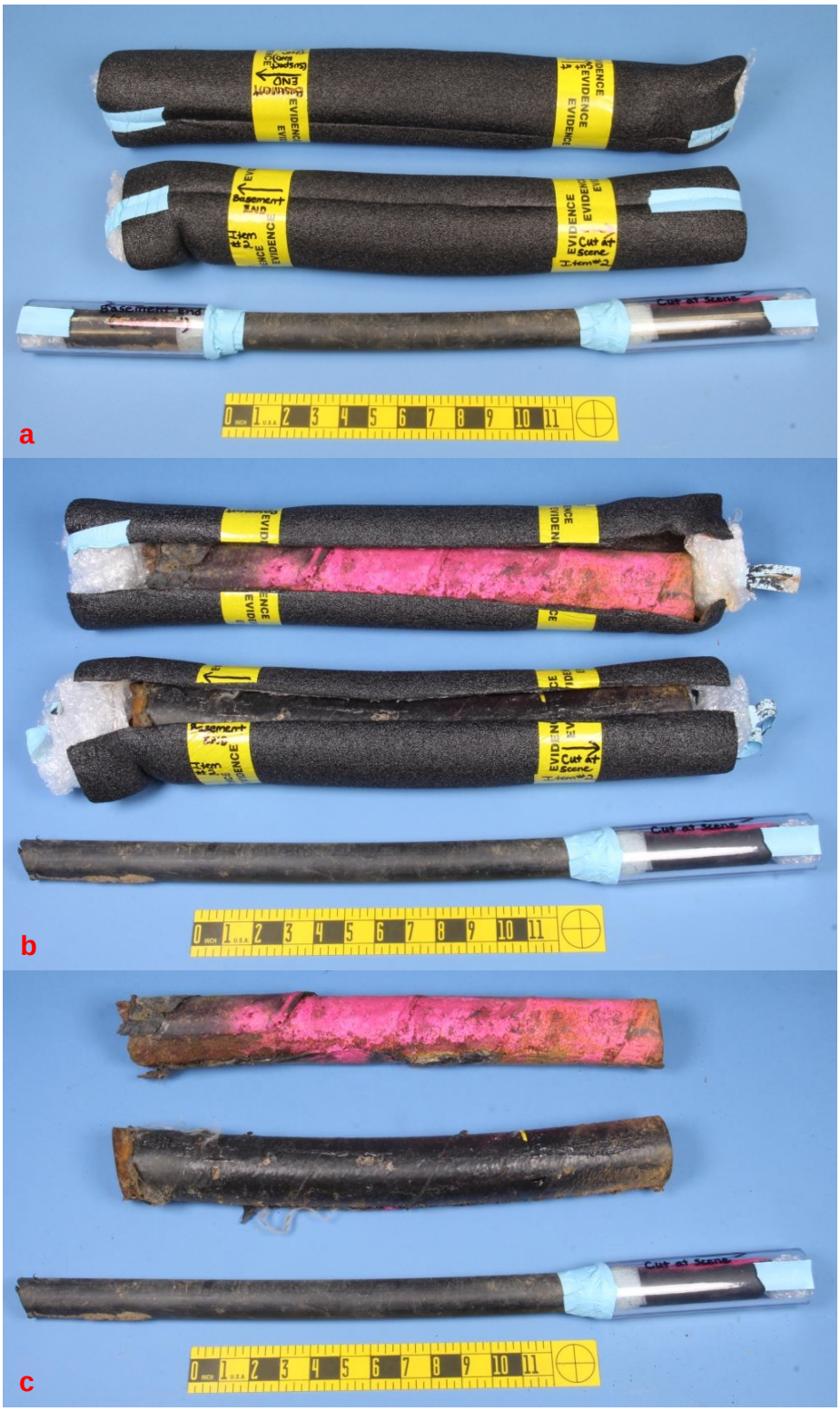

Figure 1) As-received photos of the three pipes in various stages of enwrapment. The 1-inch black plastic pipe piece is at the bottom of each image. The cut-ends-of-interest (Basement End) are all positioned facing left.

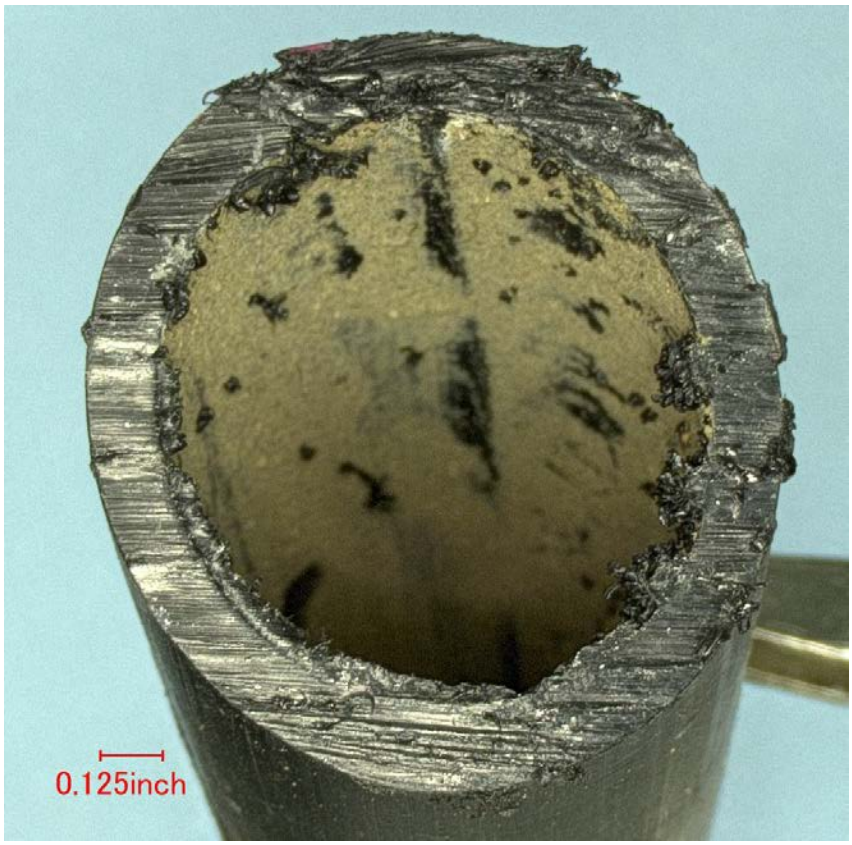

Figure 2) Image of cut-at-site end of the 1-inch black plastic pipe piece.

Figure 3) Basement foundation cut-end (region-of-interest). View (a) is before cleaning. View (b) is after cleaning.

Figure 4) Closer view (20X) of the cut surface showing the top area in figure 3b.

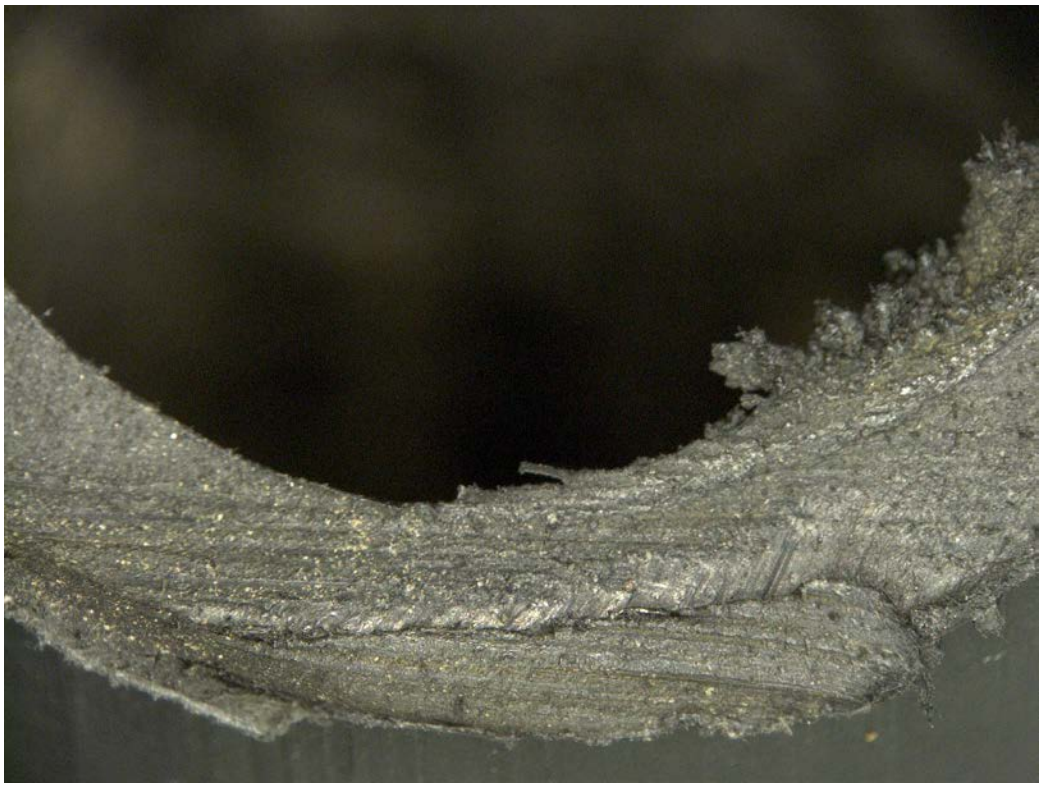

Figure 5) Closer view (20X) of the cut surface showing the bottom area figure 3b.

Figure 6) Oblique side views of the cut basement end of the black plastic pipe piece.

Edward J. Komarnicki
Engineering Technician