NATIONAL TRANSPORTATION SAFETY BOARD

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

February 13, 2017

MATERIALS LABORATORY FACTUAL REPORT Report No. 16-098

A. ACCIDENT INFORMATION

Place	:	Silver Spring, Maryland
Date	:	August 10, 2016
Vehicle	:	Washington Gas service pipe and gas regulators
NTSB No.	:	DCA16FP003
Investigator	:	Ravi Chhatre

B. COMPONENTS EXAMINED

The following gas regulators were examined:

(1) Two Reynolds mercury-containing gas pressure regulator assemblies from the residence of 8642 Piney Branch Road (referred in this report as exemplar assemblies #1 and #2).

(2) One Reynolds mercury-containing gas pressure regulator assembly from the residence of 8674 Piney Branch Road (referred in this report as exemplar assembly #3).

(3) One Schlumberger model B-39 (non-mercury) gas regulator assembly from the residence of 8674 Piney Branch Road (referred in this report as exemplar assembly #4).

C. DETAILS OF THE EXAMINATION

1.0 Materials Laboratory Group

The following individuals participated in the examination of the exemplar regulator assemblies on November 1, 2016 at the Safety Board's Materials Laboratory in Washington, D.C.:

Frank Zakar	Group Chairman	NTSB
Edward Komarnicki	Member	NTSB
Douglas Staebler	Member	Washington Gas
Lt. William Olin	Member	Montgomery County Fire Rescue Services

2.0 Examination

Figure 1 shows a photograph of four exemplar gas regulator assemblies. The four exemplar gas regulator assemblies were disassembled to determine the condition of the internal pieces. Refer to NTSB Materials Laboratory Factual Report No. 16-097 for nomenclature used to describe the different parts of the gas regulator assembly. For each assembly, the 2-inch dimeter port was removed, followed by removal of the spring, top cover, diaphragm plate and then the diaphragm.

2.1 Reynolds Gas Regulator Assemblies

Examination of each disassembled exemplar gas regulator assembly revealed the orifice and disc valves, spring, diaphragm plate, and flexible diaphragm portion were intact and showed no evidence of a crack or corrosion. The internal walls and pieces inside the assemblies #1 and #2 were covered with an oil-like material and those from assembly #3 were covered with less oil-like material than those in assemblies #1 and #2. The internal walls and pieces inside assembly #4 were dry. The top face of the flexible diaphragm from exemplar assemblies #1 through #3 was black and the bottom face exhibited a light brown texture that were consistent with leather, whereas, both faces of the flexible diaphragm from exemplar assembly #4 was black and smooth consistent with an elastomer material. The pusher post portion for each assembly was manually moved by hand in the up and down direction, and there was no evidence of resistance during motion of the stem, toggle links, and disc portions.

Figure 2 shows a photograph of the orifice and valve mechanism when viewed through the 2-inch diameter port of a Reynolds gas regulator assembly. The disc portion was disassembled from each gas regulator assembly. The disc portion of a Reynolds gas regulator assembly is an assembly that consists of several parts. Figures 3 and 4 show photographs of disassembled disc assemblies from Reynolds gas regulator assemblies #1 through #3. The disc assembly contains a flat metal base portion. An elastomer liner is installed on the flat base portion that faces the orifice. A round metal sheet portion with a hole at the center is installed over the elastomer liner. The hole in the center of the round metal sheet exposes the elastomer portion to the orifice. The diameter of the hole at the center of the round metal sheet is larger compared to the diameter of the orifice, so that during operation of the gas regulator the orifice will contact only the elastomer portion. The round metal sheet is attached to the flat metal base portion by two screws. A small diameter rod extends from the back side of the flat base portion of the disc assembly, and this small diameter rod portion contains a slot for a cotter pin.

The stem portion of the gas regulator assembly is square in cross section. The end of the stem contains a hole that is oriented parallel to the longitudinal axis of the stem and, in turn, the hole in the stem accommodates the smaller rod portion of the disc assembly. When in the fully assembled condition, the rod end portion of the disc assembly is inserted into the end of the stem. A cotter pin is inserted into a small hole at the end of the stem and, in turn, this cotter pin will have intersected a cotter pin slot at

the end of the rod portion of the disc assembly. The cotter pin prevents the disc assembly from slipping out of the stem. The disc assembly can be released from the stem by removing the cotter pin.

Examination of the disc assembly from Reynolds gas regulator assemblies #1 through #3 revealed the elastomer portion contained a round impression mark consistent with the size of the corresponding orifice for that gas regulator assembly. The area within the impression mark for the elastomer portion of assembly #1 contained evidence of metal particles (see figure 3) and the entire face of the disc assembly was covered with oil-like material. The area within the impression mark for the elastomer portion of assemblies #2 and #3 showed evidence of barely visible particles, and only a portion of disc assembly face from assemblies #2 and #3 was covered black oil-like material, compared with the face from assembly #1 (see figure 4).

2.1 Schlumberger Gas Regulator Assembly

Schlumberger gas regulator assembly #4 contained a one-piece disc that was made from an elastomer. The elastomer disc from assembly #4 can easily be popped/pulled out of the stem portion. The disc portion was pulled out of the gas regulator assembly. Visual examination of the disc revealed the flat face also contained a round impression mark consistent with the size of the corresponding orifice. The entire face of the orifice was dry and contained no evidence of particles (see figure 5).

Frank Zakar
Senior Metallurgist

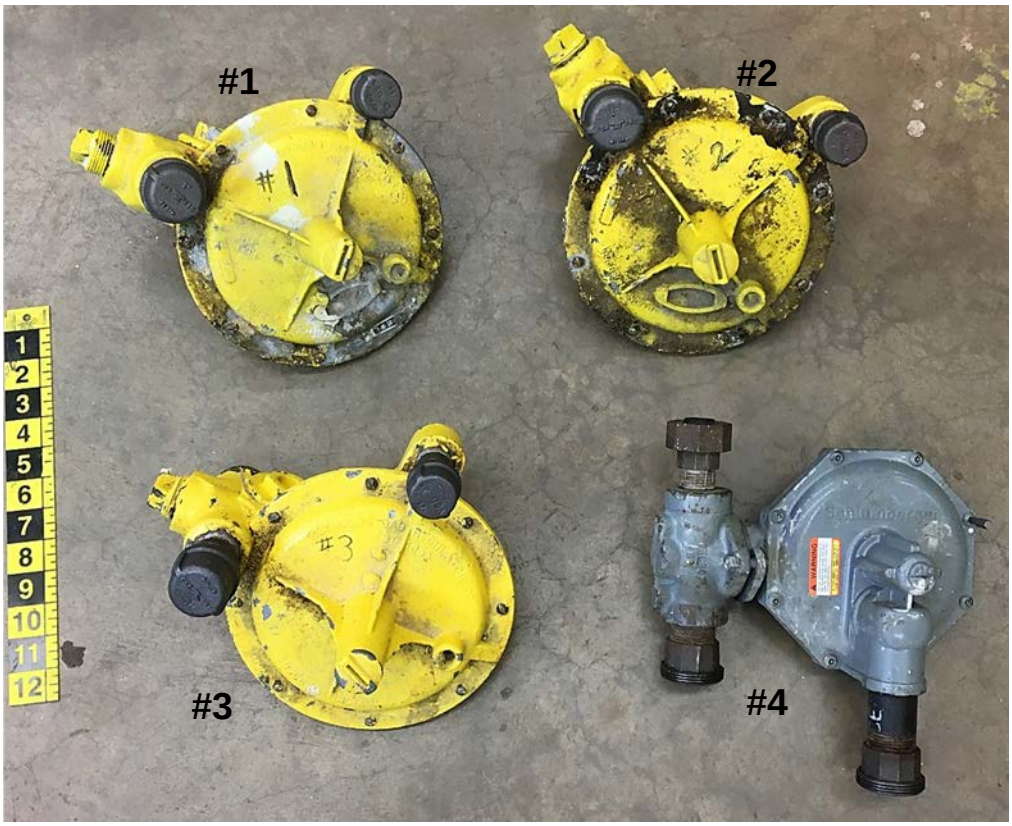

Figure 1. As-received exemplar gas regulator assemblies #1 through #4.

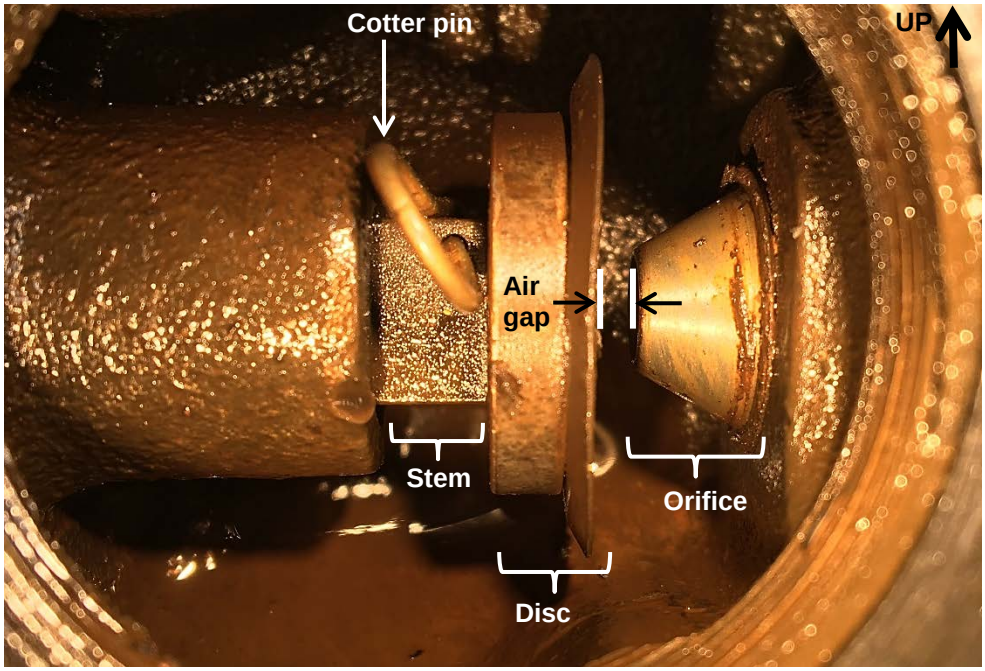

Figure 2. Orifice and disc valves when viewed through the 2-inch diameter port from exemplar gas regulator assembly #3.

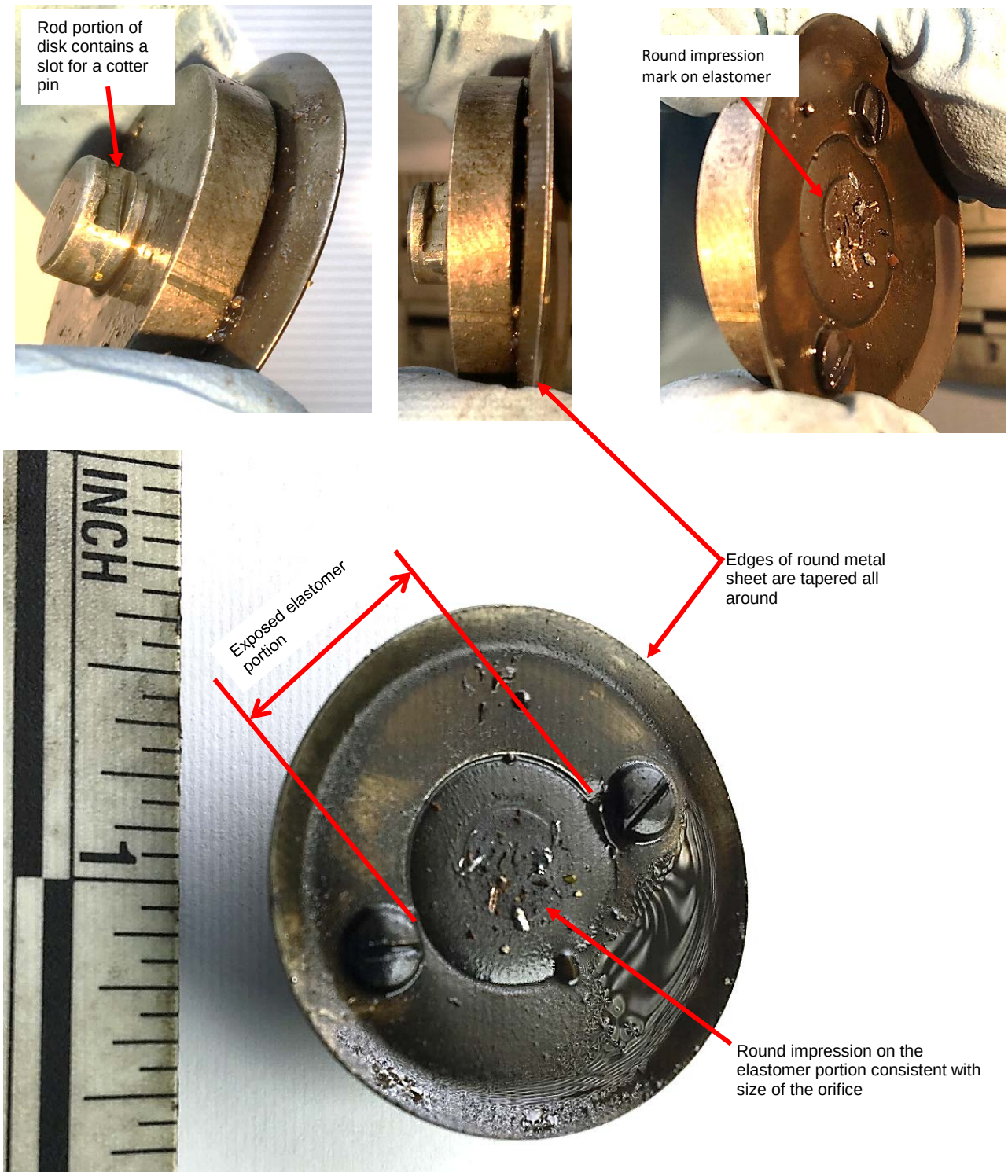

Figure 3. Various views of the disassembled disc from gas regulator assembly #1.

Figure 4. Photograph of discs from gas regulator assemblies #2 and #3, respectively.

Figure 5. Various views of the disassembled one-piece disc from gas regulator assembly #4. As can be seen in this photograph, the construction of the Schlumberger gas regulator assembly is different compared to that of the Reynold gas regular assembly.