

## Appendix W – Conveyor Belt Flame Resistance Testing

### Conveyor belt flame resistance testing

All conveyor belt materials used in underground coal mines are required to have flame-resistant qualities meeting those established by the Secretary (30 CFR § 75.1108). The flame resistance test determining this requirement is described in 30 CFR § 18.65, which is based upon the former US Bureau of Mines Schedule 2G test protocol.

The 2G test is a small scale piloted-ignition test conducted in a special enclosure. It utilizes ½-inch by 6-inch test strips of the belt material. Tested one at a time, each strip is directly exposed to a three-inch-high pilot flame from a natural gas fueled Pittsburgh-Universal Bunsen burner in quiescent air conditions. At the end of one minute, the flame is withdrawn and the air velocity is immediately increased to 300 feet per minute by a small fan. After the burner flame is removed, the duration of any continued flaming is timed and noted. Starting at the termination of any continued flaming, the sample is observed for at least an additional three minutes for any after glow. The duration of any such after glow is also timed and noted. If during this three minute period additional flaming occurs, the duration of the additional flaming is added to the previous duration of flaming recorded. If the average total flaming time of the four samples exceeds one minute, or if the average total after glow time exceeds three minutes, then the sample fails to meet the requirements for testing. Additional details of the test procedure can be found in the referenced regulation.

Two belt samples were obtained during the initial mine fire investigation. One belt sample had been taken from the 72-inch wide No. 7 belt, and the second sample from the 60-inch wide longwall belt. The longwall belt sample was recovered in by the belt storage unit. Both samples were recovered adjacent to the fire area but far enough away from the fire that the samples had no visible signs of fire or heat damage. Both samples were stored at the MSHA Approval and Certification Center (A&CC) in a secure evidence cage. Neither belt sample carried a manufacturer's marking; however, the name of the belt manufacturer was found embossed on belt material farther away from where the samples were taken. These markings were significantly worn and barely discernable.

On June 13, 2006, the two belt samples were given visual examinations and flammability tests in the first floor Quality Assurance laboratory in Building One of the A&CC. The visual examination was conducted by MSHA personnel including investigation team member Derrick Tjernlund, William Francart, and Kenneth Murray. Harry Verakis, a physical scientist with MSHA's Technical Support group, along with inspector John Kinder from the West Virginia Office of Miners Health and Safety Training, also witnessed and participated in the visual examination and testing.

Michael Hockenberry, a fire protection engineer with the Mechanical and Engineering Safety Division of the A&CC, provided assistance in moving the samples and conducting photography work. Dave Creamer, chemist with the Quality and

## Appendix W – Conveyor Belt Flame Resistance Testing

Assurance Division of the A&CC, cut the test strips and conducted the 2G flame-resistance tests. The visual examinations and 2G tests were also video taped.

### 72-inch wide No. 7 belt sample

The visual examination of the 72-inch belt sample revealed that it was of a two-ply construction with a fabric skeleton and molded edges. The approximate dimensions of the sample were 72 inches wide by 33 inches long on one side, and 39 inches long on the opposite side. Thickness measurements at six different locations yielded values ranging from 0.725 to 0.745 inches. The belt did not indicate excessive surface wear, nor did it have any signs of charring or heat. No unusual odors, colors, or coatings were found.

The surface did show some signs of rub marks, possibly due to the recovery effort when the sample was pulled along the mine floor several breaks to a mantrip used for transport from the mine. Additionally, a cut was found parallel to each edge of the belt, approximately 1-1/8 to 1-1/2 inches in from the edges. These cuts ran the length of the belt sample but did not go through the belt. A shallower cut was also seen approximately in the middle of the sample running parallel to the side edges. This cut extended into the first layer of fabric with some cords showing.

After the visual examination, four 1/2-inch by 6-inch test strips for 2G testing were cut from the sample, two parallel to the edges and two perpendicular to the edges, as required by the test procedure.

The results of the 2G test indicated the recovered belt sample passed the criteria established for this test. The longest continued flaming after burner removal was seven (7) seconds with no strips experiencing after glow.

### 60-inch wide longwall belt sample

The visual examination of the 60-inch belt sample revealed that it was a four-ply construction with a fabric skeleton. The approximate dimensions of the sample were 60 inches wide by 24 inches long on one side, and 28 inches long on the opposite side. Thickness measurements at six different locations yielded values ranging from 0.837 to 0.855 inches. The belt did not indicate any unusual surface wear, nor did it have any signs of charring or heat. No unusual odors, colors, or coatings were found.

The surface showed signs of rub marks and several small gouges, possibly due to the recovery effort when the sample was pulled along the mine floor approximately 750 feet to a mantrip used for transport from the mine. A deep cut extending the length of the sample was found parallel to one edge of the belt approximately 7/8 inches in from the edge. This cut extended into multiple plies of the belt, in some areas almost penetrating the total thickness. Strings of the fabric skeleton were visible and

## Appendix W – Conveyor Belt Flame Resistance Testing

protruding from the cut. Based upon the frayed and ragged state of these skeleton cords, the condition appears to have existed from some time.

After the visual examination, four 1/2-inch by 6-inch test strips for 2G testing were cut from the sample, two parallel to the edges and two perpendicular to the edges, as required by the test procedure.

The results of the 2G test indicated the recovered belt sample passed the criteria established for this test. The longest continued flaming after burner removal was two (2) seconds with no strips experiencing after glow.

Information provided by Aracoma Coal Company indicated twelve (12), 1000 -foot long rolls of conveyor belt were purchased for the longwall and shipped to the mine in April of 2005. The belt manufacturer's information described the belt as a 60-inch wide, 4 ply, 1800 PIW, MSHA approved belt with molded edges.

Neither belt sample described above carried a manufacturer's marking.