APPENDIX U-2

EXECUTIVE SUMMARY OF INVESTIGATION OF LONGWALL LIGHTING SYSTEM COMPONENTS

U.S. Department of Labor

Mine Safety and Health Administration
Approval and Certification Center
765 Technology Drive
Triadelphia, West Virginia 26059

November 18, 2011

MEMORANDUM FOR NORMAN G. PAGE
Accident Investigation Team Leader

FROM: JOHN P. FAINI
Chief, Approval and Certification Center

SUBJECT: Executive Summary of Investigation of Longwall Lighting System Components Recovered from Performance Coal Company's Upper Big Branch – South Mine

The Approval and Certification Center (A&CC), as requested by the Upper Big Branch Mine Accident Investigation Team Leader, Norman Page, conducted a laboratory investigation on the longwall lighting system components recovered from the April 5, 2010 mine explosion at the Upper Big Branch Mine-South.

The components received were:

Six KH Controls Model ISS1 – 13.0 – 8.10, IA-13827-0 Power Supplies.

- Exhibit No. PE-0246-a*, S/N 1034, recovered from shield 173 (written on the front of the supply).
- Exhibit No. PE-0246-b*, S/N 1832, recovered from shield 173 (written on the front of the supply).
- Exhibit No. PE-0247-a**, S/N 2536, recovered from shield 163 (written on the front of the supply).
- Exhibit No. PE-0247-b**, S/N 995, recovered from shield 163 (written on the front of the supply).
- Exhibit No. PE-0248-a***, S/N 2185, recovered from shield 3 (written on the back of the supply).
- Exhibit No. PE-0248-b***, S/N 1295, recovered from shield 3 (written on the back of the supply).

**A case with Exhibit No. PE-0246 was received and contained two power supplies. These two power supplies were assigned the newly generated Exhibit Nos. PE-0246-a and PE-0246-b when the case was opened.*

***A case with Exhibit No. PE-0247 was received and contained two power supplies. These two power supplies were assigned the newly generated Exhibit Nos. PE-0247-a and PE-0247-b when the case was opened.*

**** A case with Exhibit No. PE-0248 was received and contained two power supplies. These two power supplies were assigned the newly generated Exhibit Nos. PE-0248-a and PE-0248-b when the case was opened.*

Thirteen KH Controls Model LX1 Luminaire, IA-16453-0, X/P-4036-0.

- Exhibit No. PE-0254-a*, S/N 10774, recovered from shield 167.
- Exhibit No. PE-0254-b*, S/N unknown (missing approval plate), recovered from shield 124.
- Exhibit No. PE-0258-a**, S/N 12483, recovered from the area of shield 62.
- Exhibit No. PE-0258-b**, S/N 7791, recovered from the area of shield 66.
- Exhibit No. PE-0258-c**, S/N 6712, recovered from the area of shield 89.
- Exhibit No. PE-0258-d**, S/N 7353, recovered from the area of shield 173.
- Exhibit No. PE-0258-e**, S/N 12535, recovered from the area of shield 64.
- Exhibit No. PE-0258-f**, S/N 10437, recovered from the area of shield 139.
- Exhibit No. PE-0474, S/N unknown (missing approval plate), recovered from the area of Survey Spad 22567.
- Exhibit No. PE-0475, S/N unknown (missing approval plate), recovered from the area of the cross cut adjacent to Survey Spad 22567.
- Exhibit No. PE-0476, S/N unknown (missing approval plate), recovered from the area of the tailgate entry at the shearer.
- Exhibit No. PE-0477, S/N unknown (missing approval plate), recovered from the area of Shield 175.
- Exhibit No. PE-0478, S/N unknown (missing approval plate), recovered from the area of Shield 172.

The recovered from location information was obtained from the shield number written on the light, and/or the evidence tag.

**A cardboard box with Exhibit No. PE-0254 was received and contained two KH Controls Model LX1 Luminaire exhibits. These two exhibits were assigned the newly generated Exhibit Nos. PE-0254-a, and PE-0254-b when the box was opened.*

***A cardboard box with Exhibit No. PE-0258 was received and contained six KH Controls Model LX1 Luminaire exhibits. These six exhibits were assigned the newly generated Exhibit Nos. PE-0258-a, PE-0258-b, PE-0258-c, PE-0258-d, PE-0258-e, and PE-0258-f when the box was opened.*

IS Lighting Cable with connectors.

- Exhibit No. PE-0324, 91 feet of 14AWG, 3/C SOW, recovered from shield 143 to shield 152.

The investigation began with a preliminary inspection of all the evidence received. The preliminary inspection included documenting visual observations and photographing the

as-received conditions of the components. This inspection was conducted between October 13 and October 14, 2010.

The second phase of the investigation was conducting the electrical and functional tests, including measuring the electrical characteristics of the power supplies, luminaires cable, and energizing the lighting ballasts. These tests were conducted between October 27, 2010 and November 1, 2010.

The third phase involved a detailed inspection of the evidence. The detailed inspection involved disassembling the evidence to investigate any signs of arcing, sparking, damage, or electrical heating. These inspections were conducted between October 29, 2010 and November 18, 2010.

The fourth and final phase involved a comparison of the evidence to approval drawings. This was intended to discover any discrepancies between the evidence and the MSHA approved drawings. These comparisons were conducted between November 3, 2010 and November 19, 2010.

Evidence with Exhibit Nos. PE-0474, PE-0475, PE-0476, PE-0477, and PE-0478 were received at a later date. All inspections took place between May 16 –18, 2011.
All of the power supplies were functional and, when tested, were found to be within the specific manufacturer's electrical parameters under which the power supply was evaluated and accepted. None of the power supplies exhibited any signs of internal tampering or damage significant enough to affect the operation. There were only minor discrepancies found which did not affect the operation or safety features, and are considered non-critical. There is no evidence that these power supplies were a source of spark ignition alone or when electrically connected to the IS lighting cable (excluding connection to the luminaires).

All luminaires showed some damage such as heat damage and/or impact damage. This damage was most likely caused by the explosion, but the condition of these luminaires prior to the explosion is not definitely known. During the comparison to the approval drawings, only minor discrepancies were found which did not affect operation, safety features, or the explosion-proof integrity and are considered non-critical.

The luminaires identified by Exhibit Nos. PE-0254-b and PE-0258-b were found in a condition indicating they were not maintained in permissible condition prior to the explosion.

- Exhibit No. PE-0254-b had electrical tape wrapped around a significant crack in the connection where the polycarbonate tube threads into the maintenance sleeve. Dust and dirt were found inside the polycarbonate tube.

- Exhibit No. PE-0258-b had a missing end cap and the polycarbonate tube was broken off at the threaded end. There was electrical tape wrapped around the polycarbonate tube a few inches down from the broken end.

Based on laboratory testing and inspection of intrinsically safe lighting cables at the Upper Big Branch Mine, no evidence was found that the intrinsically safe lighting cables thermally ignited coal dust on the longwall system.

APPENDIX U-3

EXECUTIVE SUMMARY OF INVESTIGATION OF ELECTROHYDRAULIC SHIELD CONTROL COMPONENTS