

## **Appendix D – Enforcement of Specific Standards (Non-contributory Violations)**

### **Enforcement of 30 CFR Part 50**

*Notification, Investigation, Reports and Records of Accidents, Injuries, Illnesses, Employment, and Coal Production in Mines*

**Requirements:** Mandatory safety standard 30 CFR 50.10 required the mine operator to contact MSHA within 15 minutes once the operator knows or should know that an accident has occurred. Mandatory safety standard 30 CFR 50.2 defined 12 categories of accidents. Included in the definitions of an accident was an “unplanned inundation of a mine by a liquid or gas.”

MSHA regulation 30 CFR 50.11(b) required each operator of a mine to investigate each accident and each occupational injury at the mine. The Regulation also required the operator to develop a report of each investigation.

MSHA regulations 30 CFR 50.20(a) and 30 CFR 50.20-1 required each mine operator to report to MSHA each accident, occupational injury, or occupational illness at a mine on MSHA Form 7000-1 (*Mine Accident, Injury, and Illness Report*) within 10 working days after the incident occurred.

MSHA regulation 30 CFR 50.30(a) required each mine operator to report employment to MSHA on MSHA Form 7000-2 (*Quarterly Mine Employment and Coal Production Report*) within 15 days after the end of each calendar quarter. MSHA Regulation 30 CFR 50.30(b) required each coal mine operator to report coal production to MSHA on MSHA Form 7000-2 within 15 days after the end of each calendar quarter.

MSHA regulation 30 CFR 50.40(a) required each operator of a mine to maintain a copy of each investigation report required to be prepared under 30 CFR 50.11 at the mine office closest to the mine for five years after the concurrence.

MSHA regulation 30 CFR 50.41 required each mine operator to allow MSHA to inspect and copy information related to any accident, injury, or illness which MSHA considers relevant and necessary to verify a report of investigation required by 30 CFR 50.11 or relevant and necessary to a determination of compliance with the reporting requirements of 30 CFR Part 50.

**MSHA Policy and Procedures:** Volume III of the MSHA *Program Policy Manual* stated: “An evaluation of operator compliance with reporting requirements under Part 50 shall be made at every regular inspection.” The Manual also provided that a Part 50 reporting audit is to be conducted at a mine where a fatal accident has occurred, unless an audit had been conducted within a year prior to the fatal accident. The Manual also stated:

Inspection personnel should carefully review the degree of negligence associated with all Part 50 citations. Any violation of Part 50 considered to be the result of a high degree of negligence or other unique aggravating circumstances may be referred for special assessment.

Where circumstances indicate that there has been flagrant conduct surrounding a failure to report, such as attempting to conceal the fact that an injury occurred, serious consideration should be given to a reckless disregard negligence evaluation. The facts involved in such a violation should be carefully documented and transmitted to the appropriate District Manager for use in determining whether a recommendation for special assessment is appropriate.

The *General Coal Mine Inspection Procedures and Inspection Tracking System Handbook* directed inspectors to review required records and postings, including Mine Accident, Injury, and Illness Reports (MSHA Form 7000-1) and Quarterly Employment and Coal Production Reports (MSHA Form 7000-2) during each regular inspection.

**Statement of Facts:** District 4 inspectors documented checking MSHA 7000-1 Forms required by 30 CFR 50.20(a) during four of the six regular inspections and MSHA 7000-2 Forms required by 30 CFR 50.30(a) during five of the six regular inspections at UBB. A District 4 inspector issued three section 104(a) citations for violations of 30 CFR 50.20(a) during the third regular inspection for fiscal 2009. The three violations were for the Operator's failure to submit MSHA Form 7000-1 to report return to duty information for three injured miners. No violations of 30 CFR Part 50 were cited during the other five regular inspections.

District 4 personnel did not conduct a Part 50 Audit at UBB during the review period, nor were they required to do so. The previous Part 50 Audit at the Mine was conducted following a fatal electrical accident in July 2003.

District 4 personnel conducted 15 Part 50 Audits at other mines during the review period. A description of these audits follows.

- Seven audits were conducted to confirm eligibility for Sentinels of Safety awards. No violations were cited as a result of these audits.
- Five audits were conducted as a result of fatal accidents as directed by MSHA policy. During these audits, District 4 personnel issued a total of 79 citations for violations of 30 CFR Part 50. Penalties for these violations were calculated using the regular assessment provisions of Part 100.
- Three additional audits were conducted during the review period. District 4 personnel cited four violations of 30 CFR Part 50 as a result of these audits. Penalties for these violations were calculated using the regular assessment provisions of Part 100.

Including the violations cited as a result of the Part 50 audits, District 4 personnel cited 354 violations of 30 CFR Part 50 during the review period. This accounted for 36% of the total number of Part 50 violations cited at all coal mines nationwide. Four of the 28 violations (14%) designated as high negligence or reckless disregard were recommended for special assessment. Approximately 90% of the other Part 50 violations were assessed a civil penalty of \$200 or less. Nationwide, approximately 26% of Part 50 violations designated as high negligence or reckless disregard were recommended for special assessment.

Following the explosion, District 4 conducted a Part 50 Audit at UBB between June 7 and September 7, 2010. The audit period covered calendar years 2008, 2009, and the first quarter of 2010. District 4 issued 39 section 104(a) citations for violations found during the audit as follows.

- Eighteen citations were issued for failure to report injuries on MSHA 7000-1 Forms.
- Three citations were issued for failure to report illnesses on MSHA 7000-1 Forms.
- Ten citations were issued for providing inaccurate information on MSHA 7000-1 or 7000-2 Forms.
- Five citations were issued for not reporting non-injury roof falls on MSHA 7000-1 Forms. While the roof falls were orally reported to MSHA, the Operator did not submit the required MSHA 7000-1 Forms.
- Three citations were issued for not filing MSHA 7000-1 Forms within the required 10-day timeframe.

In addition to the Part 50 audit violations, two Part 50 violations were cited by District 4 at UBB after the explosion, one in May and one in June 2010. The two violations were for the Operator's failure to complete Section D of the MSHA 7000-1 Form when injured miners returned to work.

During interviews, District 4 managers stated it was District practice to conduct Part 50 audits following fatal accidents, which was consistent with MSHA policy. A comprehensive Part 50 audit is labor intensive, as demonstrated by the audit at UBB following the explosion that required 125 hours to complete.

The amended Non-Fatal Days Lost (NFDL) injury incidence rates for 2008 and 2009 were 89% and 76%, respectively, higher than originally reported after including the unreported injuries and correcting the reported worker hours. (See the “Overview of Upper Big Branch Mine-South.”)

The Accident Investigation team issued 13 additional non-contributory citations and orders for Part 50 violations. The team issued five section 104(a) citations for not reporting four injuries and one illness; five section 104(d)(2) orders for failing to immediately notify MSHA of three roof falls, one water inundation, and one methane ignition; one section 104(d)(2) order for failing to notify MSHA of the April 5 explosion within 15 minutes; one section 104(a) citation for failing to preserve evidence of a roof fall; and one section 104(a) citation for not providing copies of accident investigation reports.

Three of these violations were related to conditions that directly affected the 1 North Longwall. The following is a description of the violations.

- Based on testimony taken after the explosion, the Accident Investigation team concluded that a methane ignition had occurred mid-face of the Longwall in November 2009. The Operator failed to immediately report this ignition to MSHA and did not submit an MSHA 7000-1 Form.
- The MSHA Accident Investigation team concluded from inspector notes and witness testimony that a water inundation of the 1 North Longwall panel occurred on November 16, 2009. The inundation caused the Bandytown Fan pressure to increase from the normal pressure of -4.5 inches of water gauge on November 16 to -17.0 inches of water gauge on November 18. MSHA was not immediately notified of this inundation, and a MSHA 7000-1 Form was not submitted.
- The Accident Investigation team determined that a roof fall occurred on December 4, 2009, that extended from No. 1 shield outby to the stage loader in the No. 1 entry on the headgate side of the 1 North Longwall Section. The roof fall occurrence was discovered during the team’s review of the Operator’s production reports. This roof fall was not immediately reported to MSHA. The MSHA Form 7000-1 that was filed with MSHA indicated the roof fall occurred on December 5, 2009.

MSHA’s Headquarters conducted Part 50 Audits in conjunction with PPOV reviews at two additional Massey Energy mines after the UBB explosion. The audit at the Inman Energy, Randolph Mine commenced on October 12, 2010, and was completed on August 17, 2011. The audit at Independence Coal Company, Inc., Justice #1 mine commenced on November 10, 2010, and was completed on August 17, 2011. The audit periods were from July 1, 2009, through June 30, 2010.

The Randolph and Justice #1 mine audits were delayed due to the operators’ initial refusal to permit an Authorized Representative to inspect and copy information to determine compliance with the reporting requirements related to accidents, injuries, and illnesses that occurred at the mines or may have resulted from work at the mines. These operators were cited for violations of 30 CFR 50.41. After an Administrative Law Judge decision in MSHA’s favor, Alpha Natural Resources, which had acquired Massey, provided the requested documents needed to complete the audits.

The audits revealed that the operators did not file MSHA 7000-1 forms for a number of reportable occupational injuries. Mistakes on forms that were filed included: entering incorrect information concerning injuries and illnesses, incorrect number of days of restricted duty, and incorrect number of days lost. Errors on the 7000-2 forms included over- and under-reporting of employee hours in some quarters, under-reporting of injuries, over-reporting of average number of employees, and late filing of the forms. The operators’ investigation reports of accidents did not contain certain required information such as: the date of investigation, name of persons participating in the investigation, steps taken to prevent a future occurrence, or the name, occupation, and experience of the injured miner. In some cases, the operators failed to conduct investigations of occupational injuries. In other cases when investigations were conducted, the operators failed to maintain copies of their investigative reports.

During these audits, MSHA issued 77 section 104(a) citations because the operators failed to report, or inaccurately reported, a total of 24 injuries that resulted in 1,125 lost days of work. As a result of these audits, both mines received notices of a potential pattern of violations.

**Conclusion:** Accurate reporting of accidents, injuries, illnesses, worker hours, and coal production is critical to MSHA's ability to direct additional attention to mines with health and safety problems. Part 50 Audits conducted at UBB and two other Massey-controlled mines after the UBB explosion demonstrate the operators' repeated failure to report accidents, injuries, illnesses, and worker hours accurately on MSHA Forms 7000-1 and 7000-2, allowing these three operators to significantly under-represent injury rates at their mines. When accidents and injuries were reported by the operators, the forms frequently included inaccurate information. In some cases, they were not submitted within the required 10-day time frame.

District 4 personnel complied with MSHA policy for conducting Part 50 Audits following fatal accidents. They also conducted three additional audits during the review period beyond the requirements of Agency policy.

District 4 personnel cited more Part 50 violations during the review period than any other Coal district, accounting for 36% of the total number of Part 50 violations cited at all coal mines nationwide. They recommended special assessments for a lower percentage of Part 50 violations designated as high negligence or reckless disregard compared to the other Coal districts. The regularly assessed civil penalties for the remaining Part 50 violations were not sufficient to provide incentive for compliance.

Increased penalties for Part 50 violations and more frequent Part 50 Audits would likely improve operator compliance with Part 50 reporting requirements.

District 4 inspectors did not follow MSHA procedures for reviewing Part 50 records during two of the six regular inspections conducted at UBB during the review period. However, the routine review of Part 50 records conducted during regular inspections would not have identified many of the issues revealed during more comprehensive Part 50 audits.

**Corrective Actions Taken:** The Assistant Secretary directed that Part 50 Audits be conducted as part of the potential pattern of violations review process. Beginning in October 2010, MSHA began conducting audits at mines that met all the potential pattern of violations screening criteria, with the exception of the injury severity measure. Numerous Part 50 violations were cited, including failures to report injuries and under-reporting the lost time associated with reported injuries. As a result, four additional mines were placed in potential pattern of violations status.

In October 2010, the Department of Labor entered into a contract with Eastern Research Group, Inc. to conduct an evaluation of the accuracy and completeness of Part 50 reporting of non-fatal injuries and illnesses in the mining industry.

**Recommendations:** The Administrator for Coal should direct the District 4 and 12 Managers to: reinstruct inspectors in the *General Coal Mine Inspection Procedures and Inspection Tracking System Handbook* directive to check and document checking Part 50 records during every regular inspection. The District Managers should hold inspection supervisors accountable for enforcing compliance with this directive.

The Assistant Secretary should consider rulemaking to modify the provisions of 30 CFR Part 100 to provide for increased penalties for the failure of mine operators to report accidents, injuries, and illnesses.

The Assistant Secretary should instruct the Director of EPD to provide resources to assist Coal Mine Safety and Health by conducting additional Part 50 Audits. The Assistant Secretary should consider making some EFS specialists authorized representatives to enable them to conduct audits independently of Coal inspectors.

The Assistant Secretary should request that NIOSH develop a method to identify operators or mines for Part 50 Audits. Potential criteria could include compliance record of operators, hazardous condition complaints, respirable dust issues, and allegations of under-reporting.

## **Enforcement of 30 CFR 75.333**

### *Ventilation controls*

**Requirements:** Mandatory safety standard 30 CFR 75.333(d) stated in pertinent part that doors used in lieu of permanent stoppings or to control ventilation within an air course shall be: “[o]f sufficient strength to serve their intended purpose of maintaining separation and permitting travel between or within air courses or entries” per subparagraph (d)(2); and “[i]nstalled in pairs to form an airlock. When an airlock is used, one side of the airlock shall remain closed. When not in use, both sides shall be closed” per subparagraph (d)(3).

Mandatory safety standard 30 CFR 75.333(h) stated: “All ventilation controls, including seals, shall be maintained to serve the purpose for which they were built.”

**MSHA Policies and Procedures:** None

**Statement of Facts:** Performance Coal Company used equipment doors in lieu of stoppings at many locations in UBB, primarily to allow movement of mobile equipment between air courses without disrupting ventilation. Equipment doors must be installed in pairs to form an airlock, so that when one is opened the second remains closed, to prevent a short circuit or disruption of airflow in the mine. The mine ventilation map showed that more than 50 sets of equipment doors were installed to allow travel between isolated air courses. In addition, the MSHA Accident Investigation team determined that there were equipment doors installed in the Mine that were not indicated on the mine ventilation map.

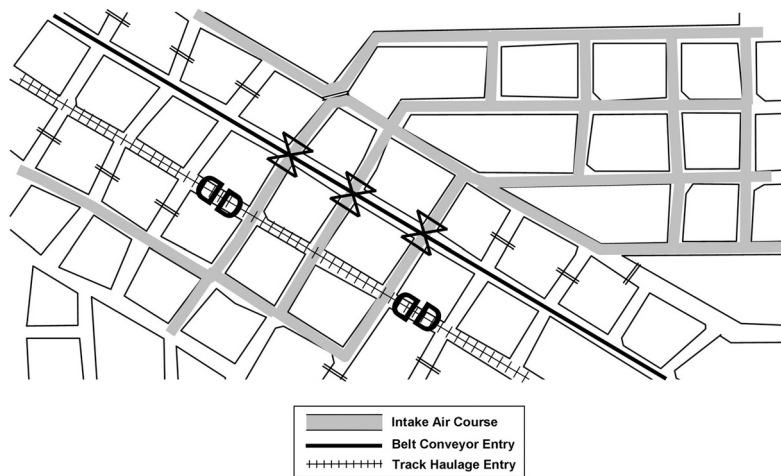
During the review period, District 4 inspectors cited 53 violations of 30 CFR 75.333 and its subparagraphs at UBB. Eight violations involved equipment doors: four for improper installation; two for failing to maintain doors; and two for failing to close doors as required.

The Accident Investigation team cited two non-contributory violations regarding equipment doors. One section 104(a) citation (No. 8258565) cited three locations where equipment doors were not installed in pairs to form an air lock as required by 30 CFR 75.333(d)(3). Another section 104(a) citation (No. 4900429) cited the Operator under 30 CFR 75.333(d) for installing equipment doors in lieu of overcasts.

An overcast allows two air courses to cross paths without mixing. A key element of a successful overcast installation requires removing a sufficient amount of roof material over the top of the overcast to maintain the same area as the entry. If the area is not maintained, the overcast restricts airflow, increases pressure loss in the air split, and reduces overall ventilation capacity. Overcasts constructed in a number of locations in outby areas of the Mine were found to have top clearances of less than three feet. These were found in areas of the Mine unaffected by the explosion where the mining height was in excess of six feet.

In some locations, the Operator installed two pairs of equipment doors to allow the track haulage road to pass through another air course, rather than building overcasts to permit uninterrupted travel. Airlock doors do not provide the same function as overcasts, but can be used to reduce the number of overcasts needed to isolate air courses. Although installing airlock doors in this manner complies with 30 CFR Part 75, miners may be tempted to leave both doors open for convenience, particularly when multiple vehicles pass through them, such as during shift change. Keeping both doors open, even for short durations, does not comply with 30 CFR 75.333.

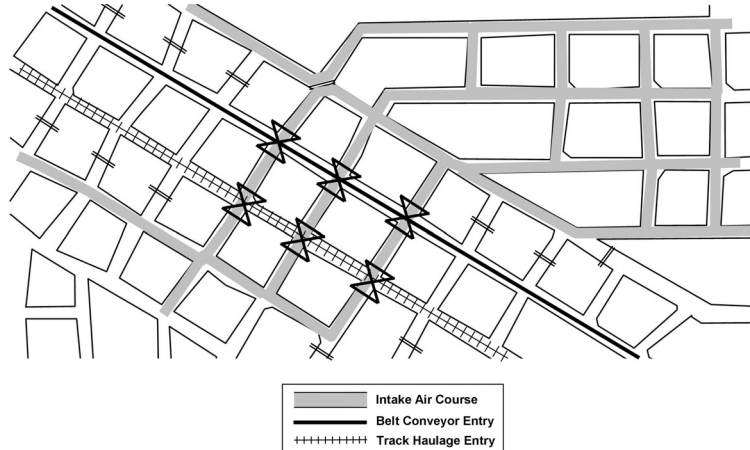
Figure 19 shows one such installation in the main track haulage road of the North Glory Mains. At the time of the explosion, miners accessed the 1 North Longwall and two development sections (Headgate #22 and Tailgate #22) using this roadway. Coal was transported in the adjacent belt conveyor entry. The two entries containing the track and belt conveyor were ventilated by a common air split along much of their length. However, where a separate intake air course crossed the belt conveyor air course, the Operator installed two sets of equipment doors. Miners drove track equipment through one set of doors, into the separate intake air split, then through a second set of doors, back into the air course containing the belt conveyor system. The belt conveyor air course was reduced from two entries to one where it crossed a set of overcasts that permitted the two air splits to cross without mixing. These air courses could not mix at this location since they isolated primary and alternate escapeways and the intake split (shown in gray) that ventilated the working sections.



**Figure 19 - Depiction of actual installation of equipment doors in the North Glory Mains**

Figure 20 shows how the separation of the two air courses could have been maintained using two sets of overcasts and no equipment doors. This method would have provided access to the track haulage entry without the need to open and close doors. Overcasts would have maintained separation of these air courses with less risk to the ventilation system because equipment doors are more prone to damage and excessive leakage. Therefore, the method illustrated in Figure 20 has historically been the preferred industry practice in areas of high traffic, such as in main haulage roads.

Another advantage to the use of overcasts is that the common air split is maintained in two entries rather than one in the area of the air lock, which reduces ventilating pressure losses when overcasts are properly installed. Vehicular access between air courses still can be accomplished by installing equipment doors to replace stoppings in crosscuts between the air courses.



**Figure 20 - Six Overcast Alternative to Eliminate Equipment Doors**

Systematic manual opening and closing of equipment doors adds time to travel and requires miners to leave the mantrip or mobile equipment to open and close the doors. The MSHA Accident Investigation team heard testimony from UBB miners that equipment doors were often left open to facilitate travel for multiple units of mobile equipment, rather than opening and closing doors systematically to maintain separation of air courses. Leaving equipment doors open short-circuits intake air, which can adversely affect methane and respirable dust control in other areas of the mine. Interlock systems are available for installation on airlock doors which ensure only one door can be opened at a time.

To form an effective airlock, the space between the doors must be able to accommodate the equipment passing through the airlock when both doors are completely closed. When closed, the door and door frame must form a tight seal to minimize leakage. Equipment doors inherently leak more than stoppings.

Gaps beneath doors, usually due to the irregularities of the mine floor, are particularly problematic.

District 4 personnel indicated during interviews that safety standards did not prohibit the use of equipment doors in this manner. However, 30 CFR 75.333(d)(1) does not provide guidance to operators or inspectors regarding the evaluation of equipment door installations, and MSHA policy has never been developed to address enforcement of this standard.

The MSHA Accident Investigation team found that open equipment doors at key locations would not have caused a dramatic decrease in the intake air quantity for the 1 North Longwall. However, some reductions on the Headgate #22 and Tailgate #22 development sections were possible when equipment doors installed on the longwall intake were opened. The Accident Investigation team also found that return air from the development sections could be routed to the longwall face when equipment doors between the No. 3 entry of the longwall headgate and the No. 1 entry of Tailgate #22 were left open (see Figure 21). The Accident Investigation team determined through interviews with miners that there was at least one occasion when this occurred.

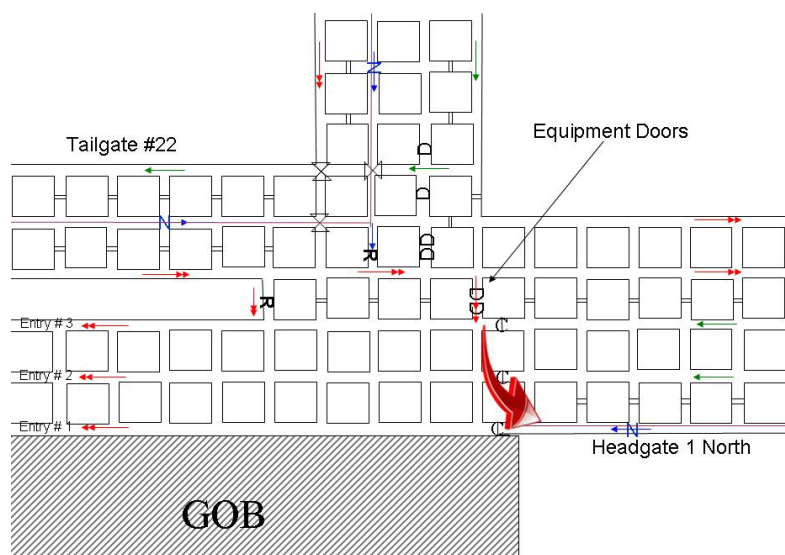


Figure 21 - Latest Headgate Ventilation Design

**Conclusion:** Mine design and plans incorporating equipment doors in critical areas often create a ventilation system too fragile to maintain an acceptable degree of safety for miners. Currently, regulations address the use of equipment doors to separate air courses in lieu of stoppings. However, the proper installation, operation, and maintenance of equipment doors are critical for maintaining a safe and effectively ventilated mine.

The use of equipment doors in critical locations to isolate air courses is a poor mining practice. Equipment doors are more likely to fail and less likely to ensure separation than overcasts. For long-term installations, the use of overcasts is a more reliable mining practice. In many instances, Performance Coal Company used equipment doors to avoid constructing overcasts. Even when the Operator constructed overcasts, many were not installed properly.

## Enforcement of 30 CFR 75.351 and 75.352

*Atmospheric monitoring systems (AMS) and Actions in response to AMS signals*

**Requirements:** Because the Operator was using air from the belt entry to ventilate the longwall section, most of the applicable standards were contained in 30 CFR Subpart D (Ventilation). Additional requirements for carbon monoxide (CO) fire detection systems were contained in 30 CFR Subpart L (Fire Protection).

**MSHA Policies and Procedures:** MSHA guidance on the inspection of AMS and CO monitoring systems was provided in the *Carbon Monoxide and Atmospheric Monitoring Systems Inspection Procedures Handbook* (PH-08-V-2). The Handbook was being revised at the time of the explosion to address changes in regulations regarding the use of air from the belt entry to ventilate working sections and fire detection systems in belt entries of underground coal mines required by 30 CFR 75.1103.

The *General Coal Mine Inspection Procedures and Inspection Tracking System Handbook* directed inspectors to conduct the following activity during each regular inspection:

AMS Alarm Systems (AMS). The inspector shall examine AMS system components and observe the operator making a required calibration of system sensors. Data and times obtained during the inspection shall be compared with information recorded by the system on the surface. Additionally, an evaluation shall be made concerning the responsible person(s) about the AMS system display, the actions required for any alert and alarm, and appropriate notification of miners and mine management when an alert or alarm occurs. The most recent AMS records shall also be reviewed to determine if proper notifications and corrective actions have been taken to address previous alerts, alarms, or system failures.

Documentation Required: *Compliance with this procedure shall be recorded in the inspection hard-copy notes to include the AMS manufacturer and model.....* [Emphasis on original]

The *Carbon Monoxide and Atmospheric Monitoring Systems Inspection Procedures Handbook* (CO Handbook) provided procedures for inspecting AMS and CO monitoring systems. In pertinent part, the Handbook stated: "Observe a function test on 10% of the total sensors but not less than 5 sensors by applying a known concentration of CO. Record the reading of the sensor and compare it with the known concentration." The *General Coal Mine Inspection Procedures and Inspection Tracking System Handbook* did not specifically reference the CO Handbook for use during each regular inspection.

**Statement of Facts:** The Accident Investigation team identified nine separate non-contributory violations of mandatory safety standards related to the installation, operation, examination, and maintenance of the AMS and CO systems at UBB. Conditions and practices cited included the following:

- CO sensor spacing was not maintained at 1,000-foot intervals
- The CO sensor map was not up-to-date
- AMS operators did not take the correct actions when alarm signals were received on the surface
- AMS operators did not always record actions taken to correct system malfunctions or failures
- Time periods between CO sensor calibrations exceeded 31 days
- Records of calibrations were not properly maintained
- Not all of the AMS operators at the Mine were trained adequately
- Some CO sensors were not positioned at the correct height within the belt entry

The Accident Investigation team determined that at least 64 CO sensors were installed at UBB at the time of the explosion. In September 2009, the ventilation plan map indicated approximately 54 sensors were in use in the belt entries. A review of the inspection notes indicated that some inspectors documented checking sensors, but there was no indication that inspectors checked either 5 or 6 sensor calibrations during three of the six regular inspections conducted during the review period. Notes indicated that inspectors observed the Operator calibrating a sensor during only one regular inspection in the review period.

On September 23, 2009, the Operator was cited for failing to maintain the system in proper operating condition. The #72 sensor located at the longwall mule train was found to be out of calibration when a known gas of 25 ppm was applied to the sensor. The inspection notes for this shift indicated three sensors were checked, which included the application of calibration gas to the sensors. On the same inspection, the inspector cited the Operator for not maintaining the longwall belt tail alarm unit in proper operating



condition when he found it would not automatically provide a visual and audible alarm. A similar condition was cited as a contributory violation in the Aracoma accident investigation. In addition, three violations on the surface, including AMS records, were cited by this inspector.

Some inspectors stated in interviews that they left the inspection of AMS and CO fire detection systems to electrical specialists. During the second regular inspection for fiscal 2010, an inspector recorded in his notes that he checked CO sensors installed on four belt conveyors, which encompassed an area where more than five sensors were installed. However, the inspector did not identify in his notes the specific locations of these sensors or what was checked.

The *General Coal Mine Inspection Procedures and Inspection Tracking System Handbook* directed that the adequacy of AMS operator training was to be determined by inspectors asking the AMS operators a series of questions to determine if the responses and recordkeeping requirements are being fulfilled. Most inspectors indicated they knew AMS operators were to be interviewed as part of this determination; however, some inspection notes did not indicate that these interviews were being completed as directed.

While the AMS at Aracoma responded properly to the fire, the accident investigation identified the failure to provide AMS operator training as a contributory violation. The Aracoma mine was operated by another subsidiary of Massey and inspected by District 4 enforcement personnel. Several deficiencies in the installation, operation, and maintenance of the system also were identified at UBB by the accident investigation team. These included inadequate recordkeeping, improper sensor locations, and calibration of sensors at intervals exceeding 31 days.

Records indicated there were no violations for inadequate training of AMS operators at UBB during the review period. However, on September 21, 2009, a District 4 inspector did cite the operator of a different mine for failing to maintain a record of the training of the AMS operator on one occasion.

Entry-level inspector training and journeyman inspector retraining provided at the National Mine Health and Safety Academy each included a comprehensive session on the inspection of AMS and CO fire detection systems. Content of these training sessions was modified regularly to address regulatory and policy changes. However, interviews indicated that District 4 inspectors were not consistently well versed in relevant inspection procedures. Furthermore, District 4 journeyman inspectors had not received training on AMS and CO system inspections since their entry-level inspector training.

**Conclusion:** The guidance provided in the *General Coal Mine Inspection Procedures and Inspection Tracking System Handbook* did not reference or direct inspectors to use the CO Handbook when inspecting AMS and CO fire detection systems. While many inspectors were aware of most AMS regulations, some inspectors relied on electrical specialists to conduct inspections of these systems. While some of the inspection procedures in the CO Handbook would be more appropriate for electrical specialists to conduct, there are many salient portions of the inspection that a regular inspector can complete.

Some inspectors were not adequately trained to enforce the installation and maintenance requirements of 30 CFR 75.351, or the recordkeeping requirements of 30 CFR 75.352. This contributed to the failure to identify deficiencies in the Operator's installation of the CO sensors in the belt entries at UBB and in the records maintained by the Operator.

**Recommendations:** The Administrator for Coal should direct the committee revising the *Carbon Monoxide and Atmospheric Monitoring Systems Inspection Procedures Handbook* to identify the salient parts of an AMS or CO system inspection. The CO Handbook should describe how an inspector would conduct an inspection to address each salient part to determine the system is being operated and maintained in compliance with the appropriate safety standards. Any portions of the system inspection that require an electrical specialist attention should be clearly identified.

The Administrator for Coal should direct the revision of the *General Coal Mine Inspection Procedures and Inspection Tracking System Handbook* to specify those procedures outlined in the CO Handbook that are to be completed during each regular inspection.

## Enforcement of Electrical Safety Standards

**MSHA Policies and Procedures:** In pertinent part, the *General Coal Mine Inspection Procedures and Inspection Tracking System Handbook* directed inspectors to conduct the following activities during each regular inspection:

Outby Electrical Equipment. An inspection shall be conducted of each piece of in-use or available-for-use permanent electrical equipment as listed in the operator examination records or observed in-use by the inspector to determine compliance with applicable standards. Portable electrical equipment should be inspected as encountered. A regular inspector shall not attempt to perform inspections or tests that require the expertise of an electrical specialist.

Section Equipment. Each piece of in-service section equipment shall be inspected to determine compliance with applicable standards.

In pertinent part, The *Coal Electrical Inspection Procedures Handbook*, PH93-V-7, May 1993, stated the following:

Many of the requirements of 30 CFR 75.500 through 75.1003 and 30 CFR 77.500 through 77.906 are very technical in nature and a thorough knowledge of electrical theory, mine power systems, and electric equipment is essential if inspection personnel are to properly implement these requirements without creating hazards to themselves or to miners. When coal mine inspectors encounter electrical problems involving high-voltage protection, grounding conductors, or other problems that require special electrical expertise, the assistance of an electrical engineer or coal mine inspector (electrical) should be requested.

During each electrical inspection, the electrical inspector or engineer (electrical specialist) shall inspect an adequate portion of the electric circuits, electric equipment, and mechanical equipment at each mine to ascertain that the equipment and circuits are being maintained in accordance with the Mine Act. If the electrical specialist determines that the maintenance program at the mine is not adequate to maintain compliance with the Mine Act, the inspector shall make a complete electrical inspection of the mine. During each electrical inspection, every effort shall be made to insure that management has established an examination and maintenance program (30 CFR 75.512 and 30 CFR 77.502) for electric equipment that will insure compliance with the requirements of the Mine Act so that the equipment and circuits will not be installed in an unsafe manner or be allowed to deteriorate into an unsafe condition.

**Statement of Facts:** A review of training records for District 4 inspectors revealed that regular inspectors received training to conduct general inspections of electric equipment at the National Mine Health and Safety Academy. Interviews with District 4 inspectors demonstrated they possessed the skills and knowledge to conduct basic inspections of electric equipment. Electrical specialists received the same general training, but also received additional specialized electrical training and biannual electrical retraining at the Academy.

The Internal Review team found that prior to the explosion, District 4 inspectors conducted inspections of electric equipment that normally did not require special electrical expertise. During the review period, District 4 inspectors cited 684 violations at UBB. Seventy-eight (11%) were violations of electrical standards.

After the explosion, the Accident Investigation team, which included electrical engineers and specialists from outside District 4, conducted an inspection of electric equipment and circuits within the explosion area. The team cited 199 violations of electrical standards, of which 49 were cited as section 104(d)(2) orders and 103 were evaluated as S&S.

The Internal Review team examined inspector notes and the Inspection Tracking System to identify the electric equipment that District 4 personnel inspected during the month before the explosion. An analysis

then was conducted to determine which violations cited by the Accident Investigation electrical team were not identified by District 4 inspectors.

The Accident Investigation team dedicated significant resources examining electric systems and equipment. In contrast, inspectors did not have equivalent time to inspect electric systems and equipment during regular inspections. In addition, some violations cited by the Accident Investigation team could have occurred following the District 4 inspections. To minimize the possibility of changing equipment conditions, the analysis was limited to March 2010. This limited timeframe increased the likelihood that the violations cited by the Accident Investigation electrical team should have been identified during District 4 inspections. The analysis revealed that the Accident Investigation electrical team cited 63 violations on equipment inspected by District 4 inspectors during March 2010.

The 63 violations cited by Accident Investigation electrical team identified 225 total safety defects. Training records indicate that District 4 regular inspectors had received the training necessary to identify 149 (66%) of these safety defects. Identification of the remaining defects would have required specialized knowledge and training and would probably be identified only by an electrical specialist or engineer. District 4 inspectors cited eight electrical violations on the same equipment in the month before the explosion.

Interviews revealed that during the review period, inspectors did not request the assistance of an electrical specialist at UBB. Electrical specialists stated that complete electrical inspections had not been performed in District 4 for several years.

The last inspections by an electrical specialist at UBB were performed in October 2009. The specialist examined CO sensors on the North Belts on October 6, and electrical records, handheld methane detectors, and electric equipment on 4 Section on October 8. No enforcement actions were taken.

In April 2010, the District 4 Electrical Department was staffed by a supervisor, four specialists, and one office assistant. The department operated as follows.

- One specialist reviewed shaft & slope construction plans and conducted the required monthly inspections of these sites.
- One specialist reviewed Field Modifications and conducted hoist & elevator inspections.
- Two specialists were assigned full-time to review Emergency Response Plans (ERPs), which address, in part, communication and tracking systems and refuge alternatives. These plan reviews were assigned to the Electrical Department by the District Manager. The ERPs also included 30 CFR 75.1502 and SCSR plans.

In addition, the Electrical Department supervisor stated during his interview that due to the large number of plan reviews his department had to complete, electrical specialists were only spending an estimated 10% of their time on actual electrical inspections.

While not a requirement pursuant to MSHA policy, some district offices assign electrical specialists to inspect new substation installations for safety and compliance when resources permit. The District 4 Electrical Department supervisor also stated that for several years prior to the explosion the Electrical Department had not conducted any new high-voltage substation inspections. He estimated that as many as 25 new substations were put on-line in District 4 without being inspected by electrical specialists. When asked if issues were found during recent substation inspections that needed to be corrected, he stated: "It's rare that you go to one and check it that there's not an issue that needs to be corrected."

The Electrical Department supervisor stated that District 4 did not have adequate resources in the Electrical Department to conduct complete electrical inspections. He also stated that electrical specialists had been selected from within four field offices in the District. However, they had not completed any electrical inspection duties due to mandated regular inspection assignments. The District Manager indicated during his interview that inspection assignments and the hiring of personnel focused on completing mandatory inspections.

**Conclusions:** The Operator's disregard for numerous electrical safety standards at UBB frequently endangered the safety of its miners. Equipment not being maintained in permissible condition can lead to death or serious injury.

While there was no evidence that District 4 inspectors failed to cite electrical violations that they identified, it is clear that electrical standards were not effectively enforced at UBB. The Accident Investigation team found a significant number of violations that were not identified by District 4 inspectors in the month before the explosion. Some of the violations may have occurred after the last regular inspection, some required specialized electrical training to identify, and others likely existed and should have been recognized during the regular inspections.

The number of electrical specialists in District 4 was not adequate to handle the workload, and the number of specialists available to the Mt. Hope Field Office was insufficient to handle the demands created by the Operator's persistent failure to comply with electrical standards. Electrical specialists are trained and qualified to identify hazards in complex electrical systems. However, during the review period, some electrical specialists were assigned to conduct regular inspections, further diminishing the resources available for conducting comprehensive electrical inspections. Without sufficient and properly allocated resources to conduct specialized electrical inspections, miners potentially will continue to be exposed to electrical hazards.

30 CFR 75.503 - Permissible electric face equipment; maintenance

**Requirements:** Mandatory safety standard 30 CFR 75.503 stated: "The operator of each coal mine shall maintain in permissible condition all electric face equipment required by §§ 75.500, 75.501, and 75.504 to be permissible which is taken into or used in by the last open crosscut of any such mine."

**Statement of Facts:** District 4 inspectors conducted permissibility inspections of electric face equipment during each regular inspection. A total of 18 violations of 30 CFR 75.503 were cited during the six inspections. Four of the 18 violations were evaluated as S&S, and all were issued as section 104(a) citations. An electrical specialist did not participate in the last regular inspection at UBB before the explosion.

After the explosion, the Accident Investigation team identified and cited the Operator for 31 violations of 30 CFR 75.503 in the explosion area, including 18 section 104(d)(2) orders. Nineteen of these non-contributory violations were cited on electric machinery or equipment that District 4 inspectors examined during the regular inspection ongoing in March 2010. Seven of these 19 were cited as section 104(d)(2) orders; eight were evaluated as S&S. There were 131 individual safety defects identified in these violations. Some of these cited safety defects may have existed during the last complete regular inspection, while others may have occurred after the last inspection. In the following examples, safety defects that may have existed during the inspection of the cited equipment and, if so, should have been recognized by an inspector are indicated by an asterisk (\*).

The Accident Investigation team issued a section 104(d)(2) order (No. 4900584) because the continuous mining machine "located on the HG 22 section was not being maintained in approved condition." The following conditions were listed:

1. The X/P [explosion-proof] enclosure for the fire suppression is not securely attached to the machine.\*
2. The X/P enclosure for the methane monitor power supply is not securely attached to the machine.\*
3. The trailing cable junction box (X/P enclosure) has plugs in two of the unused entrances that are not spot-welded.\*
4. The off-side cutter motor junction box (X/P enclosure) is not securely attached to the machine.
5. The master control station (X/P enclosure) has the interlock switch taped in the closed position (this switch is designed to de-energize all components inside the enclosure in event someone removes the cover while the machine is energized-SAFETY SWITCH DEFEATED).

6. The lid switch on the methane monitor power supply is broken.\*
7. Two packing nuts on the entrance glands in the trailing cable junction box are not secured from loosening.\*
8. The left rear MCI area light has a packing gland damaged to the degree that conductors may be damaged.\*
9. The guard is missing over the rear area light.\*
10. The left rear area light has a plug in an unused entrance that is not spot -welded, and\*
11. The off-side cutter motor junction box has two packing glands that are not secured from loosening.\*
12. The methane monitor sensor did not have a set screw at the cable entrance gland.
13. The XP enclosure for the methane sensor has a lock washer missing from one of the bolts in the lid.\*

The Accident Investigation team issued a section 104(d)(2) order (No. 8405506) for a shield hauler that was not being maintained in permissible condition. The following conditions were listed:

1. The breaker panel box lid has 2 bolts missing.\*
2. The main and breaker control panel do not have the same length bolts.
3. The battery end off-side headlight has 2 lock washers missing from the lid and the other side light has a bolt missing.\*
4. One of the flat washers is missing from the deck mounted control station panel lid.\*
5. The battery lead cables are too long, one is 43 inches and the other is 52 inches long.\*
6. The battery leads have a welding plug spliced into the leads and there is a splice in the lead that is not adequately insulated.\*
7. The deck mounted speed indicator has the wrong bolt in the cover. The bolt is not the correct bolt for the lenses.
8. There is a cut cable conduit and the cable is lying on the drive shaft. The conduit has been taped.\*
9. The pump motor cable has been pulled from the gland.\*
10. The gland nut for the master controller in the operator's deck is not secure.\*
11. The battery does not have an approval tag.
12. The Stahl barrier relay does not have an IA number on the tag.

**Conclusion:** Many of the 131 safety defects identified by the Accident Investigation electrical team within the 19 violations discussed in this section were obvious, extensive, and of a nature that depicts Massey's disregard for the requirements of this standard. While there were a number of violations that inspectors should have seen if they existed at the time of the inspection, interviews with District 4 inspectors, inspection notes, and citations did not disclose any instances in which a permissibility violation was identified and not cited. Additionally, some permissibility violations were technical in nature and required the expertise of an electrical specialist to identify. Other violations may have occurred after inspectors examined the equipment involved.

District 4 regular inspectors did not uniformly display the level of technical skills required to conduct permissibility inspections of section electric machinery and equipment.

*30 CFR 75.512 - Electrical Equipment; Examination, testing and maintenance*

**Requirements:** Mandatory safety standard 30 CFR 75.512 required that "All electric equipment shall be frequently examined, tested, and properly maintained by a qualified person to assure safe operating conditions. When a potentially dangerous condition is found on electric equipment, such equipment shall be removed from service until such condition is corrected. A record of such examinations shall be kept and made available to an authorized representative of the Secretary and to the miners in such mine."

**MSHA Policies and Procedures:** The *General Coal Mine Inspection Procedures and Inspection Tracking System Handbook* directed inspectors to review all records of Weekly Examination of Underground Electric Equipment during each regular inspection. Before the inspection is completed, records shall be reviewed back in time to the ending date of the previous regular inspection.

The *Program Policy Manual* included the following policy for 30 CFR 75.512:

The required examinations and tests must be thorough enough to insure that the electric equipment has not deteriorated through neglect, abuse or normal use into an unsafe condition that could result in a shock, fire, or other hazard to the miners.

The record of examinations of electric equipment required by this Section shall list separately each individual piece of electric equipment in the mine.

If the qualified person making the required examinations and test finds any potentially dangerous condition, that person shall immediately cause the defective equipment to be removed from service until such condition is corrected.

If each individual piece of electric equipment is not listed separately and identified with a serial or company number and the location of each unit, and if all dangerous conditions and corrective actions are not recorded, the records of weekly examinations of electric equipment are incomplete and shall be considered to be in violation of this Section.

**Statement of Facts:** Of all of the non-contributory violations cited by the Accident Investigation team, the single-most cited safety standard was 30 CFR 75.512. Most of these violations were failures to conduct weekly examinations, to record examinations, and to remove equipment from service when unsafe conditions were found.

The 85 violations cited under this mandatory safety standard accounted for nearly one-fourth of the total number of non-contributory violations. In these enforcement actions, 24 section 104(d)(2) orders were issued to the Operator, including two determined to be flagrant. In addition, 61 section 104(a) citations were issued.

In one of the flagrant orders, the Accident Investigation team determined that the continuous mining machine located on Headgate #22 Section was not being maintained in a safe operating condition. The deficiencies identified included:

(1) the cutter motor circuit breaker cannot be reset from outside the XP enclosure. The handle to reset the breaker has bolts missing in the mechanism. (2) inside the XP enclosure on the off-side of the machine containing the cutter motor circuit breaker, the 120 volt Rev relay is not mounted. It is being supported by the wiring for the relay. (3) the XP enclosure on the off-side of the machine where the cutter motor power conductors are connected is not securely mounted. The mounting bolts are broken and the XP enclosure is lying inside the compartment. (4) the conduit is missing from the cable to connect the antenna to the receiver (off machine component). (5) the 3/0 trailing cable is not properly bushed at the XP enclosure where the cable is attached to the machine. The individual conductors are all that are protruding through the packing gland. (6) The cable from the receiver to the antenna is not long enough to connect to the antenna. This is a remote controlled machine.

The Accident Investigation team also determined that the Operator failed to make an adequate weekly electrical examination of the continuous mining machine for the week prior to the explosion. The Accident Investigation team concluded the numerous citations issued for this machine should have been detected during the examination, and that some of the cited conditions had existed for a significant amount of time.

**Conclusion:** Many of the 30 CFR 75.512 violations cited were for the Operator's failure to conduct weekly electrical examinations in the week prior to the explosion. Some violations cited by the Accident Investigation team existed for months. Although, other violations may not have existed at the time equipment was last inspected some violations should have been observed and cited by District 4 inspectors prior to the explosion.

30 CFR 75.1002 - Installation of electric equipment and conductors; permissibility

**Requirements:** Mandatory safety standard 30 CFR 75.1002 requires that:

- (a) Electric equipment must be permissible and maintained in a permissible condition when such equipment is located within 150 feet of pillar workings or longwall faces.
- (b) Electric conductors and cables installed in or inby the last open crosscut or within 150 feet of pillar workings or longwall faces must be-
  - (1) Shielded high-voltage cables supplying power to permissible longwall equipment;
  - (2) Interconnecting conductors and cables of permissible longwall equipment;
  - (3) Conductors and cables of intrinsically safe circuits; and
  - (4) Cables and conductors supplying power to low- and medium-voltage permissible equipment.
  - (5) Shielded high-voltage cables supplying power to permissible continuous mining machines.

**Statement of Facts:** Inspection reports for UBB disclosed that District 4 enforcement personnel conducted permissibility inspections of longwall electric face equipment during each regular inspection after the section started production in September 2009. There were no violations of 30 CFR 75.1002 cited at UBB by District 4 inspectors prior to the explosion.

The longwall was last inspected for permissibility on March 15, 2010. The inspector's Time and Activity Report for that date shows that he spent a total of four hours on the MMU and two hours in outby areas. Follow-up interviews verified that the only electric equipment checked by the inspector was the headgate drive, stage loader, and high-voltage power systems of the longwall. A ROE inspector trainee, who was not a qualified electrician and had minimal longwall experience, was assigned by the inspector to check permissibility of the remainder of the longwall face equipment, including the shearer, tailgate drive electric equipment, face lighting systems, and associated electrical systems, such as electric shield controls and methane monitoring systems.

The inspector also assigned the ROE inspector trainee the task of checking the interior of the shearer's explosion-proof electrical compartment for frame cracks, which the inspector stated he had found during an earlier inspection of the machine. These checks and inspections, including the observation of the calibration of installed methane monitor sensors by the inspector trainee, were not personally monitored by the inspector. No violations were identified on the longwall equipment.

The ROE inspector trainee stated he was not comfortable conducting the inspection of the longwall equipment without the inspector's presence. During a follow-up interview, the inspector was asked if he was aware that permitting the inspector trainee to check the longwall systems without his presence was contrary to Agency policy and the District 4 SOP for mentoring trainees. He stated he was aware of that fact.

The Accident Investigation electrical team cited six non-contributory violations of 30 CFR 75.1002. Three were issued as section 104(d)(2) orders, and all were evaluated as S&S. There were 51 individual safety defects identified in these violations. Some of the cited safety defects may have existed during the last regular inspection. In the following examples, safety defects that should have been recognized by an inspector, if they existed during the March 2010 inspection of the longwall equipment, are indicated by an asterisk (\*).

The Accident Investigation team issued a section 104(a) citation (No. 4900517) for failing to maintain the shearer in permissible condition due to the following conditions:

1. One bolt was missing from the shearer XP enclosures retaining bar on the first compartment.\*
2. Lock washers was not being used for any of the bays of the shearer control panel XP.\*
3. There was a terminating diode in the shearer cable junction box that was partially terminated inside the box.
4. The incoming 4,160 volt shearer cables gland nut was not supplied with a securing wire tie.\*

5. The shearer cable junction box had 10.9 bolts installed, while 12.9 bolts were the approved type.
6. A piece of flatbar (not attached) was keeping the shearer termination box in place. The mounting bolts were removed.\*
7. The left shearer cutter motor RTD was not connected as shown in the approval. The wiring from the RU1 (RTD unit) was connected to the two white wires of the motor and reads 0.6 ohms.
8. The gland nut for the left cutter motor did not have a retaining screw to hold the gland nut in place.\*
9. The methane monitor lens retaining strap had one bolt missing and the strap is bent.\*
10. The haulage motor's ground fault protection circuitry was disabled on the JNAO controller.

The Accident Investigation team issued a section 104(d)(2) order (No. 8250024) for failing to maintain the shield electrics and lighting circuit on the longwall section in permissible and approved condition due to following conditions:

1. An opening in excess of .005 inches was present under the lid of the power supply on the #63 shield.\*
2. The packing nuts on the 110 volt power cables on the power supplies on #83, 103, 123 shields had less than 1/8 inch clearance between the gland nut and gland.\*
3. The snap ring on the diode receptacle inside the power supply at #173 shield was not in place.
4. The trip unit on the lighting circuit breaker was adjusted to 300 amps. The correct setting was 41 amps.
5. The lighting power supply at #43 shield had three missing flat washers.\*
6. Several intrinsically safe lighting cables were spliced.\*
7. The 110 volt lighting power cable was damaged at #62 shield.\*
8. The 110 volt lighting power cable was damaged at #38 shield.\*
9. Unapproved solenoids were being used on the valve banks of several shields.
10. The B-66 plug on the cable supplying power to the power supply for the Shield Control Center was not properly assembled. The snap ring behind the threaded outer shell had been slid back to allow the plug to be easily inserted into the receptacle.\*
11. The B-66 plug on the cable supplying power to the power supply for the MSU was not properly assembled. The snap ring behind the threaded outer shell had been slid back to allow the plug to be easily inserted into the receptacle.\*

**Conclusion:** Many of the 51 safety defects identified in the six violations cited under 30 CFR 75.1002 by the Accident Investigation team were obvious, extensive, and of a nature that depict the Operator's disregard for compliance with this standard. The Internal Review team's interviews with District 4 inspectors and evaluation of inspection notes and citations did not disclose any instances in which a permissibility violation was identified and not cited. However, the inspection of the longwall equipment conducted on March 15, 2010, was not conducted in accordance with MSHA policy and procedures. Many of the 51 safety defects cited by the Accident Investigation team likely existed at the time of the March 15, 2010, inspection. The incomplete inspection of this equipment allowed such violations to remain undetected until after the explosion on April 5, 2010.

Some District 4 regular inspectors did not have the technical skills required to conduct permissibility inspections of longwall equipment. While regular inspectors should have identified many of the permissibility violations cited by the Accident Investigation team, some violations were technical in nature and required the expertise of an electrical specialist to identify.

**Corrective Actions Taken:** MSHA divided District 4 into two separate districts in June 2011. The creation of the new District 12 doubled the number of Electrical Departments in the region.

**Recommendations:** The Administrator for Coal should collaborate with the Directors of EPD and Technical Support to provide refresher training for District 4 and 12 regular inspectors to assure they have appropriate skills to ensure uniform recognition of electrical violations.



The Administrator for Coal should direct the revision of the *General Coal Mine Inspection Procedures and Inspection Tracking System Handbook* to direct electrical or permissibility inspections of longwall systems to be conducted by electrical specialists or inspectors who hold a current MSHA electrical qualification card.

The Assistant Secretary should instruct the Directors of EPD and Technical Support to develop and provide advanced technical training on longwall mining equipment. This training should be provided to MSHA regular inspectors who are MSHA-qualified electricians and electrical specialists Agency-wide.

## **Violations Cited during Post-Accident Inspections outside the Explosion Area**

Inspectors from outside District 4 conducted the section 103(i) spot inspections and the two regular inspections from July through December 2010 in portions of the Mine outside the explosion area. Concurrently with these mandated inspections, the Accident Investigation team conducted a spot inspection of UBB, beginning the underground portion of this inspection in late June 2010. During these inspections, the teams spent 5,796 hours on-site at UBB and issued a total of 698 citations and orders. These included violations of the following categories of underground mandatory safety standards: 212 electrical, 142 ventilation, 79 roof control, 61 combustible materials and rock dusting, and 46 fire protection.

The Internal Review team evaluated the citations and orders issued during these inspections. The Internal Review team also conducted interviews with District 4 personnel and reviewed the records of inspections conducted before the explosion. These reviews and interviews indicated that inspectors did not identify and cite some violations that existed before the explosion. Since there was no mining activity in these areas between the time of the explosion and the time of the subsequent inspections, the majority of the violations would likely have existed when District 4 inspectors made their last inspections. However, during the six months immediately preceding the explosion, District 4 inspectors and specialists identified and cited approximately 50% more violations per on-site inspection-hour than inspectors from outside District 4 did after the explosion. Between October 1, 2009, and March 31, 2010, District 4 enforcement personnel spent 1,000 hours on-site at UBB and issued 187 citations and orders.

The Internal Review team determined that some of the electrical violations existed during the last inspection completed prior to the explosion but were not identified by District 4 inspectors. Some of the violations could have been identified by regular inspectors, while only a properly-equipped electrical specialist would have been likely to identify the remainder. Other violations, such as those related to ventilation, roof control, combustible material, and fire protection, likely existed when the affected areas or equipment was last inspected. For example, several of the violations related to fire suppression devices were at belt drives installed several months before the explosion.

District 4 personnel stated during interviews that they believed the District was understaffed. Some inspectors indicated they were often hurried in order to complete inspections on time. The Internal Review team determined through interviews that several inspectors were not adequately trained on many of the Agency's policies and procedures. These issues are discussed in more detail in various sections of this report.

**Conclusion:** Inspectors did not recognize and cite violations that existed at the Mine during the inspections conducted prior to the explosion. Contributing factors include the inexperience and lack of training of some District 4 inspectors, the ineffective oversight provided by supervisors and managers, and the lack of specialists who could provide technical assistance during inspections and guidance to inspectors when needed.

**Recommendations:** These concerns, and the recommendations for addressing them, are consistent with those regarding enforcement of specific standards presented in other sections of this report.