§ 74.15 Approval labels.

(a) Certificate of approval will be accompanied by photographs of designs for the approval labels to be affixed to each CMDPSU or CPDM, as appropriate.

(b) The labels showing approval by NIOSH and by MSHA shall contain such information as MSHA or NIOSH may require and shall be reproduced legibly on the outside of a CMDPSU or CPDM, as appropriate, as directed by NIOSH or MSHA.

(c) The applicant shall submit full-scale designs or reproductions of approval labels and a sketch or description of the position of the labels on each sampling device.

(d) Use of the approval labels obligates the applicant to whom the certificate of approval was issued to maintain the quality of the complete CMDPSU or CPDM, as appropriate, and to guarantee that the complete CMDPSU or CPDM, as appropriate, is manufactured or assembled according to the drawings and specifications upon which the certificate of approval was based. Use of the approval labels is authorized only on CMDPSUs or CPDMs, as appropriate, that conform to the drawings and specifications upon which the certificate of approval we based.

§ 74.16 Material required for record.

(a) As part of the permanent record of the approval application process, NIOSH will retain a complete CMDPSU or CPDM, as appropriate, and MSHA will retain a CMDPSU or CPDM, as appropriate, that has been tested and certified. Material not required for record purposes will be returned to the applicant at the applicant's request and expense upon receipt of written shipping instructions by MSHA or NIOSH.

(b) As soon as a CMDPSU or CPDM, as appropriate, is commercially available, the applicant shall deliver a complete sampling device free of charge to NIOSH at the address specified on the NIOSH Web page: *http://www.cdc.gov/niosh/mining*.

§ 74.17 Changes after certification.

(a) If the applicant desires to change any feature of a certified CMDPSU or a certified CPDM, the applicant shall first obtain the approval of NIOSH pursuant to the following procedures:

(1) Application shall be made as for an original certificate of approval, requesting that the existing certification be extended to encompass the proposed change. The application shall be accompanied by drawings, specifications, and related material.

(2) The application and accompanying material will be examined by NIOSH to determine whether testing of the modified CMDPSU or CPDM or components will be required. Testing will be necessary if there is a possibility that the modification may adversely affect the performance of the CMDPSU or CPDM. NIOSH will inform the applicant whether such testing is required.

(3) If the proposed modification meets the pertinent requirements of these regulations, a formal extension of certification will be issued, accompanied by a list of new and revised drawings and specifications to be added to those already on file as the basis for the extension of certification.

(b) If a change is proposed in a pump unit of a certified CMDPSU or in electrical components of a CPDM, the approval of MSHA with respect to intrinsic safety shall be obtained in accordance with the procedures set forth in § 74.11(d).

§ 74.18 Withdrawal of certification.

Any certificate of approval issued under this part may be revoked for cause by NIOSH or MSHA which issued the certificate.

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DEPARTMENT OF LABOR

Mine Safety and Health Administration

30 CFR Parts 18 and 75

RIN 1219–AB34

High-Voltage Continuous Mining Machine Standard for Underground Coal Mines

AGENCY: Mine Safety and Health Administration, Labor.

ACTION: Final rule.

SUMMARY: This final rule revises the Mine Safety and Health Administration's (MSHA's) electrical safety standards for the installation, use, and maintenance of high-voltage continuous mining machines in underground coal mines. It also revises MSHA's design requirements for approval of these mining machines. The final rule will allow mine operators to use high-voltage continuous mining machines with enhanced safety protection against fires, explosions, and shock hazards and will facilitate the use of advanced equipment designs.

DATES: The final rule is effective on June 7, 2010. The incorporation by reference in this rule is approved by the Director of the Federal Register as of June 7, 2010.

FOR FURTHER INFORMATION CONTACT: Patricia W. Silvey, Director, Office of Standards, Regulations, and Variances, MSHA, 1100 Wilson Boulevard, Room 2350, Arlington, Virginia 22209–3939. Ms. Silvey can be reached at *silvey.patricia@dol.gov* (e-mail), 202–693–9440 (voice), or 202–693–9441 (facsimile). (These are not toll-free numbers.)

SUPPLEMENTARY INFORMATION: The outline of this final rule is as follows:

I. Introduction

A. Background

Horsepower for electrical equipment in mines has increased over the years. The voltages required to operate this equipment have also increased to accommodate the design of safe, practical, and efficient equipment. Because of the industry's need for higher voltages and the marked improvement in the design and manufacturing technology of high-voltage components, MSHA has established requirements for use of high-voltage electrical equipment such as longwall systems. This rule establishes additional requirements to address the use and approval of high-voltage continuous mining machines. These additional requirements preserve safety and health protections for miners.

MSHA's existing standards do not allow the use of high-voltage continuous mining machines because high-voltage mining machines were not available when the standards were developed. MSHA has granted 52 Petitions for Modification (PFMs) since 1997 to allow mine operators to use this equipment. In granting the PFMs, MSHA determined that the methods the mine operator proposed to follow when using the high-voltage equipment would at all times guarantee no less than the same measure of protection afforded the miners by the existing standards.

On July 16, 2004, MSHA published a proposal (69 FR 42812) to establish design requirements in part 18 for approval of high-voltage continuous mining machines operating in production areas of underground mines. The proposal also included new requirements in part 75 for the installation, use, and maintenance of high-voltage continuous mining machines in underground coal mines.

In the proposal, MSHA announced that it would hold four public hearings in September 2004, and would allow comments through October 14, 2004. However, on August 23, 2004, MSHA published a notice changing the public hearing dates to November 2004 and extending the comment period to December 10, 2004 (69 FR 51787). Based on the review of all comments and testimony, MSHA re-proposed provisions related to the types of trailing cables that could be used with high-voltage continuous mining machines and the types of cable handling equipment that must be used when handling energized high-voltage trailing cables (71 FR 15359, March 28, 2006). In developing the final rule, MSHA considered the comments, hearing testimony, and granted PFMs.

B. Petition for Modification Requirements in the Final Rule

The final rule includes most of the requirements that were in the granted PFMs. In each instance where a PFM requirement was not included in the rule, MSHA has addressed the Agency's rationale in the section-by-section analysis of the preamble.

This final rule supersedes all PFMs granted prior to the effective date, and eliminates the need for mine operators to file for a PFM to use high-voltage continuous mining machines with voltage up to 2,400 volts.

II. Discussion of the Final Rule

A. General Discussion—Part 18—Electric Motor-Driven Mine Equipment and Accessories

The final rule addresses design requirements for approval of high-voltage continuous mining machines. The rule is intended to prevent the following hazards:

(1) High-voltage arcing;

(2) Ignition of a methane-air mixture surrounding the machine if an arc or methane explosion occurs within the explosion-proof enclosure;

(3) Enclosure failure from an increased pressure rise if an arc or methane explosion occurs within the explosion-proof enclosure; and

(4) Electrical shock hazards to miners when working with or around high-voltage equipment.

One commenter stated that the proposal did not provide the same level of safety that some of the granted PFMs provided. This commenter expressed concern that MSHA was trying to issue a one-size-fits-all regulation while mine-specific PFMs better assure safety. MSHA does not believe that the final rule represents a generic approach or compromises safety. MSHA reviewed all provisions contained in granted PFMs and the final rule includes most of the provisions. However, in some cases, the Agency revised the language in the PFMs to allow more flexibility for mine specific conditions. The Agency explained at the public hearing that Part 18 covers this commenter's examples and should eliminate the concerns. Additionally, the final rule incorporates additional safety measures such as short-circuit, under-voltage, sensitive ground-fault protection, a look-ahead circuit, cable handling methods, and cable inspection procedures that would assure the same level of safety as the granted PFMs.

This final rule provides a mining environment as safe as the existing environment and facilitates the use of advanced equipment designs.

B. General Discussion—Part 75—Mandatory Safety Standards—Underground Coal Mines

This final rule revises 30 CFR Part 75 to establish mandatory electrical safety standards for the proper installation of high-voltage continuous mining machines, electrical and mechanical protection of the equipment, handling of trailing cables, and procedures for performing electrical work. These safety standards include new provisions as well as most of the provisions contained in granted PFMs.

There are 27 high-voltage continuous mining machines used in 8 underground coal mines that have been granted PFMs. Some of the requirements in this final rule are not included in those PFMs. Accordingly, mine operators with granted PFMs who wish to continue using high-voltage continuous mining machines will be required to comply with the additional requirements specified in this final rule. These additional requirements include new testing and recordkeeping requirements for tramming the machine in and out of the mine. In addition, there may be other new provisions that mine operators must adopt, such as following the cable manufacturers' recommended procedures when pulling the trailing cable with equipment other than the continuous mining machine (See § 75.828).

The final rule also revises § 75.1002 by adding paragraph (b)(5) to allow the use of high-voltage continuous mining machines in areas where permissible equipment is required.

III. Section-by-Section Analysis

A. Part 18—Electric Motor-Driven Mine Equipment and Accessories

Section 18.54 High-Voltage Continuous Mining Machines

Final § 18.54(a) is derived from existing requirements for high-voltage longwall mining systems and is similar to the proposal. The final rule retains the proposed requirement that low- and medium-voltage circuits in each motor-starter enclosure be separated from high-voltage circuits by barriers, partitions, or covers. The purpose of this provision is to protect persons from coming in contact with energized high-voltage conductors or parts when testing and troubleshooting low- and medium-voltage circuits.

Several commenters expressed concern over this proposal. They indicated that in order to comply with the proposed provisions, existing high-voltage continuous mining machines would need to be retrofitted with

additional interlocked barriers and partitions to separate low- and medium-voltage from high-voltage components and circuits. One commenter stated that it is not the location of components that is the risk, but rather the access to energized high-voltage components. The commenter further stated that barriers, partitions, or the enclosure itself can prevent access. The primary purpose of proposed paragraph (a) is to prevent access to energized high-voltage components and circuits. In the final rule, MSHA has revised the proposal to clarify its intent to assure that existing equipment would not need retrofitting. The final rule permits high-voltage and low- and medium-voltage components and circuits in the same compartments if barriers are provided and covers are arranged so that testing and troubleshooting can be performed without exposing persons to any high-voltage conductors or parts. This change allows for flexibility in design and does not reduce safety for miners.

Final paragraph (a), like the proposal, requires barriers and partitions to be constructed of grounded metal or nonconductive insulating board.

One commenter expressed a preference for using barriers made of insulating boards rather than grounded metal, but stated that either is acceptable. MSHA agrees that use of either material would meet the requirements of final paragraph (a).

Final paragraph (b) requires that each removable cover, barrier, or partition of a motor-starter enclosure that provides access to high-voltage components be provided with at least two interlock switches that automatically de-energize the high-voltage components when the cover, barrier, or partition is removed.

A commenter expressed concern with the proposed requirement for interlock switches on all barriers, partitions, and covers. The commenter requested that MSHA not require interlock switches except when the cover, barrier, or partition provides access to energized high-voltage circuits or parts.

MSHA did not intend to require interlock switches on all barriers, partitions, and covers and has clarified the language in the final rule to require interlock switches only when there is direct access to high-voltage circuits. Interlock switches protect miners from shock hazards by de-energizing high-voltage circuits when barriers, partitions, or covers are removed.

Final paragraph (c), like the proposal, requires that circuit-interrupting devices be designed and installed to prevent automatic re-closure to protect miners from electrical shocks, fires, explosions, and unintentional machine movement. For example, a roof-collapse or equipment insulation failure can result in short-circuit or ground-fault condition. This could result in the automatic re-closing of the circuit-interrupting device and pose a hazard to miners. MSHA received no comments on this proposal.

Final paragraph (d), like the proposal, includes requirements for the grounding of the electrostatic shield for high-voltage transformers supplying control voltages on continuous mining machines.

Final paragraph (d)(1), like the proposal, requires that the nominal control voltage not exceed 120 volts line-to-line. Limiting the control voltages to 120 volts line-to-line reduces the potential for electrocution of miners. This provision is consistent with granted PFMs. MSHA received no comments on this proposal.

Final paragraph (d)(2), like the proposal, requires that control transformers with high-voltage primary windings in each high-voltage motor-starter enclosure, or that supply control power to multiple motor-starter enclosures, have an electrostatic (Faraday) shield installed between the primary and secondary windings. The purpose of the electrostatic shield is to isolate the high-voltage from lower-voltage circuit. This protects miners from high-voltage shocks should a fault develop between the primary and secondary windings. Electrostatic shielding also prevents transients (sudden short-term changes in voltage and current) occurring on the primary circuit from being transferred to the secondary circuit. These transients can damage equipment and create the risk of a fire and electrical shock.

Final paragraphs (d)(2)(i) and (d)(2)(ii) address requirements for grounding the electrostatic shield. If the transformer has an external grounding terminal, paragraph (d)(2)(i) requires the shield to be connected from the grounding terminal to the equipment ground by a minimum of a No. 12 American Wire Gauge (A.W.G.) grounding conductor. This requirement will assure proper current carrying capacity and mechanical strength of the grounding conductor.

If the transformer does not have an external terminal, paragraph (d)(2)(ii) requires that the electrostatic shield be connected to the transformer frame by an internal conductor. This conductor, generally installed when the transformer is manufactured, is considered an extension of the shield and therefore may be smaller than a No. 12 A.W.G. In this case, bolting the transformer frame to the equipment enclosure will provide the required path to ground, as long as an effective low impedance electrical connection is maintained. MSHA received no comments on these proposals.

Final paragraph (e), like the proposal, addresses requirements for indicator light circuits. Final paragraph (e)(1) requires a grounded-phase indicator light on any ungrounded, three-phase power circuit onboard the machine to alert the machine operator when a grounded-phase condition occurs. Ungrounded circuits include high-voltage transformers that power low- and medium-voltage circuits. The secondary windings of these transformers are connected in an ungrounded configuration. With ungrounded systems, the capacitive coupling between each phase conductor and ground can subject the ungrounded system to dangerous over-voltages resulting from intermittent ground faults. If a second phase is grounded, a short-circuit condition will occur and cause arcing between components. This could result in a methane-air explosion, cause failure of the enclosure, and expose miners to electrical shock. MSHA received a number of comments on this proposal.

Some commenters stated that a grounded phase indicator light should be required on all high-voltage continuous mining machines. MSHA does not agree. This requirement is unnecessary when the three-phase power circuits onboard are grounded because the circuits are protected with ground-fault devices that automatically trip the circuit breaker at the power center. Currently, all 2,400-volt continuous mining machines have grounded-phase indicator light circuits because they have ungrounded power circuits onboard.

Several commenters stated that lower voltage continuous mining machines and high-voltage shearing machines are not required to have a grounded-phase indicator light circuit and have operated many years without incident. They further stated that grounded-phase indictor light circuits are unnecessary and create a shock hazard for those who perform maintenance on the machine.

In response, MSHA notes that lower voltage continuous mining machines and high-voltage shearing machines are designed differently from high-voltage continuous mining machines. Explosion-proof enclosures onboard low- and medium-voltage continuous mining machines and explosion-proof enclosures for high-voltage shearing machines are designed and tested to withstand arcing faults within the enclosure. On a high-voltage continuous

mining machine, however, only explosion-proof enclosures containing high-voltage switchgear are designed and tested to withstand internal arc faults. High-voltage continuous mining machines also have explosion-proof enclosures that do not contain high-voltage switchgear. These enclosures are not designed and tested to withstand high-energy arcing faults. Therefore, to prevent ignition hazards, the final rule requires indicator light circuits to assure that arcing does not occur and injure miners. Additionally, maintenance personnel are not exposed to shock hazards if they follow the troubleshooting and testing procedures specified in this final rule. MSHA believes that a greater hazard exists when a grounded-phase condition goes undetected.

Final paragraph (e)(2), like the proposal, requires that the indicator light be installed so that the machine operator can readily observe it from any location where the continuous mining machine is normally operated. MSHA received no comments on this proposal.

Final paragraph (e)(3), like the proposal, requires that the onboard ungrounded, three-phase power circuit have a test circuit for the grounded-phase indicator light circuit. It also requires that the test circuit be designed so that it can be activated without removing any enclosure covers and without creating a double-phase-to-ground fault. This requirement will assure proper operation of the indicator light circuit and that personnel conducting the test are not exposed to any hazard. MSHA received no comments on this proposal.

Final paragraph (f) addresses the current carrying capacity, outside diameter, and the physical properties of high-voltage trailing cables. Unlike the proposal, the final rule does not incorporate by reference the Insulated Cable Engineer's Standards (ICEA) S–75–381/National Electrical Manufacturer's Association (NEMA) Standard, NEMA WC 58–1997, but rather includes a table for the outside diameters and ampacity ratings for high-voltage trailing cables. This table is referenced as Table 10 in Appendix I of 30 CFR Part 18, and is consistent with tables contained in the ICEA S–75–381/NEMA WC 58–1997. The purpose of the table is to standardize the ampacity and outer diameter of cables to ensure the interchangeability of trailing cables provided by different manufacturers.

A commenter expressed concern that proposed paragraph (f) did not specifically limit trailing cable length. Existing § 18.35(a)(5) specifies the maximum allowable lengths for trailing cables used to conduct electrical energy to production equipment, including continuous mining machines. For this reason, the Agency does not believe that it needs to limit trailing cable length in this provision.

Final paragraph (f)(1), like the proposal, requires that trailing cables be constructed to include 100 percent semi-conductive tape shielding over each insulated power conductor. Final paragraph (f)(2) requires a grounded metallic braid shielding over each power conductor. The combination of semi-conductive tape and grounded metallic shielding around each power conductor provides symmetrical distribution of voltage stresses on the conductor insulation. Shielding also prevents transients on power systems. These provisions protect miners from shock and electrocution. MSHA received no comments on these proposals.

Final paragraph (f)(3) requires that the cable include either a ground-check conductor not smaller than a No. 10 A.W.G., or a center ground-check conductor not smaller than a No. 16 A.W.G. stranded conductor. The term "stranded" has been added in the final rule to describe the No. 16 A.W.G. ground-check conductor for accuracy. The ground-check conductor is either located in the outer interstice of a trailing cable along with the grounding conductors or in the center of the trailing cable. Cables designed with a No. 16 A.W.G. center ground-check conductor have been successfully used in high-voltage longwall applications for several years.

A commenter indicated that the reference in the proposed preamble to the No. 16 A.W.G. "stranded" conductor describing the center ground-check conductor is technically incorrect, and suggested "special annular stranded with extensibility." MSHA does not agree. Cable manufacturers and ICEA/NEMA standards reference the center ground-check conductor as "stranded." The terminology suggested by the commenter is a description of the quality of the No. 16 A.W.G. ground-check conductor and is consistent with the cable designs specified in the ICEA/NEMA standard.

Final paragraph (f)(4), like the re-proposal, addresses the design and construction of high-voltage trailing cable jackets. MSHA received several comments on the proposal.

Some commenters suggested that the final rule allow single-jacketed cables made of thermoplastic polyurethane (TPU) because of its high tensile strength and resistance to abrasion and tear. A commenter stated that the minimum tensile strengths for the single-jacketed and double-jacketed cables are 5,000 and 2,400 pounds per square inch, respectively; and tear strengths are 120 and 40 pounds per inch, respectively. The commenter also stated that the TPU material can be made in a color other than black, that TPU-jacketed trailing cables have been in use in the mining industry for 11 or 12 years, and that they have been used successfully on mining equipment such as shearing machines and medium-voltage continuous mining machines.

Others stated that at least one granted PFM permitted the use of a TPU jacket as an alternative to the double-jacket requirement on two high-voltage continuous mining machines and on shuttle cars for over two years without any problems.

Based on the comments, MSHA re-proposed paragraph (f)(4) to allow the option of using either a double-jacketed or a single-jacketed cable. The final rule contains requirements for both types of trailing cables.

Final paragraph (f)(4)(i) requires that a double-jacketed cable, if used, consist of two reinforced layers of jacket material, with the inner layer a distinctive color from the outer layer. It also requires that black not be used for either layer. If used, a double-jacketed cable must have tear strength of more than 40 pounds per inch thickness and a tensile strength of more than 2,400 pounds per square inch.

Final paragraph (f)(4)(ii) specifies the requirements for a single-jacketed cable. If used, a single-jacketed cable must have tear strength of more than 100 pounds per inch thickness and a tensile strength of more than 4,000 pounds per square inch, and not be black in color. The final rule specifies the minimum values for the tear and tensile strength based on granted PFMs.

In the re-proposal, MSHA requested comments on the minimum tear and tensile strength values for single-jacketed cables and received none.

Final paragraph (g), like the proposal, requires manufacturers to provide safeguards against corona on all 4,160-volt circuits in explosion-proof enclosures.

Corona is a luminous discharge that occurs around electric conductors that are subject to high electric stresses. Corona can cause premature breakdown of insulating materials in explosion-proof enclosures onboard the high-voltage continuous mining machine. This poses the risk of arcing and may result in explosion. Although corona usually does not present a hazard until a voltage of 8,000 volts is reached, safeguards should be taken at 4,160

volts, the maximum voltage permitted under Part 18. Safeguards include using cables with a corona-resistant insulation such as ethylene propylene to avoid small nicks or cuts in the cable insulation and to minimize high-voltage transients. MSHA received no comments on this proposal.

Final paragraph (h), like the proposal, requires limiting the maximum explosion pressure rise within an enclosure to 0.83 times the design pressure for any explosion-proof enclosure containing high-voltage switchgear. The requirement protects miners against explosion hazards that may arise from the effects of sustained high-voltage arcing faults. Arcing faults may significantly contribute to a pressure rise in an explosion-proof enclosure during an internal methane-air explosion. A pressure rise above the design limit of the enclosure can cause the explosion-proof enclosure to fail to contain the methane explosion. MSHA received no comments on the proposal.

Final paragraph (i), like the proposal, prohibits high-voltage electrical components located in explosion-proof enclosures from being coplanar with a single-plane flame-arresting path. This provision prevents the heat or flame from an arc or methane explosion in an explosion-proof enclosure from igniting a methane-air mixture surrounding the enclosure by preventing conductor material particles from being expelled through the flame-arresting path. The possibility of this occurring with multi-plane flame-arresting path surfaces is non-existent because deflecting the path prevents ignitions by expelled particles. MSHA received no comments on this proposal.

Final paragraph (j), like the proposal, requires that rigid insulation between high-voltage terminals (phase-to-phase or phase-to-ground) be designed with creepage distances in accordance with the table specified in this section. The distances in the table provide adequate isolation to prevent a phase-to-phase or phase-to-ground fault that could cause a possible explosion. The required creepage distances are based on the phase-to-phase use voltage and the Comparative Tracking Index (CTI) of the insulation used. An appropriate method of determining the CTI of the electrical insulating material is described in the American Society for Testing and Materials Standard, ASTM D3638 "Standard Test Method for Comparative Tracking Index of Electrical Insulating Materials." The creepage distances in the table are consistent with most commercially available high-voltage components to which this provision applies. MSHA received no comments on the proposal.

Final paragraph (k), like the proposal, specifies minimum free distances (MFDs) in motor-starter enclosures. If the MFDs are below the values specified in the table, the enclosure could fail and cause an explosion. MFDs are distances between the wall or cover of an enclosure and uninsulated electrical conductors inside the enclosure. These MFDs are established to prevent wall or cover damage that might result from arcing.

Final paragraph (k)(1), like the proposal, requires that values not specified in the table be calculated using a specific engineering formula. This formula is based on existing longwall requirements. Final paragraph (k)(2) requires that the MFD be increased by 1.5 inches for 4,160-volt systems and by 0.7 inches for 2,400-volt systems when the adjacent wall area is the top of the enclosure. This increase in distance is necessary to account for the thermal effects of arcing due to heat rising within the enclosure. Final paragraph (k)(2) also addresses the use of a steel shield in conjunction with an aluminum wall or cover. Under these circumstances, the thickness of the steel shield is used to determine the MFD. MSHA received no comments on the proposal.

Final paragraph (l), like the proposal, addresses static pressure testing of explosion-proof enclosures containing high-voltage switchgear. Final paragraph (l)(1) requires that, prior to performing the explosion tests, a static pressure test be performed on each prototype design of an explosion-proof enclosure housing high-voltage switchgear. It also establishes the static pressure testing and performance requirements for explosion-proof enclosures housing the high-voltage switchgear.

Final paragraph (l)(2) requires that every explosion-proof enclosure containing high-voltage switchgear manufactured after the prototype was tested undergo a static pressure test or follow an MSHA-accepted quality assurance procedure covering inspection of the enclosure. MSHA received no comments on this proposal.

B. Part 75—Mandatory Safety Standards—Underground Coal Mines

Section 75.823 High-Voltage Continuous Mining Machines; Scope

Final § 75.823 describes the scope of this standard. The standard addresses requirements for use of high-voltage continuous mining machines of up to 2,400 volts in underground coal mines. Final § 75.823 also defines the term "qualified person" to mean a person meeting the requirements specified in existing § 75.153.

MSHA received no specific comments on this proposal. However, several comments relating to machine voltage are relevant here. One commenter agreed with the proposed rule which would have allowed machines to operate at 4,160-volts. Other commenters opposed allowing the voltage to exceed 2,400-volts, the limit in granted PFMs. They stated that the industry has no experience with 4,160-volt continuous mining machines and that these machines are more dangerous than 2,400-volt machines.

The final rule limits the voltage of the continuous mining machines to 2,400 volts because of the Agency's lack of experience with 4,160-volt continuous mining machines in coal mines. Part 18, however, allows for approval of equipment up to 4,160 volts. Mine operators seeking MSHA approval to use 4,160-volt continuous mining machines would have to file a petition for modification.

Section 75.824 Electrical Protection

Final § 75.824 establishes the electrical protection requirements for high-voltage continuous mining machines. Effective electrical protection reduces the likelihood of ignitions, fires, and electrical shocks. With the exception of (a)(2)(ii), this section is based on granted PFMs. This section of the final rule is the same as the proposed rule except that non-substantive changes have been made for clarity.

Final paragraph (a) requires the use of an adequate circuit-interrupting device capable of providing short-circuit, overload, ground-fault, and under-voltage protection. The purpose of a circuit-interrupting device is to interrupt the circuit in which it is used without damage to itself when subjected to the maximum voltage and current of the system. Short-circuit and overload protection prevent damage to cables and motors that can result from arcing and overheating. Ground-fault protection minimizes the risk of shock and electrocution. Under-voltage protection prevents the unintentional movement of equipment which can place miners at risk when power is lost and then restored.

Final paragraph (a)(1)(i) specifies the current setting for a short-circuit protective device. The device is required to be set at the lower of: (1) The setting specified in the approval documentation, or (2) 75 percent of the minimum available phase-to-phase

short-circuit current at the continuous mining machine.

The approval documentation specifies the maximum allowable setting of the breaker required to protect the trailing cable. This setting takes into consideration the cable size and length, and the motor starting current. If 75 percent of the minimum available short-circuit current is less than the setting specified in the approval, the breaker setting will be based on that amount.

One commenter suggested that MSHA eliminate the phrase "whichever is less" from the rule to allow the design of systems that could utilize smaller cables and reduce injuries from handling cables. MSHA does not agree with this commenter. If the size of the trailing cable used is different than the cable size specified in the approval documentation, the machine would not be permissible. Furthermore, eliminating the words "whichever is less," would allow the mine operator to set the circuit-interrupting device at a value that may cause it not to trip. For example, if the mine operator chooses to set the circuit-interrupting device at 1,200 amps as required in the approval, and 75 percent of the minimum available short-circuit current is only 750 amps, the circuit-interrupting device would not trip.

Final paragraph (a)(1)(ii) revises the proposed rule to allow the short-circuit device protecting the trailing cable to have an intentional time delay not exceeding 0.050 seconds. The purpose of permitting a time delay is to eliminate nuisance tripping during motor starting.

Proposed paragraph (a)(1)(ii) required that the time delay not exceed the setting specified in the approval documentation or 0.050 seconds, whichever is less. After further review, MSHA found that the approval documentation does not specify a time delay. No comments were received on this proposal.

Final paragraph (a)(2) establishes requirements for ground-fault protection.

Final paragraph (a)(2)(i) requires a neutral grounding resistor to limit ground-fault currents to not more than 0.5 amps. Neutral grounding resistors are used in resistance grounded systems to limit the level of ground-fault current in a circuit. The use of a 0.5 amps neutral grounding resistor in conjunction with the ground-fault device specified in final paragraph (a)(2)(ii) will provide additional protection to miners from shock and fire hazards. MSHA received no comments on this proposal.

Final paragraph (a)(2)(ii) requires that the circuit extending to the continuous mining machine be protected by a ground-fault device set at not more than 0.125 amps. The provision also allows a maximum time delay of up to 0.050 seconds. The 0.125-amps limit is based on MSHA's experience and knowledge that sensitive ground-fault devices are commercially available and have been successfully used to detect ground-fault currents. The ground-fault device would have to operate within 0.050 seconds when exposed to 0.125 amps or more. MSHA received no comments on this proposal.

Final paragraph (a)(2)(iii) requires a look-ahead circuit to detect a ground-fault condition and prevent the closing of a circuit-interrupting device when the ground-fault exists in a circuit. Detection of the ground-fault condition prior to energizing the circuit will protect miners from the risk of electrical shock. Additionally, the final rule incorporates the best practice to prevent the circuit-interrupting device from repeatedly closing when a ground-fault condition exists because that could create a second ground-fault which would result in a short-circuit condition. MSHA received no comments on this proposal.

Final paragraph (a)(2)(iv) requires a backup ground-fault device to detect an open neutral grounding resistor under a ground-fault condition. This device will provide additional protection. Once an open neutral grounding resistor is detected, the backup device will cause the circuit-interrupting device to de-energize that circuit at 40 percent of the voltage developed across the resistor. This value provides a safety factor. Additionally, this provision allows the backup device to have a maximum time-delay setting of 0.250 seconds. The time-delay setting is low enough to assure quick de-energization of the circuit when the neutral resistor opens and a ground-fault exists, while also allowing for selective tripping with the ground-fault protective device in final paragraph (a)(2)(ii).

One commenter had several concerns about this provision. The commenter stated that there were numerous problems with the potential transformer and voltage relay monitoring method as a backup device, which was used in MSHA's example. The commenter stated that potential transformers are not able to detect rectified faults because of ferroresonance. The potential transformer and voltage relay monitoring method has been widely used in the industry and MSHA is not aware of any problems associated with it. It is important to note that the proposal did not require the use of a particular backup device to detect an open neutral grounding resistor. Although MSHA listed this method as an example of a backup device in the proposal as one means of compliance, the Agency noted that other alternatives were acceptable.

The commenter also expressed concern that the proposal did not include a requirement for detecting a shorted resistor. The commenter stated that a shorted grounding resistor will not limit the voltage on the frame of portable equipment to 100 volts or less. The purpose of requiring a backup device is to detect a ground-fault condition when the neutral grounding resistor is open. The commenter's recommendation is not necessary because the ground-fault protection required in final paragraph (a)(2)(ii) will detect that condition and de-energize the circuit.

This commenter also suggested that the proposal be changed to require de-energization of the circuit within a certain time if the neutral grounding resistor opens, such as within 30 to 60 seconds. MSHA is not aware of any device that monitors a shorted neutral grounding resistor, nor does the Agency see the need for such a device. For the reasons stated above, no changes have been made to this section, and the final rule is the same as the proposal.

Final paragraph (a)(2)(v), like the proposal, requires a thermal device to detect an overheated neutral grounding resistor caused by sustained ground-fault current, and de-energize the incoming power. This device provides an added safety measure for miners.

The rule also requires that the overtemperature rating or setting of the device be the lower of: (1) 50 percent of the maximum temperature rise of the neutral grounding resistor, or (2) 302 °F (150 °C). Exposure of the neutral grounding resistor to sustained ground-fault currents generates heat which can cause the resistor to fail in the open mode. Failure of the resistor in an open mode will not provide ground-fault protection and increases the risk of shock hazards. The overtemperature setting requirement assures that the affected circuit is quickly de-energized under a sustained fault. MSHA's experience is that the temperature settings specified are high enough to prevent nuisance tripping while providing safe operating temperatures. Under the final rule, thermal protection must not be dependent on control power. This requirement recognizes that the loss of control power would prevent the operation of the detection device. Thermal protection includes, but is not

limited to, current transformers and thermal relays, thermostats, and other devices that sense overtemperature. MSHA did not receive any comments on the proposal.

Final paragraph (a)(2)(vi), like the proposal, requires a single window-type current transformer to encircle the three-phase conductors to activate the ground-fault device required in final paragraph (a)(2)(ii). It also prohibits the equipment grounding conductors from passing through the current transformer as this defeats operation of the ground-fault device and eliminates protection. Using the single-window type current transformer in conjunction with a ground-fault relay provides ground-fault protection for the circuit extending from the power center to the continuous mining machine. MSHA received no comments on this proposal.

Final paragraph (a)(2)(vii), like the proposal, requires a ground-fault test circuit for each ground-fault device. This provision requires that the test circuit inject no more than 50 percent of the current rating of the neutral grounding resistor through the current transformer. The purpose of the test circuit is to verify that a ground-fault condition will cause the corresponding circuit-interrupting device to open. MSHA received no comments on this proposal.

Final paragraph (a)(3), like the proposal, requires that the under-voltage device operate on a loss of voltage, de-energize the circuit, and prevent the equipment from automatically restarting. This provision is performance-oriented, which allows any under-voltage protective device that will operate on loss of voltage and prevent the circuit-interrupting device from automatically closing upon restoration of power. This requirement will reduce pinning and crushing risks to miners in case the equipment automatically restarts upon restoration of power. MSHA received no comments on this proposal.

Final paragraph (b), like the proposal, prohibits use of circuit-interrupting devices that automatically re-close after opening. Automatic re-closure allows a circuit that has been de-energized to become automatically re-energized. This provision will prevent automatic re-closing under fault conditions. Typically, faults occur in trailing cables due to damage from roof falls or when equipment runs over the cables. If this occurs, the use of a circuit-interrupting device designed to re-close automatically could present a risk of electrical shock and fire. MSHA received no comments on this proposal.

Final paragraph (c) requires a mine operator to take certain actions when a grounded-phase indicator light, if used, indicates a grounded-phase condition. Detection of a grounded-phase condition will reduce risks of electrical shock and arcing. The capacitive coupling between each phase conductor and ground can subject an ungrounded circuit to dangerous over-voltages from intermittent ground faults, which in turn can lead to arcing and insulation failure. Arcing can ignite methane and create a hazard to miners. Insulation failure can lead to another phase-to-ground failure and create a shock hazard.

Final paragraphs (c)(1) and (c)(2) specify the actions to be taken when a grounded-phase condition is indicated. Under paragraph (c)(1), once the indicator light shows that a grounded-phase condition has occurred, the machine must immediately be moved to an area where the roof is supported. This will minimize miners' exposure to roof falls while the equipment is being repaired. Final paragraph (c)(2) requires that that the grounded-phase condition be located and corrected prior to placing the machine back into operation. This requirement will protect miners from risks of electrical shocks.

MSHA received a number of comments concerning the indicator light circuit, and has addressed these comments in § 18.54(e). Except for minor editorial changes, the final provision is the same as the proposed rule.

Section 75.825 Power Centers

Final § 75.825 revises the proposal, and addresses the requirements for power centers that supply high-voltage continuous mining machines. The final rule includes provisions for disconnecting switches and devices, barriers and covers, interlocks, emergency stop switches, grounding sticks, and caution labels. These provisions reduce risks of electrical shocks, fires, and explosions.

Final paragraph (a), like the proposal, requires a main disconnecting switch in the power center that supplies power to the high-voltage continuous mining machines. The main disconnecting switch, when open, must de-energize the input power to all power transformers in the power center. This will provide a safe means of de-energizing high-voltage circuits in the power center without affecting the feed-through circuits. MSHA received no comments on the proposal.

Final paragraph (b), like the proposal, requires a disconnecting device for each circuit that powers a continuous mining machine. Disconnecting devices in power centers de-energize the power to the machine. Power must be de-energized prior to performing electrical work.

MSHA received no comments on this provision. In the final rule, MSHA has added clarifying language and defined "disconnecting device" as either a disconnecting switch or cable coupler.

Final paragraph (c), which was paragraph (c)(7) in the proposal, addresses labeling, design, and installation requirements for disconnecting switches specified in this final rule. This provision requires that each switch be labeled to clearly identify the circuit that it disconnects. MSHA's experience is that identifying the circuit being de-energized by the switch assures that the proper circuit is de-energized, which protects miners from exposure to electrical hazards. The design and installation requirements are specified in paragraphs (c)(1) through (c)(6) of the final rule.

Final paragraphs (c)(1) and (c)(2), like the proposal, require each disconnecting switch to have voltage and current ratings compatible with the circuits in which they are used. Improperly rated switches can cause overheating and arcing and may create a shock or fire hazard for miners. MSHA received no comments on these proposals.

Final paragraph (c)(3), like the proposal, requires that the disconnecting switch be designed and installed so that one can visually verify, without removing any covers, that the contacts of the device are open. If miners had to remove the cover to verify that the contacts are open, they could be exposed to energized high-voltage circuits and electrical shock risks. MSHA received no comments on the proposal.

Final paragraph (c)(4), like the proposal, requires the disconnecting switch to ground all power conductors on the "load" side when the switch is in the "open and grounded" position. It assures the discharge of any voltage caused by capacitance between the power conductors and ground. Grounding the circuit on the load side reduces the risk of shocks to miners who are working on the trailing cable or continuous mining machine. MSHA received no comments on the proposal.

Final paragraph (c)(5), like the proposal, requires that each disconnecting switch be designed so that it can only be locked when in the "open and grounded" position. A disconnecting switch that locks in the closed position could delay opening the switch during an emergency. This provision, in conjunction with the

requirements of final § 75.831, assures that the circuit will remain de-energized until work is completed. MSHA received no comments on the proposal.

Final paragraph (c)(6), like the proposal, requires that the disconnecting switch safely interrupt the full-load current in the circuit. A switch that is not capable of safely interrupting the full-load current could result in its destruction and injuries to miners from flash burns or flying parts.

The final rule provides an alternative if the switch is not designed to interrupt the full-load current of the circuit. It requires that the switch be designed to cause the circuit-interrupting device to automatically de-energize the incoming power before the disconnecting switch opens the circuit. MSHA received no comments on this provision and the requirement of the final rule is identical to the proposed rule.

Final paragraph (d) requires all compartments that provide access to high-voltage conductors or parts to have barriers or covers to prevent miners from coming into contact with energized circuits.

A commenter was concerned that the proposed rule would require that both a cover and a barrier be installed. This was not MSHA's intent. MSHA has revised the final rule to clarify that barriers or covers, or both, can be used.

Final paragraph (e), like the proposal, addresses the interlocking requirements between the control circuit and the main disconnecting switch.

Final paragraph (e)(1) requires that the interlock allow the control circuit to be energized through an auxiliary switch in the "test" position only when the main disconnecting switch is in the "open and grounded" position. When the main disconnecting switch is in the "open and grounded" position, the power conductors on the load side of the disconnecting switch are de-energized and grounded. The interlocking feature assures that, before the auxiliary switch can be placed in the "test" position, the main disconnecting switch is open and grounded.

Final paragraph (e)(2), like the proposal, requires that when the main disconnecting switch is "closed," the control circuit can only be powered through an auxiliary switch that is in the "normal" position. These requirements will prevent energization of the high-voltage circuits during testing and troubleshooting. MSHA received no comments on the proposed paragraph (e).

Final paragraph (f), like the proposal, was derived from granted PFMs. It requires that each cover or removable barrier of any compartment providing access to energized high-voltage conductors or parts have at least two interlock switches for the purpose of de-energizing exposed high-voltage conductors or parts when the cover or barrier is removed. While the granted PFMs did not specify how many interlock switches were required, the proposed rule required a minimum of two interlock switches as an added safety measure to protect miners against accidental contact with energized high-voltage circuits.

In the proposal, MSHA specifically requested comments on whether to add an exception for troubleshooting control circuits. A commenter suggested that each removable cover or barrier be interlocked to remove all power in the compartment before entering it, except when testing and troubleshooting control circuits. The commenter gave an example of some power centers that are designed with a circuit breaker in a separate incoming high-voltage compartment where the circuit breaker will remove power in other compartments instead of removing the incoming power.

MSHA believes that it is crucial to miners' safety that incoming power be de-energized when miners remove covers prior to performing electrical work. De-energizing incoming power rather than only the power in the compartment being accessed assures that miners will not be exposed to energized high-voltage circuits.

This commenter further suggested that MSHA require a single interlock switch instead of the two switches required in the proposed rule. The commenter stated that interlock switches expose miners to hazards when they troubleshoot failed switches. As noted in the proposal, MSHA has found that interlock switches might not operate effectively after exposure to the mine environment. To protect miners against accidental contact with energized high-voltage circuits, the final rule, like the proposal, requires two interlock switches to assure that at least one switch will function.

Another commenter stated that MSHA should not allow an exception for troubleshooting control circuits in the high-voltage compartments. MSHA believes that miners who troubleshoot and test energized circuits in accordance with the provisions in this and other existing rules, will be protected.

MSHA has considered comments and revised the proposal to allow troubleshooting and testing energized circuits when the control circuit is powered through an auxiliary switch in the "test" position.

Final paragraph (g), like the proposal, requires that an emergency stop switch be located on the outside of the power center. The switch will de-energize the incoming high-voltage if an emergency arises. This provision also requires that the switch be hard-wired to a fail-safe ground-wire monitor. In emergency situations, reliability of the stop-switch is critical. MSHA received no comments on the proposal.

Final paragraph (h), like the proposal, requires that the power center be equipped with a grounding stick to be used to discharge capacitors and circuits before electrical work is performed. The purpose of the grounding stick is to assure that all high-voltage capacitors are discharged and that all circuits and components are de-energized before electrical work is performed.

Capacitors are energy storage devices; they continue to be energized even after the circuit is de-energized. Although some capacitors are supplied with bleed-off resistors, these resistors can open and the capacitor will continue to be energized. A disconnecting switch blade may stick in the closed position with the switch in the open position. If this happens, one or more phases of the circuit would remain energized. Use of a grounding stick provides a last line of defense to assure that the person performing electrical work will not be exposed to energized high-voltage circuits.

Although there is no generally accepted definition, MSHA considers a grounding stick to be a live line tool (hot stick) made of either wood or fiberglass with a grounding attachment bonded to a No. ⅛ A.W.G. copper grounding conductor. To safely discharge the capacitors and parts, the grounding conductor would need to be permanently bonded to the power center frame.

The final rule requires that the power center have a label that identifies the location of the grounding stick to assure that the person performing the electrical work can easily find it. The rule requires that the grounding stick be stored in a dry location to maintain its effectiveness.

A commenter suggested that MSHA allow alternatives to the grounding stick to discharge capacitors or circuits. At this time, MSHA is not aware of any alternatives to the grounding stick. This provision will assure that energy storing components and circuits are discharged and de-energized before miners come in contact with them.

Another commenter agreed with the grounding stick requirement, stating that it will allow the safe discharge of stored energy and assure that miners

will not be exposed to high-voltage circuits. This commenter suggested that MSHA require steps to assure that energy stored in the cable after it is disconnected is discharged. Final paragraph (c)(4) requires that the disconnecting device ground all power conductors of the trailing cable when the device is in the "open and grounded" position. Therefore, MSHA has addressed this concern.

A third commenter stated that power centers that have a visual disconnect should not be required to have a grounding stick. Although the visual disconnecting device de-energizes the circuit it disconnects, it does not discharge capacitors and other circuits. Therefore, MSHA has not adopted the comment.

Based on comments, MSHA has clarified that the intent of the grounding stick is to discharge capacitors and de-energize high-voltage circuits.

Final paragraph (i), like the proposal, requires that all compartments that provide access to energized high-voltage conductors and parts display a caution label that warns miners against entering the compartment before de-energizing the incoming high-voltage. The label serves as a reminder to miners that the line side of a disconnecting switch remains energized when the switch is opened unless the incoming power to the switch is de-energized. The Agency did not receive any comments on the proposal.

Section 75.826 High-Voltage Trailing Cables

Final § 75.826, like the proposal, is derived from existing §§ 75.804 and 18.35 and specifies the requirements for high-voltage trailing cables.

Final paragraph (a) requires that the high-voltage trailing cable meet the design requirements of existing § 18.35 and the approval requirements of high-voltage continuous mining machines.

Final paragraph (b) allows two sizes of ground-check conductors depending on the cable design. The first option allows the use of a ground-check conductor not smaller than a No. 10 A.W.G. as required in existing § 75.804. This minimum size is required because the ground-check conductor is located on the periphery of the cable and is subjected to more flexing and bending, weakening the conductor and resulting in possible breakage or damage. As an alternative, the cable can have a ground-check conductor not smaller than the No. 16 A.W.G. located in the center of the cable. This design does not subject the ground-check conductor to the same stresses as the No. 10 A.W.G. when the cable is flexed. The main advantage of this alternative is the reduction of inter-machine arcing because the cable design will include three grounding conductors placed symmetrically. This cable design has been used successfully with high-voltage longwall equipment. It eliminates the need to petition for modification of § 75.804(a) when the cable is designed with a center ground-check conductor smaller than No. 10 A.W.G. but not smaller than a No. 16 A.W.G. No comments were received on the proposed section.

Section 75.827 Guarding of Trailing Cables

Final § 75.827 addresses requirements for guarding trailing cables. It renumbers proposed § 75.827(c) and (d) as final paragraphs (a) and (b).

Proposed § 75.827(a) would have required the high-voltage trailing cable to be supported on insulators or placed in an unused entry from the power center to the last open crosscut during advance mining, to within 150 feet outby any pillar workings during second mining, and to within 150 feet of the continuous mining machine when used in outby areas.

Some commenters were concerned that supporting the cable on insulators may subject shuttle or ram car operators to injuries if the cable is supported at canopy height. They stated that in muddy conditions, shuttle or ram cars could slide into the coal ribs and cause the equipment to hit and damage the cable, exposing the equipment operators to possible arc burns and electrical shock. They also stated that by placing the cable on the floor, the machine tires and not the canopy would hit the cable, and any resulting hazard would occur away from the machine operator. Other commenters agreed with the proposed language requiring that the cables be supported on insulators but suggested that the cable be installed only when it is de-energized. Others suggested that the cable be installed on insulators at a minimum height of 6.5 feet and 7.5 feet.

Commenters stated that an unused entry may not always be available to meet the proposed requirement to place the cable in an unused entry. After evaluating the comments, MSHA agrees that suspending the cable may be more of a hazard to miners than placing the cable on the mine floor. MSHA also agrees that an unused entry may not always be available. Therefore, the final rule does not contain the proposed requirements that the cable must be supported or placed in an unused entry.

Proposed § 75.827(b) permitted the temporary storage of cables on a sled or in a crosscut located between the power center and the last open crosscut. It required these storage locations to be barricaded and to have warning signs posted.

One commenter stated that in many cases, allowing temporary storage of trailing cables at the locations in the proposal would encourage storage of cables in mining sections, posing a safety threat to miners. The commenter further stated that the proposal was not practical or safe. In response to comments, the final rule does not contain the requirement for temporary storage of cables.

One commenter stated that the requirements of § 75.827 are excessive because the cable leaving the power center is the safest cable on the section and should not be required to meet additional requirements. MSHA does not agree with this commenter because the cable is still susceptible to damage by mobile equipment. Consequently, guarding and protecting the cable from damage by mobile equipment are important safety measures for the protection of miners.

Proposed § 75.827(c), redesignated as final § 75.827(a), addresses guarding of the trailing cable. Final paragraph (a)(1) specifies the locations where the high-voltage trailing cable must be guarded. These locations are: (1) From the power center cable coupler for a distance of 10 feet inby the power center; (2) from the entrance gland for a distance of 10 feet outby the last strain clamp on the continuous mining machine; and (3) any location where the cable could be damaged by moving equipment. These are locations where miners are likely to come in contact with the cable and where the cable could be damaged. To be effectively guarded, the cable must be fully covered, so that there is a physical barrier between the cables and miners. One commenter suggested that the trailing cable be guarded for 10 feet inby the power center. MSHA agrees that this is the location that miners are most likely to come in contact with the cable. In response to comments, the final rule requires that the cable be guarded for 10 feet inby the power center. The proposed requirement for guarding the trailing cable between the power center and the first cable insulator is not included in the final rule since insulators are not required.

Final paragraph (a)(1)(ii) requires that the high-voltage trailing cable be guarded from the entrance gland for a distance of 10 feet outby the last strain clamp on the continuous mining machine. The proposal required guarding for a "minimum" of 10 feet. Some commenters suggested that this distance be increased from 10 feet to 35 feet or more. The proposal would have

allowed guarding for a distance of 35 feet or more. However, requiring guarding for a distance longer than 10 feet, as suggested by the commenters, would preclude detection of a damaged cable in the guarded area because the final rule does not require removal of guarding when inspecting the cable. The final rule does not contain the term minimum and does not require guarding beyond 10 feet.

Final paragraph (a)(1)(iii), like the proposal, requires guarding at any location where the cable could be damaged by moving equipment. MSHA received no comments on this proposal.

Final paragraph (a)(2), like the proposal, requires that guarding be constructed of nonconductive flame-resistant material, or grounded metal. If a marking does not appear on the guarding to indicate that it is flame-resistant, MSHA will request documentation to substantiate that the material is flame-resistant. Metal and non-conductive guarding may be of a continuous length or overlapping shorter pieces. Shorter pieces of metal guarding must be bonded together to assure a continuous metallic path. MSHA received no comments on this proposal.

Final paragraph (b) addresses requirements when equipment must cross any portion of the cable. It allows two alternatives for protecting the cable from mobile equipment: (1) Suspension of the cable from the mine roof; or (2) the use of commercially available cable crossovers. MSHA encourages mine operators to establish work practices that minimize the need for cable crossovers, such as placing the cable in locations where mobile equipment is not likely to travel.

Final paragraphs (b)(2)(i) through (b)(2)(vii), like the proposal, specify minimum design requirements for cable crossovers. Cable crossovers are commercially available and are used throughout the industry to protect cables from mobile equipment damage. These minimum design requirements will assure that the largest piece of equipment used would be able to cross over the cable without damaging it. MSHA's experience is that cable crossovers provide effective protection when properly used. MSHA received no comments on the proposal. However, the phrase "in or inby the last open crosscut" is not included in the final rule and the requirement is not limited to any section of the mine.

Section 75.828 Trailing Cable Pulling

Final § 75.828 addresses procedures for pulling high-voltage trailing cable with equipment other than the continuous mining machine.

In the proposal, § 75.828 was titled "Trailing Cable Handling and Pulling". Proposed § 75.828(a), dealing with handling energized cables, is renumbered § 75.833(a) and addressed in the discussion of that provision. Except for editorial changes, final § 75.828 is identical to proposed § 75.828(b). It requires that the mine operator de-energize the high-voltage trailing cable and follow manufacturer's procedures for pulling the cable. Cable manufacturers' recommendations usually include: The proper application of a rope or sling to pull the cable; minimum bending diameter; maximum length of trailing cable that can be safely pulled; and the number of corners that the cable can be pulled around. The purpose of this requirement is to prevent damage to the cable while it is being pulled. For example, when pulling a cable with ropes, if a loop smaller than the minimum bending diameter for the size of the trailing cable is created, the cable can be damaged.

One commenter suggested that this proposed requirement be eliminated. Another stated that there was no safety benefit from requiring the trailing cable to be de-energized since the high-voltage trailing cable is significantly safer than other cables. These necessary requirements are included in the final rule as it has been MSHA's experience that pulling long lengths of cable around corners with shuttle cars or scoops may cause the ropes or slings to penetrate the cable and roll back the jacket, shielding, and insulation, thereby exposing energized conductors. If these conditions occur while the cable is energized, miners will be exposed to the risk of an electrical shock. De-energizing the trailing cable prior to pulling will assure that exposed conductors will not present shock hazards to miners.

Section 75.829 Tramming Continuous Mining Machines In and Out of the Mine and From Section to Section

Final § 75.829 addresses tramming continuous mining machines in and out of the mine or from one section to another, and testing required prior to tramming.

Final paragraph (a) revises the proposal for clarity and sets forth procedures for tramming the continuous mining machine. It also requires that the applicable power sources used to tram the machine not be moved while energized as specified in existing § 75.812.

Final paragraph (a)(1), like the proposal, requires that when tramming the continuous mining machine the power source must not be located where permissible equipment is required. This provision is adapted from existing § 75.500, which prohibits non-permissible equipment from being used in specific areas of the mine. Typically, power sources listed in § 75.829(c) are not "permissible" and, therefore, must not be used in areas where permissible equipment is required. MSHA received no comments on this proposal.

Final paragraph (a)(2) prohibits the mining machine from being used for mining while being trammed except when using a power source that is appropriate for this activity. Typically, the power sources used to tram the machine do not have the capacity to provide for mining or cutting functions. If mining or cutting were attempted while the machine was powered by sources other than a power center, overloading and loss of power could occur.

Although MSHA received no comments on proposed § 75.829(a)(2), the final rule clarified the proposal by specifying when a power center used for tramming is appropriate for mining and cutting.

Final paragraph (a)(3), like the proposal, requires that low-, medium-, and high-voltage cables comply with the applicable provisions dealing with flame resistance qualities and design requirements of low, medium, and high voltages when using the power sources specified in § 75.829(c). MSHA received no comments on this proposal.

Final paragraph (a)(4), like the proposal, requires that the high-voltage cable be mechanically secured onboard the continuous mining machine. This requirement applies to the high-voltage portable transformer specified in paragraph (c)(2) of this section. If the trailing cable does not fit on the machine, a shorter length of cable should be used to connect the diesel-generator output to the continuous mining machine. The purpose of this requirement is to prevent anyone from handling energized high-voltage cables and to minimize damage to the cable while tramming the continuous mining machine. MSHA received no comments on this proposal.

Final paragraph (b), like the proposal, requires specific tests to be conducted prior to tramming. Final paragraph (b)(1) requires that ground-fault and ground-wire monitor tests be performed by a qualified person. The purpose of these tests is to assure proper operation of the ground-fault and ground-wire monitor. It is not the Agency's intent that these tests be performed after momentary or incidental stops during the tramming process. The testing

requirements assure that these devices operate properly to protect miners from electrical shocks. The final rule clarifies the meaning of a functional test. This provision also requires that corrective actions and recordkeeping resulting from these tests be performed in accordance with §§ 75.832(f) and (g) of this final rule.

The ground-fault test assures that the circuit will be de-energized if a ground-fault condition exists. Most manufacturers of power centers provide ground-fault test circuits so that the circuit can be tested without creating an actual ground-fault condition, which would expose miners to the risk of burns and shocks. The test will assure that the ground-wire monitor will de-energize the circuit if the ground-check or grounding circuit is opened. Manufacturers of ground-wire monitors provide a built-in test switch for this purpose. When low- and medium-voltage power sources are used, a ground-wire monitor is required in accordance with § 75.902. A ground-wire monitor is not required for the high-voltage power sources because these power sources use external bonding.

One commenter suggested that a record be made only of the corrective actions and that such a record be kept on the machine with the date, time, and initials of the qualified person when the work is completed. MSHA's data and experience show that all records and certifications of tests and repairs are valuable tools for both mine operators and MSHA. Records and certifications can be used to determine trends with respect to equipment failure and/or design problems. They have also been useful sources of information during accident investigations. Records are required to be kept on the surface because they will be more readily accessible to mine personnel and inspectors. Therefore, final § 75.829(b)(1) retains the requirements of the proposal.

Final paragraph (b)(2), like the proposal, requires that prior to tramming the continuous mining machine, where applicable, a person designated by the operator must activate the test circuit for the grounded-phase detection circuit on the continuous mining machine. This test is applicable only if a grounded-phase detection circuit is required. The purpose of requiring this test is to assure that the detection circuit will successfully detect a grounded-phase condition. If the test indicates that the detection circuit is not functioning properly, corrective action must be taken in accordance with § 75.832(f) of the final rule. A record of this test is not required. MSHA received no comments on this proposal.

Final paragraph (c) specifies the power sources, in addition to the power center, that may be used when the mining machine is trammed. Power sources specified in this section have been selected to minimize the need to handle energized high-voltage cables. It also specifies the requirements that different power sources, such as generators or stationary power supplies found at belt drives, must meet. These sources can provide: (1) Low or medium voltage to portable transformers that are either mounted on or attached to the high-voltage continuous mining machine; or (2) high-voltage power sources. The source is a generator set that includes a low- or medium-voltage diesel-generator and a step-up transformer that provides high voltage to the continuous mining machine.

Final paragraph (c)(1), like the proposal, addresses the use of a medium-voltage power source that supplies 995 volts to the continuous mining machine. To use this type of power source, the machine circuitry would need to be rewired to allow the 995-volt trailing cable to energize the tram and hydraulic pump motor circuits. Figure 1 of the standard illustrates a high-voltage continuous mining machine using a 995-volt power source. The 995 volts can be supplied by the mine's power system or a low- or medium-voltage diesel-generator set. If a low- or medium-voltage diesel-generator set is used as the power source, the generator set may be moved while energized in accordance with existing regulations. MSHA received no comments on the proposal.

Final paragraph (c)(1)(i), like the proposal, prohibits back-feeding the continuous mining machine with medium voltage to energize the high-voltage circuits. This provision will prevent the high-voltage motors from being powered by medium-voltage sources that do not meet necessary requirements. MSHA received no comments on this proposal.

Final paragraph (c)(1)(ii) requires compliance with all applicable requirements for medium-voltage circuits in 30 CFR Part 75, such as overcurrent, ground-fault, under-voltage, and ground-wire monitors. MSHA received no comments on this proposal.

Proposed § 75.829(c)(1)(iii) is not included in the final rule. It would have prohibited moving the medium-voltage portable transformer while energized. This section was initially included in the proposed rule because it would not have been practical to move the energized portable transformer and comply with 30 CFR 75.516, which requires the power cable feeding the portable transformer to be supported on well-insulated insulators. Additionally, if the portable transformer has a high-voltage primary winding that provides a medium-voltage output for tramming the continuous mining machine, the movement of the transformer would be prohibited by § 75.812, unless the conditions specified in § 75.812 are met. However, neither §§ 75.516 nor 75.812 prohibit movement of this equipment.

Therefore, upon reconsideration, MSHA has decided not to include the proposed provision in the final rule to avoid any conflict with existing standards.

Final paragraph (c)(2) addresses the use of step-up transformers to convert low or medium voltage to high voltage to power the continuous mining machine. Figure 2 of the standard illustrates this configuration. Unlike the proposal, the final rule does not include the term "onboard" to allow for other step-up transformers. The term "temporary," used in the proposed rule to define an "onboard step-up transformer," is not used in the final rule.

Final paragraph (c)(2)(i) requires that the trailing cable supplying low- or medium-voltage to the step-up transformer meet the applicable requirements of 30 CFR Part 75. For example, the trailing cable must meet the overcurrent, ground-fault, and under-voltage protection requirements for underground low- and medium-voltage alternating current circuits (Subpart J). The term "input" describing the trailing cable was removed, as unnecessary. This requirement remains unchanged from the proposed rule.

Final paragraph (c)(2)(ii), like the proposal, requires that the high-voltage circuit output of the step-up transformer supplying power to the mining machine meet the applicable provisions of final § 75.824.

Final paragraph (c)(2)(iii)(A) requires the step-up transformer to be securely mounted on either the continuous mining machine or a sled/cart connected to the machine. This will minimize vibration that can lead to an internal ground fault or damage to the transformer. The proposal would have required the step-up transformer to be securely mounted onboard the continuous mining machine.

Some commenters suggested that MSHA allow the installation of the transformer on a sled/cart connected by a tow-bar and in close proximity to the continuous mining machine. MSHA agrees that this alternative provides

effective protection and has revised the proposal accordingly.

Final paragraph (c)(2)(iii)(B), like the proposal, requires that the frame of the transformer be bonded to the frame of the continuous mining machine and the metallic shell of each cable coupler by a No. 1/0 A.W.G. or larger conductor, and connected to the incoming ground conductor of the trailing cable. These grounding requirements assure a low impedance grounding path from the transformer to the outby power source should a ground-fault condition occur. MSHA received no comments on the proposal.

Final paragraph (c)(2)(iii)(C), like the proposal, requires that each of the transformer enclosure covers be equipped with at least two interlock switches and that an external emergency stop switch be provided to de-energize the input power to the step-up transformer when activated in emergency situations. MSHA received no comments on the proposal and the final rule includes clarifying changes.

Proposed paragraph (c)(3) is not included in the final rule in response to comments.

One commenter objected to addressing high-voltage diesel-powered generators in the proposed rule, stating that the equipment was not relevant to the rulemaking and should be dealt with in a separate rulemaking. The commenter requested that MSHA conduct public hearings on the issue and suggested that MSHA include these requirements in the rulemaking on low- and medium-voltage diesel-powered electrical generators if necessary. In response to comments, the final rule does not include the high-voltage diesel generator option.

Section 75.830 Splicing and Repair of Trailing Cables

Final § 75.830 defines and addresses requirements for splices and repairs of trailing cables.

Final paragraph (a) is derived from granted PFMs and addresses requirements for persons performing splices and repairs. It also specifies the manner in which the trailing cable must be spliced or repaired to assure that miners are not exposed to shock and burn hazards.

Commenters stated that the proposal did not distinguish between a splice and a repair, and suggested that MSHA define these terms. In response, MSHA has defined the terms in final paragraphs (a)(1) and (a)(2) based on existing § 7.402 and granted PFMs.

Another commenter stated that MSHA should use the language from the Program Policy Manual relating to the existing standard for temporary splice of trailing cable (§ 75.603) to identify whether cable damage requires a splice or repair. This existing standard is not applicable here because the proposed rule addressed permanent cable repairs. The final rule does not use temporary or permanent. It requires the use of an MSHA-approved kit, which precludes the use of temporary splices.

Final paragraph (a)(3)(i), like the proposal, requires that cable splicing and repair be performed only by a qualified person who is trained in cable splicing and repair of high-voltage cables. From MSHA's experience, hands-on training provides effective training. These requirements will assure that the individual performing cable splicing and repair understands the construction of the cable, the purpose of every component, and the hazards associated with failure to replace each component with a component similar to the original.

Some commenters suggested that the proposal be revised to allow splices to be made under the direction of a qualified person. MSHA has not incorporated this suggestion because a qualified person has the knowledge and experience to make an effective splice that will protect miners from electrical shocks. MSHA is concerned that a person who is not qualified may not have the knowledge, training, or experience to perform splicing and repairs safely.

Final paragraph (a)(3)(ii), like the proposal, requires that splicing and repairs be made in a workman-like manner. The quality of workmanship is vital to maintaining the same level of protection to miners as that provided by the original cable. MSHA received no comments on the proposal.

Final paragraph (a)(3)(iii), like the proposal, requires that splices and repairs of trailing cables meet the requirements of existing § 75.810. This existing standard requires that the spliced or repaired cable be mechanically strong, provide the same flexibility and conductivity as the original cable, be insulated and sealed to exclude moisture, preserve the cable's flame-resistance quality, and have good bonding to the outer jacket. MSHA received no comments on this proposal.

Final paragraph (a)(3)(iv) revises proposed § 75.830(b) by deleting the reference to permanent cable repair and requires that the trailing cable be repaired using an MSHA-approved splice kit that contains specific instructions.

MSHA prohibited the use of a permanent tape-type splice in granted PFMs. The final rule does not prohibit this type of splice. Tape-type splices can be used to make an effective splice when proper procedures are followed. MSHA did not allow them in granted PFMs because the splice materials were often used improperly and allowed moisture to enter the splice. Moisture degrades the insulation and ultimately creates a risk of electrical shock. Instead of prohibiting all tape-type splices, the final rule requires that all splices be made with an MSHA-approved splice kit. The approved kits contain materials and appropriate instructions on the proper methods for making a splice. The kit includes tape that is self-vulcanizing so it will exclude moisture when applied as instructed, thereby preventing the risk of electrical shock.

MSHA received several comments concerning tape-type splices. Some commenters suggested that only vulcanized splices be used because moisture cannot be kept out of tape splices. These commenters stated that although tape-type splices are good when first made, after dragging the cable the tape splices become damaged. MSHA does not agree that only vulcanized splices can be effective. If a splice is made in accordance with the instructions included in the MSHA-approved high-voltage splice kit, the splice should be effective and exclude moisture.

Another commenter stated that electricians need more training on cable splicing and repair because not everyone reads the instructions provided in the kits. MSHA agrees and, in response, the final rule includes a new requirement for specialized training for persons who perform maintenance on high-voltage mining machines which includes the cable.

Final § 75.830(b) limits the number of splices in a certain portion of the trailing cable. Final § 75.830(b)(1), as in the proposal, prohibits splicing of the high-voltage trailing cable within 35 feet of the continuous mining machine.

Some commenters suggested that splicing should be prohibited within 50 to 60 feet from the continuous mining machine. MSHA's experience with low- and medium-voltage equipment is that the portion of the cable within 35 feet of the continuous mining machine is subjected to more strains, stresses, and cable handling than the rest of the cable. The probability that a miner will be shocked by an inadequate splice is greatest within this portion of the cable due to weakened and damaged cable.

Several commenters stated that the number of splices should be limited because cable splicing causes the resistance of the cable to go up. MSHA asked commenters during public

hearings for suggestions on a reasonable limit for the number of splices. No number was suggested. Final paragraph (b)(2) limits to four (4) the splices in the portion of the trailing cable that extends from the continuous mining machine outby for a distance of 300 feet. Granted PFMs contained a 4-splice limitation. Based on Agency experience with PFMs, the final rule includes this limit.

Section 75.831 Electrical Work; Troubleshooting and Testing

Final § 75.831 includes requirements for performing electrical work, including troubleshooting and testing. It contains editorial changes for clarity.

Final paragraph (a) requires that prior to performing electrical work, other than troubleshooting and testing, on the trailing cable or continuous mining machine, a qualified person must de-energize the trailing cable in accordance with either paragraph (a)(1) or (a)(2). De-energization is usually accomplished by opening the circuit-interrupting device. The qualified person must follow the required work procedures to prevent inadvertent re-energization. These procedures are important to assure that miners are not exposed to potential shock, fire, or other hazards when performing electrical work.

Final paragraphs (a)(1) and (a)(2) specify the two lock-out and tagging procedures. Depending on the power center design, a disconnecting switch or a cable coupler (plug and receptacle) would be used to lock-out and tag the trailing cable. Final paragraph (a)(1) specifies work procedures if a disconnecting switch is used on the output circuit of the power center supplying power to the continuous mining machine. If a disconnecting switch is used, final paragraph (a)(1)(i) requires the switch to be opened to provide visual evidence that the output is de-energized, grounded, and locked out and tagged in the open and grounded position. This allows the cable coupler plug to remain connected to the power receptacle. No comments were received on this proposal.

Final paragraph (a)(1)(ii), like the proposal, requires the plug and receptacle to be locked together and tagged. This requirement will assure that the cable coupler plug cannot be disconnected from the receptacle and connected to a spare circuit. When this procedure is used, connection to a grounding receptacle is unnecessary because opening the disconnecting switch grounds the power conductors of the high-voltage trailing cable.

MSHA understands that some mine operators prefer not to disconnect high-voltage couplers since this may lead to problems when re-energizing the circuit. The main problem with disconnecting high-voltage couplers is the risk of contaminating the couplers' insulation with dust. Using a disconnecting switch to ground and isolate power from the trailing cable and continuous mining machine would eliminate the need to remove the cable coupler plug from the receptacle.

One commenter suggested that the proposal be revised to allow other means of locking-out and tagging, such as requiring all spare circuit visual disconnects to be locked-out and tagged. This suggestion may require the person performing the work to carry more keys and locks because there may be more than one spare circuit and each must be locked. Also, MSHA believes that most of the plugs and receptacles are designed with means to lock them together.

Final paragraph (a)(2), like the proposal, addresses the use of a cable coupler as a disconnecting device. After power has been removed, final paragraph (a)(2)(i) requires the plug to be disconnected from the receptacle and connected to a grounding receptacle. The grounding receptacle, which is mounted on the power center, will cause all power conductors of the cable to be grounded to the power center frame. Connecting the plug to the grounding receptacle assures that no voltage will be present in the cable conductors. MSHA received no comments on this proposal.

Final paragraph (a)(2)(ii) requires the plug and grounding receptacle to be locked together and tagged. Tagging will alert miners that work is being done on the circuit, and the lock will prevent the circuit from being re-energized and ungrounded while work is being performed. These requirements will prevent shock hazards to miners while performing electrical work. MSHA received no comments on this proposal.

Final paragraph (a)(2)(iii) requires that a dust cover be placed over the power receptacle to protect it from becoming contaminated by dust when the trailing cable is disconnected. Dust is a conducting medium and can create ground faults. The dust cover will also prevent miners from contacting energized parts of the receptacle. MSHA received no comments on this proposal.

Final paragraph (b) addresses all troubleshooting requirements. It contains only minor clarifying changes from the proposal. It requires that during troubleshooting and testing, the de-energized cable may be disconnected from the grounding receptacle only for that period of time necessary to locate the defective condition. Generally, when the cable is disconnected from the power receptacle, it is connected to the grounding receptacle. It also requires that prior to troubleshooting and testing the trailing cable, a qualified person must follow one of the lock-out and tagging procedures specified in paragraphs (b)(1) and (b)(2). Following these procedures prevents inadvertent re-energization of the circuits being tested and protects miners from shock, fire, or other hazards.

Final paragraphs (b)(1) and (b)(2), like the proposal, address lock-out and tagging procedures based on the design of the power center. These procedures are the same as discussed in paragraph (a) of this section.

One commenter suggested that since the high-voltage trailing cable is not subject to accumulation of static charges, as in the case of a surface high-voltage line which is subject to wind and other sources of charge buildup, the Agency should not require constant grounding. MSHA does not agree and, consistent with existing rules, the final rule contains grounding requirements to assure the safety of personnel performing electrical work on high-voltage circuits.

Final paragraph (c), re-numbered from proposed paragraph (d), addresses limitations on troubleshooting and testing. It is derived from granted PFMs and existing troubleshooting requirements for longwalls. The final rule recognizes that it may be necessary for circuits or equipment to remain energized for troubleshooting and testing, such as when taking voltage and current readings to identify a problem. It contains conditions under which this can be done.

Final paragraph (c)(1), like the proposal, limits troubleshooting and testing of energized circuits to low- and medium-voltage systems because troubleshooting and testing energized circuits is known to be inherently hazardous work. Further, there are no adequate equipment and insulation ratings for testing energized high-voltage circuits and equipment. MSHA received no comments on this proposal.

Final paragraph (c)(2), like the proposal, permits troubleshooting and testing of energized circuits only for the purpose of determining voltages and currents, including evaluation of waveforms or other electrical diagnostic testing. MSHA received no comments on this proposal.

Final paragraph (c)(3), like the proposed (d)(3), requires that troubleshooting and testing of energized circuits be performed only by a qualified person. This requirement assures that the person conducting the

testing is aware of the hazards associated with these tests. The requirement for wearing properly rated gloves has been moved to final paragraph (c)(4). MSHA received no comments on this proposal.

Final paragraph (c)(4) requires that the qualified person wear protective gloves when the voltage of the circuit is 40 volts or more. It also specifies the types of gloves to be used for different voltages. Based on MSHA's experience and electrical accident data, the Agency has concluded that 40 volts is the lowest voltage level that is likely to cause electrocution. The final rule requires gloves to protect miners who might inadvertently contact energized circuits during troubleshooting and testing.

Dry work gloves or rubber insulating gloves with leather protectors, in good condition, i.e., free of holes, etc., can be used when troubleshooting 40-volt to 120-volt circuits nominal. Normally, the nominal control voltage for mining equipment is 120 volts. If miners are testing intrinsically safe circuits, dry gloves can be used for circuits that exceed 120 volts nominal. When the circuit is not intrinsically safe, rubber insulating gloves with leather protectors rated for at least the nominal voltage of the circuit and equipment are required to be used on circuits that exceed 120 volts nominal. Typically, mining equipment is rated as 220, 480, 995 volts and higher. Commercially available rubber insulating gloves are rated for 1,000 volts but are not rated for each of these voltages. Therefore, when testing or troubleshooting low- and medium-voltage circuits, 1,000-volt rated gloves must be used. MSHA received no comments on this proposal.

Final paragraph (d), re-numbered from proposed paragraph (e), specifies the work procedures to be followed when performing electrical work, other than troubleshooting and testing, in any compartment of the power center. These procedures will assure that miners are not exposed to potential shock, fire, or other hazards when performing electrical work.

Final paragraph (d)(1), re-numbered from proposed (e)(1), requires that affected circuits be de-energized in accordance with existing de-energization requirements (see § 75.509). MSHA received no comments on the proposal.

Final paragraph (d)(2), re-numbered from proposed paragraphs (e)(2) and (4), requires that a qualified person open the corresponding disconnecting switch and lock it out and tag it to isolate the circuit. MSHA received no comments on the proposal.

Final paragraph (d)(3), re-numbered from proposed (e)(3), requires that a qualified person visually verify that the contacts of the disconnecting switch are open and grounded. To verify, the qualified person views the position of the contacts through a window. Opening the disconnecting switch grounds the high-voltage conductors. Grounding the conductors protects the miner working on a circuit from exposure to energized high-voltage circuits which reduces the risk of electrical shock and electrocution. MSHA received no comments on the proposal.

Final paragraph (d)(4), re-numbered from proposed paragraph (e)(5), requires that all high-voltage capacitors and circuits in the power center be discharged prior to performing electrical work. Because capacitors are energy storage devices, they may continue to hold a charge even after the disconnecting switch is opened and the circuit is de-energized. Therefore, to assure that miners are not exposed to shock hazards, capacitors and circuits must be discharged before performing work. MSHA received no comments on the proposal.

Final paragraph (e), re-numbered from proposed paragraph (f), requires that when more than one qualified person is working on the same circuit or equipment, each person must install their own lock and tag on the circuit or equipment on which work is being performed. It also requires that each lock and tag be removed by the individual who installed them. Limiting removal of the lock to the person who installed it will prevent accidental re-energization of equipment or circuits before all persons have completed their work.

MSHA's accident investigation experience reveals that failure to lock out and tag circuits and equipment prior to performing maintenance is the root cause of many accidents. This finding is supported in both the National Safety Council's Data Sheet 237 Revision B, "Methods of Locking Out Electrical Switches" (1971) and the National Fire Protection Association's NFPA 70E "Standard for Electrical Safety Requirements for Employee Workplaces" (2000 Edition). If persons are required to place and remove their own locks, they will be more aware of and responsible for their own safety as well as safety of others. Following these procedures, miners will take the steps necessary to assure proper de-energization. This requirement reduces the risk of error due to lack of communication or inadvertent re-energization. MSHA received no comments on this proposal.

Final paragraph (e)(2), like proposed paragraph (f)(2), includes requirements for removing locks and tags. If the person who installed the lock and tag is not available, the mine operator can authorize a qualified person to remove that person's lock and tag. In this case, the mine operator must notify the person who installed the lock and tag that they have been removed. MSHA received no comments on this proposal.

Section 75.832 Frequency of Examinations; Recordkeeping

Final § 75.832 includes non-substantive editorial changes for clarity. It specifies the frequency of testing certain equipment and circuits, and the requirements for creating and maintaining adequate records. Unlike granted PFMs that required some tests to be done weekly, the final rule requires those tests to be conducted at least every 7 days. Frequent examination and testing of the trailing cable and the high-voltage continuous mining machine, as well as testing of the ground-fault test circuit and ground-wire monitor circuit, is necessary because moving this equipment increases the likelihood of component failure and break down. MSHA's enforcement experience with existing weekly examination and testing requirements indicates that the actual frequency between examinations and tests is sometimes as long as 13 days. By changing the requirement to testing every 7 days, MSHA will avoid prolonged periods between tests and examinations.

Final paragraph (a) requires that a qualified person examine the high-voltage continuous mining machine at least once every 7 days to verify that electrical protection, equipment grounding, permissibility, cable insulation, and control devices are properly installed and maintained. The purpose of the examination is to assure that the equipment is operating safely. The examination will also advance miners' safety and minimize their exposure to fire, electric shock, ignition, or operational hazards.

Final paragraph (b) requires that, at least once every 7 days and prior to tramming the machine, a qualified person activate the ground-fault test circuit to verify that it will cause the corresponding circuit-interrupting device to open. Activating the ground-fault test circuit verifies that the ground-fault protection circuit is operating properly. Failure of the ground-fault circuit to function properly when a

ground fault exists would expose miners to shock hazards.

Final paragraph (c), like the proposal, requires that, at least once every 7 days and prior to tramming the machine, a qualified person test the ground-wire monitor circuit to verify that it will cause the corresponding circuit-interrupting device to open. Testing of a ground-wire monitor circuit normally requires activation of a test switch.

MSHA received a number of comments on this proposal. Some commenters suggested that the 7-day examination requirement be changed to a weekly examination. They stated that the 7-day requirement will be confused with other electrical examinations performed on a weekly or monthly basis and recommended that, for consistency purposes, testing should be done on a weekly basis. Other commenters supported the 7-day requirement, stating that the weekly requirement can provide a gap of 13 days between tests. MSHA agrees and the final rule includes the 7-day requirement for testing and examination.

Final paragraph (d) addresses inspection of the high-voltage trailing cable.

Final paragraph (d)(1) requires that once each day, during the shift that the continuous mining machine is first energized, a qualified person de-energize and inspect the entire length of cable from the power center to the machine. This inspection must include all areas of the cable where guarding is required, the outer jacket repairs, and splices for damage or deterioration. The cable inspection does not require removal of the guarding but rather, requires assuring that the guarding is provided where required. In response to comments, MSHA has replaced production day that was in the proposal with the more clarifying phrase "during the shift that the continuous mining machine is first energized".

Final paragraph (d)(2) requires that at the beginning of each shift that the continuous mining machine is energized, a person designated by the mine operator de-energize and visually inspect the high-voltage trailing cable from the mining machine: (1) To the last open crosscut; (2) to within 150 feet of the working place during retreat or second mining; or (3) up to 150 feet of the machine when it is used in outby areas for cutting overcasts, underpasses, sumps, etc. The inspection must include an examination of the outer jacket of the cable for damage. The specified locations are areas where the trailing cable is most likely to be damaged by mobile equipment. Visual inspection will assure the integrity of the cable and increase miners' safety.

MSHA received a number of comments on the proposed provisions relating to trailing cable inspections. One commenter suggested that the proposed requirements be deleted due to the superior design and construction of high-voltage trailing cables. Although MSHA agrees that the high-voltage trailing cable design and construction is superior to low- and medium-voltage cable designs, the Agency continues to believe that the requirements in the final rule are necessary to assure integrity of the cable while in use.

Others recommended changing the proposal from each production shift to each shift. They stated that such a change would be necessary in order to include idle shifts during which equipment is moved for section setup and maintenance. Another commenter suggested that MSHA change the proposal to allow for hot seat change-outs. Some commenters disagreed with this suggestion because this change would allow inspections to be made at the end of the shift and could result in a damaged cable remaining undetected for eight hours.

MSHA agrees with the suggestion to inspect the cable at the beginning of each shift the machine is energized, which would include idle shifts. MSHA believes that it is important to examine the trailing cable in all shifts where the machine is energized to detect any damage and has revised the proposal accordingly.

Another commenter objected to the proposed provision requiring the high-voltage trailing cable to be de-energized, suggesting instead that the miner wear high-voltage gloves when handling the energized cable. MSHA does not agree because when visually examining the high-voltage trailing cable, the miner may need to handle, move, or bend the cable. Handling, moving, or bending a damaged energized cable can result in an internal short-circuit and subsequent arc-flash injuries to the miner. Using high-voltage gloves to handle a damaged energized cable would not protect miners from arc-flash injuries. Therefore, it is necessary to de-energize the cable prior to the examination.

Final paragraph (e), like the proposal, is derived from granted PFMs and requires that at the beginning of each production shift, a person designated by the operator must test the grounded-phase detection circuit on the high-voltage continuous mining machine. This provision will assure that the detection circuit functions properly and that it will detect a grounded-phase condition. If the detection circuit is defective, a grounded-phase condition will remain undetected and miners will be exposed to the risk of electrical shock. MSHA received no comments on the proposal.

Final paragraph (f), like the proposal, requires equipment to be removed from service or repaired when any examinations or tests reveal damage that could lead to a risk of fire, electric shock, ignition, or operational hazard. This provision will assure that equipment that may pose a danger to miners is not used until the hazardous condition is corrected. For example, if examination of a trailing cable reveals an exposed conductor, miners would be at risk of potential fire, electrical shock, and methane gas ignition when the cable is energized. MSHA received no comments on this proposal.

Final paragraph (g) specifies the recordkeeping requirements for the examinations and tests in the final rule and is consistent with existing recordkeeping requirements. Records and certifications of tests and repairs are valuable tools for mine operators. Records and certifications are used by MSHA to identify trends in equipment failure and design problems so that the Agency can disseminate necessary best practice information to the mining community.

Final paragraph (g)(1)(i), like the proposal, requires that the person who examines and tests the equipment certify by signature and date that the tests and examinations have been conducted. Only the person conducting the examinations and tests can provide the certification because that person would have direct knowledge of the test results.

Final paragraph (g)(1)(ii) requires that a record be kept of any unsafe conditions found by the individual who conducted the tests because that person would have direct knowledge of the unsafe conditions. Unlike the proposal, which did not identify who must record corrective action, final paragraph (g)(2) specifies that the individual who takes any corrective action must be the one to record that action. The clarification is important because the person conducting the tests may not be the one who takes the corrective action.

Final paragraphs (g)(3) and (g)(4) are new provisions added in response to comments. Final paragraph (g)(3) requires that records must be countersigned by the mine foreman or equivalent mine official by the end of their next regularly scheduled working shift. Final paragraph (g)(4) requires that records be maintained either in a secure book that is not susceptible to alteration or electronically in a computer system

that is also secure and not susceptible to alteration.

Some commenters suggested that mine management share the responsibility of assuring that records are properly documented and stored. In so doing, these commenters raised the fact that the proposal did not require records to be countersigned and that they have made this suggestion on several occasions during previous rulemakings. MSHA has re-evaluated this issue. In the preamble to the proposed rule, MSHA stated that the Agency accepts certification only from the person who examines and tests the equipment because that person will have knowledge of the results of the examination and tests. MSHA reconsidered its position and the final rule requires countersigning of records by a foreman or equivalent. In making this change, the Agency determined that countersigning of records by a foreman or equivalent will help to assure accuracy of the records. Additionally, as mentioned earlier, records are an important tool in maintaining miners' health and safety. The countersigning requirement will provide important corroboration of this vital action.

One commenter requested that the recordkeeping requirement be more specific. This commenter requested clarification on alternate methods of recordkeeping, specifically questioning electronic signatures for electronic records.

The final rule requires that examination, testing, and repair records for mine equipment must not be susceptible to alteration. MSHA recognizes that electronic storage of records is becoming a more valuable alternative for the mining industry. In response to comments, the final rule includes a new provision to require that records be maintained either in a secure book that is not susceptible to alteration or electronically in a computer system that is also secure and not susceptible to alteration. MSHA defines the phrase "secure and not susceptible to alteration" to mean that the stored record, including signatures, cannot be tampered with or modified. Examples of books that are considered secure and not susceptible to alteration include, but are not limited to, record books that are currently approved by state mine safety agencies and permanently bound books. Examples of books that are not considered secure and are susceptible to alteration include loose leaf binders and spiral note books. An example of an acceptable electronic record storage that is secure would be a record stored in a "write once, read many" drive. MSHA believes that electronic records meeting these criteria are practical and reliable as traditional records.

Final paragraph (g)(5), like the proposal, requires that certifications and records, including those in electronic form, be kept for at least one year and be made available at the mine for inspection by authorized representatives of the Secretary and representatives of miners. MSHA received no comments on this proposal.

Section 75.833 Handling High-Voltage Trailing Cables

Final § 75.833 addresses the requirements for handling energized trailing cables. It requires that energized trailing cable not be handled unless high-voltage insulating gloves or insulated cable handling tools are used.

Based on comments received on the proposed rule, the re-proposal contained the option of providing high-voltage insulating gloves, which include both the rubber gloves and the leather outer protector gloves, or insulated cable handling tools. MSHA received two comments on the re-proposal. Both commenters suggested that MSHA should not require the use of insulating high-voltage gloves because the high-voltage trailing cable is safer than current trailing cables already permitted for use without gloves. Under the final rule, gloves are not required if cable handling tools are used.

Some commenters on the proposal recommended that personal protective equipment (PPE) be required in addition to the cable handling tools. MSHA considered this comment and decided that because PPE is not tested to a nationally-recognized standard, it may not provide protection to miners. For that reason the final rule does not require PPE.

Final paragraph (a), like the re-proposal, prohibits handling energized trailing cables unless high-voltage insulating gloves or insulating cable handling tools are used.

Final paragraph (b), like the re-proposal, requires that mine operators make either the insulating gloves or cable handling tools available for miners to use.

Final paragraph (c), like the re-proposal, addresses the requirements for insulating gloves and cable handling tools. Final paragraph (c)(1) addresses the design requirements for rubber gloves and incorporates by reference the American Society for Testing and Materials (ASTM) publication ASTM F496–02a, "Standard Specification for In-Service Care of Insulating Gloves and Sleeves" (2002). Final paragraph (c)(2) requires that the rubber gloves be air-tested to assure their effectiveness. Final paragraph (c)(3) requires that both the leather protector and the rubber insulating glove be visually examined before each use. Final paragraph (c)(4) requires that damaged rubber gloves be removed from service or destroyed, and that the leather protector be maintained in good condition or replaced.

Final paragraph (d), like the re-proposal, addresses the requirements for insulated cable handling tools. Final paragraph (d)(1) requires that insulated cable handling tools be rated and maintained to withstand at least 7,500 volts to assure that the handling tools provide at least the same level of protection to miners as the insulating high-voltage gloves.

Final paragraph (d)(2) requires that insulated cable handling tools be designed and manufactured for cable handling to protect miners from shock hazards. Examples of insulated cable handling tools are hooks, slings, and tongs, when designed and manufactured for cable handling.

Final paragraph (d)(3) requires that the insulated cable handling tools be visually examined before each use for signs of damage or defects.

Final paragraph (d)(4) requires that damaged or defective insulated cable handling tools be removed from the underground area of the mine or destroyed to assure that they are not available to use.

Section 75.834 Training

Final § 75.834 is new and addresses training requirements based on comments received on the proposal. One commenter stated that it is important to train miners on safety practices where new technologies are utilized and requested that specific training be required for those who test and repair high-voltage cables. MSHA originally believed that part 48 provides sufficient training requirements. Upon consideration, the final rule contains specific training requirements that are consistent with the provisions in granted PFMs. It also requires that the specialized training be specified in the part 48 plans.

Final paragraph (a) requires that miners who perform maintenance on high-voltage continuous mining machines be trained in high-voltage safety, testing, and repair and maintenance procedures. Final paragraph (b) requires that miners who work in the vicinity of high-voltage continuous mining machines or who move the high-voltage equipment or cables also be trained in high-voltage safety procedures and precautions. MSHA's experience is that not only miners who work on equipment are

exposed to hazards, but also miners in the vicinity.

Section 75.1002 Installation of Electric Equipment and Conductors; Permissibility

Existing § 75.1002 addresses requirements for conductors and cables used in or in by the last open crosscut as well as electrical equipment, conductors and cables used within 150 feet of pillar workings. Final § 75.1002 allows the use of shielded, high-voltage cables that supply power to permissible continuous mining machines in underground coal mines. No comments were received on this proposal.

IV. Executive Order 12866: Regulatory Planning and Review

Executive Order (E.O.) 12866, as amended, requires that regulatory agencies assess both the costs and benefits of intended regulations. To comply with Executive Order 12866, MSHA has prepared a Regulatory Economic Analysis (REA) for the final rule. The REA contains supporting data and explanations for the summary materials presented in sections IV through VII of this preamble, including the covered mining industry, benefits and costs, feasibility, small business impact, and information collection requirements. The REA is located on MSHA's Web site at *http://www.msha.gov/rea.HTM#final*. A copy of the REA can be obtained from MSHA's Office of Standards, Regulations and Variances. MSHA has determined that the final rule will not have an annual effect of $100 million or more on the economy and, therefore, it is not an economically "significant regulatory action" pursuant to section 3(f) of E.O. 12866.

A. Population at Risk

The final rule applies to all underground coal mines in the United States. Based on MSHA data, there were 583 underground coal mines reporting production, employing 44,456 miners, operating in the U.S. in 2008.

B. Benefits

The final rule will reduce the potential for electrical-related fatalities and injuries when using high-voltage continuous mining machines due to: Better design and construction criteria; improved ground-fault protection; handling of lighter cables; and increased safety requirements for work practices. These design and work practice requirements offer greater protection against electrical shock, cable overheating, fire hazards, unsafe work and repair practices, and back injuries and other sprains caused by handling trailing cables. These benefits are described in more detail in Chapter III of the REA associated with this rulemaking.

C. Compliance Costs

MSHA estimates that the final rule will result in total yearly net compliance cost of approximately $50,100 for all the underground operators that use high-voltage continuous mining machines. MSHA estimates that for all underground coal mine operators that use high-voltage continuous mining machines with 20–500 employees, yearly costs will be approximately $85,875 and yearly cost savings will be approximately $45,200, which results in a net cost of approximately $40,675. For all underground coal mine operators using high-voltage continuous mining machines with 501+ employees, MSHA estimates yearly costs of approximately $16,225 and yearly cost savings of approximately $6,800, which results in a net cost of $9,425. For a complete breakdown of the compliance costs and savings of the final rule, see Chapter IV of the REA associated with this rulemaking.

V. Feasibility

MSHA has concluded that the requirements of the final rule are technologically and economically feasible.

A. Technological Feasibility

High-voltage continuous mining machines have been used to produce coal in underground coal mines since 1997. Underground coal mine operators that use high-voltage continuous mining machines are currently following most of the provisions of the final rule through conditions set forth in their granted Petitions for Modification (PFMs). Any requirements in the final rule that are different from those currently being followed in granted PFMs will not make the implementation of the final rule technologically infeasible for underground coal mine operators who choose to use high-voltage continuous mining machines for extracting coal. MSHA therefore concludes that the final rule is technologically feasible.

B. Economic Feasibility

MSHA has traditionally used a revenue screening test—whether the yearly compliance costs of a regulation are less than 1 percent of revenues, or are negative (i.e., provide net cost savings)—to establish presumptively that compliance with the regulation is economically feasible for the mining industry. As estimated in the REA that accompanies this final rule, the underground coal mining industry will incur a net yearly compliance cost of approximately $50,100 versus annual revenue of approximately $18.4 billion per year. On this basis, the Agency concludes that the rule is economically feasible.

VI. Regulatory Flexibility Act (RFA) and Small Business Regulatory Enforcement Fairness Act (SBREFA)

Pursuant to the Regulatory Flexibility Act (RFA) of 1980, as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA), MSHA has analyzed the impact of the final rule on small businesses. Based on that analysis, MSHA has notified the Chief Counsel for Advocacy, Small Business Administration, and made the certification under the Regulatory Flexibility Act at 5 U.S.C. 605(b) that the final rule will not have a significant economic impact on a substantial number of small entities. The factual basis for this certification is presented in full in Chapter V of the REA and in summary form below.

A. Definition of a Small Mine

Under the RFA, in analyzing the impact of the final rule on small entities, MSHA must use the Small Business Administration (SBA) definition for a small entity or, after consultation with the SBA Office of Advocacy, establish an alternative definition for the mining industry by publishing that definition in the **Federal Register** for notice and comment. MSHA has not taken such an action and hence is required to use the SBA definition. The SBA defines a small entity in the mining industry as an establishment with 500 or fewer employees.

In addition to examining small entities as defined by SBA, MSHA has also looked at the impact of this final rule on underground coal mines with fewer than 20 employees, which MSHA and the mining community have traditionally referred to as "small mines." These small mines differ from larger mines not only in the number of employees, but also in economies of scale in material produced, in the type and amount of production equipment, and in supply inventory. Therefore, the cost of complying with MSHA's final rule and the impact of the final rule on small mines will also be different. It is for this reason that small mines are of special concern to MSHA.

Although the final rule does apply to mine operators with fewer than 20 employees that choose to use high-

voltage continuous mining machines, MSHA's experience has been that no underground coal mine operator with fewer than 20 employees has ever requested a PFM to use high-voltage continuous mining machines. MSHA has analyzed the economic impact of the final rule on all underground coal mine operators with 500 or fewer employees, which conforms to the requirements of the RFA. The Agency concludes that it can certify that the final rule will not have a significant economic impact on a substantial number of small entities that are covered by this final rule.

B. Factual Basis for Certification

Using SBA's definition of a small mine operator, the estimated yearly net compliance cost of the final rule on small underground coal mine operators is approximately $40,675. The estimated yearly net compliance cost is less than one percent of the estimated annual revenues of approximately $14.5 billion for small underground coal mine operators with 500 or fewer employees.

Based on this analysis, MSHA has determined that the final rule will not have a significant economic impact on a substantial number of small underground coal mine operators with 500 or fewer employees. MSHA has certified these findings to the SBA. The factual basis for this certification is discussed in Chapter V of the REA associated with this final rule.

VII. Paperwork Reduction Act of 1995

As a result of this final rule there will be: (1) An elimination of burden hours and related cost approved under OMB control numbers 1219–0065 and (2) burden hours in the Information Collection Request (ICR) that accompanies this final rule. The burden hours and related cost for these two items are discussed below. For a more detailed explanation of how the burden hours and related cost for the two items were determined, see Chapter VII of the REA associated with this final rule.

A. Elimination of Burden Hours

As a result of this final rule, mine operators will no longer need a PFM of existing 30 CFR 75.1002 to use a high-voltage continuous mining machine. Existing OMB control number 1219–0065 includes annual burden hours and cost related to the time it takes mine operators to prepare and file petitions with MSHA, including petitions to use a high-voltage continuous mining machine. As a result of this rulemaking, the burden hours and cost approved under OMB control number 1219–0065 that relate to the time it takes operators to prepare and file petitions need to be reduced to reflect the fact that petitions to use a high-voltage continuous mining machine will no longer be needed. Therefore, the burden hours and cost in OMB control number 1219–0065 should be reduced by approximately 48 hours and $3,700 annually.

B. Burden Hours

The final rule will impose approximately 819 first-year burden hours and related cost of $50,200 on underground coal mine operators using high-voltage continuous mining machines. Of the 819 first-year burden hours, 12 hours and related costs of $700 are associated with conducting a ground-fault and ground-wire monitor circuit test prior to tramming the high-voltage continuous mining machine as required by final § 75.829. In addition, 242 hours and related cost of $9,450 are associated with tagging requirements that are required by final § 75.831. Also, 565 hours and related cost of $40,050 are associated with final § 75.832(c), which requires a ground-wire monitor circuit test, and final § 75.832(g), which requires countersigning of records concerning examinations and tests specified in final § 75.832(a), (b), and (c).

The following final requirements do not have burden hours associated with them. Final § 75.825(i) requires that all compartments providing access to energized high-voltage conductors and parts display a caution label to warn miners against entering the compartment(s) before de-energizing incoming high-voltage circuits. This requirement is not a paperwork burden to mine operators because it is currently a normal business practice of manufacturers to place such warning labels on the compartments noted above.

Final § 75.832(a) and (b) require that examinations or tests be conducted at least once every seven days, and final § 75.832(g) requires that a record be made of these examinations or tests. Paragraph (a) requires an examination of the high-voltage continuous mining machine. Paragraph (b) requires a test of the ground-fault test circuit. The examinations required by final § 75.832(a) and (b) are already being conducted as part of a larger weekly examination of electrical equipment required under existing § 75.512 (electrical equipment; examination, testing and maintenance). Existing § 75.512 also requires that records be made of these examinations and tests. Since the burden for conducting examinations and tests required by final § 75.832(a) and (b) and making records of them is already accounted for under existing § 75.512 (which is approved under OMB control number 1219–0116), such activity is not included in the ICR accompanying this final rule. However, the countersigning of these records is not part of any existing requirement, and is, therefore, accounted for in the ICR that accompanies this rulemaking.

C. Details

The information collection package has been submitted to the Office of Management and Budget (OMB) for review under 44 U.S.C. 3504(h) of the Paperwork Reduction Act of 1995, as amended. A copy of the information collection package can be obtained from the Department of Labor by email request to *king.darrin@dol.gov* or by phone request at 202–693–4129.

VIII. Other Regulatory Considerations

A. The Unfunded Mandates Reform Act of 1995

MSHA has reviewed the final rule under the Unfunded Mandates Reform Act of 1995 (2 U.S.C. 1501 *et seq.*). MSHA has determined that this final rule does not include any federal mandate that may result in increased expenditures by State, local, or tribal governments; nor will it increase private sector expenditures by more than $100 million in any one year or significantly or uniquely affect small governments. Accordingly, the Unfunded Mandates Reform Act of 1995 (2 U.S.C. 1501 *et seq.*) requires no further Agency action or analysis.

B. Executive Order 13132: Federalism

The final rule does not have "federalism implications" because it will not "have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government." Accordingly, under E.O. 13132, no further Agency action or analysis is required.

C. The Treasury and General Government Appropriations Act of 1999: Assessment of Federal Regulations and Policies on Families

Section 654 of the Treasury and General Government Appropriations Act of 1999 (5 U.S.C. 601 note) requires agencies to assess the impact of Agency action on family well-being. MSHA has determined that the final rule will have no effect on family stability or safety, marital commitment, parental rights and authority, or income or poverty of families and children. The final rule impacts only the underground coal mine industry. Accordingly, MSHA

certifies that the final rule will not impact family well-being.

D. Executive Order 12630: Government Actions and Interference With Constitutionally Protected Property Rights

This final rule does not implement a policy with takings implications. Accordingly, under E.O. 12630, no further Agency action or analysis is required.

E. Executive Order 12988: Civil Justice Reform

The final rule was written to provide a clear legal standard for affected conduct and was carefully reviewed to eliminate drafting errors and ambiguities, so as to minimize litigation and undue burden on the Federal court system. Accordingly, the final rule will meet the applicable standards provided in section 3 of E.O. 12988, Civil Justice Reform.

F. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

The final rule will have no adverse impact on children. Accordingly, under E.O. 13045, no further Agency action or analysis is required.

G. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

The final rule does not have "tribal implications" because it will not "have substantial direct effects on one or more Indian tribes, on the relationship between the Federal government and Indian tribes, or on the distribution of power and responsibilities between the Federal government and Indian tribes." Accordingly, under E.O. 13175, no further Agency action or analysis is required.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

Executive Order 13211 requires agencies to publish a statement of energy effects when a rule has a significant energy action that adversely affects energy supply, distribution or use. MSHA has reviewed this final rule for its energy effects because the final rule applies to the underground mining sector. Because this final rule will result in yearly net compliance cost of approximately $50,100 to the underground coal mining industry, relative to annual revenues of $18.4 billion in 2008, MSHA has concluded that it is not a significant energy action because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. Accordingly, under this analysis, no further Agency action or analysis is required.

List of Subjects in 30 CFR Parts 18 and 75

Coal mining, Incorporation by reference, Mine safety and health, Reporting and recordkeeping requirements, Underground mining.

Dated: March 29, 2010.

Joseph A. Main,

Assistant Secretary of Labor for Mine Safety and Health.

■ For the reasons set out in the preamble and under the authority of the Mine Safety and Health Act of 1977, as amended, Chapter I of Title 30, Code of Federal Regulations, Parts 18 and 75 are amended as follows:

PART 18—ELECTRIC MOTOR-DRIVEN MINE EQUIPMENT AND ACCESSORIES

■ 1. The authority citation for part 18 continues to read as follows:

Authority: 30 U.S.C. 957 and 961.

■ 2. Add § 18.54 to subpart B to read as follows:

§ 18.54 High-voltage continuous mining machines.

(a) *Separation of high-voltage components from lower voltage components.* In each motor-starter enclosure, barriers, partitions, and covers must be provided and arranged so that personnel can test and troubleshoot low- and medium-voltage circuits without being exposed to energized high-voltage circuits. Barriers or partitions must be constructed of grounded metal or nonconductive insulating board.

(b) *Interlock switches.* Each removable cover, barrier, or partition of a compartment in the motor-starter enclosure providing direct access to high-voltage components must be equipped with at least two interlock switches arranged to automatically de-energize the high-voltage components within that compartment when the cover, barrier, or partition is removed.

(c) *Circuit-interrupting devices.* Circuit-interrupting devices must be designed and installed to prevent automatic re-closure.

(d) *Transformers supplying control voltages.*

(1) Transformers supplying control voltages must not exceed 120 volts line to line.

(2) Transformers with high-voltage primary windings that supply control voltages must incorporate a grounded electrostatic (Faraday) shield between the primary and secondary windings. Grounding of the shield must be as follows:

(i) Transformers with an external grounding terminal must have the shield grounded by a minimum of No. 12 A.W.G. grounding conductor extending from the grounding terminal to the equipment ground.

(ii) Transformers with no external grounding terminal must have the shield grounded internally through the transformer frame to the equipment ground.

(e) *Onboard ungrounded, three-phase power circuit.* A continuous mining machine designed with an onboard ungrounded, three-phase power circuit must:

(1) Be equipped with a light that will indicate a grounded-phase condition;

(2) Have the indicator light installed so that it can be observed by the operator from any location where the continuous mining machine is normally operated; and

(3) Have a test circuit for the grounded-phase indicator light circuit to assure that the circuit is operating properly. The test circuit must be designed so that, when activated, it does not require removal of any electrical enclosure cover or create a double-phase-to-ground fault.

(f) *High-voltage trailing cable(s).* High-voltage trailing cable(s) must conform to the ampacity and outer dimensions specified in Table 10 of Appendix I to Subpart D of this part. In addition, the cable must be constructed with:

(1) 100 percent semi-conductive tape shielding over each insulated power conductor;

(2) A grounded metallic braid shielding over each insulated power conductor;

(3) A ground-check conductor not smaller than a No. 10 A.W.G.; or if a center ground-check conductor is used, not smaller than a No. 16 A.W.G. stranded conductor; and

(4) Either a double-jacketed or single-jacketed cable as follows:

(i) *Double jacket.* A double-jacketed cable consisting of reinforced outer and inner protective layers. The inner layer must be a distinctive color from the outer layer. The color black must not be used for either protective layer. The tear strength for each layer must be more than 40 pounds per inch thickness and the tensile strength must be more than 2,400 pounds per square inch.

(ii) *Single jacket.* A single-jacketed cable consisting of one protective layer. The tear strength must be more than 100 pounds per inch thickness, and the

tensile strength must be more than 4,000 pounds per square inch. The cable jacket must not be black in color.

(g) *Safeguards against corona.* Safeguards against corona must be provided on all 4,160-voltage circuits in explosion-proof enclosures.

(h) *Explosion-proof enclosure design.* The maximum pressure rise within an explosion-proof enclosure containing high-voltage switchgear must be limited to 0.83 times the design pressure.

(i) *Location of high-voltage electrical components near flame paths.* High-voltage electrical components located in high-voltage explosion-proof enclosures must not be coplanar with a single plane flame-arresting path.

(j) *Minimum creepage distances.* Rigid insulation between high-voltage terminals (Phase-to-Phase or Phase-to-Ground) must be designed with creepage distances in accordance with the following table:

Phase-to-phase voltage	Points of measure	Minimum creepage distances (inches) for comparative tracking index (CTI) range [1]			
		CTI ≥ 500	380 ≤ CTI < 500	175 ≤ CTI < 380	CTI < 175
2,400	0–0	1.50	1.95	2.40	2.90
	0–G	1.00	1.25	1.55	1.85
4,160	0–0	2.40	3.15	3.90	4.65
	0–G	1.50	1.95	2.40	2.90

[1] Assumes that all insulation is rated for the applied voltage or higher.

(k) *Minimum free distances.* Motor-starter enclosures must be designed to establish the minimum free distance (MFD) between the wall or cover of the enclosure and uninsulated electrical conductors inside the enclosure in accordance with the following table:

Wall/cover thickness (in)	Steel MFD (in)			Aluminum MFD (in)		
	A [1]	B [2]	C [3]	A [1]	B [2]	C [3]
1/4	2.8	4.3	5.8	[4] NA	[4] NA	[4] NA
3/8	1.8	2.3	3.9	8.6	12.8	18.1
1/2	* 1.2	2.0	2.7	6.5	9.8	13.0
5/8	* 0.9	1.5	2.1	5.1	7.7	10.4
3/4	* 0.6	* 1.1	1.6	4.1	6.3	8.6
1	*	* 0.6	* 1.0	2.9	4.5	6.2

* Note: The minimum electrical clearances must still be maintained in accordance with the minimum clearance table of § 18.24.

[1] Column A specifies the MFD for enclosures that have available three-phase, bolted, short-circuit currents of 10,000 amperes root-mean-square (rms) value or less.

[2] Column B specifies the MFD for enclosures that have maximum available three-phase, bolted, short-circuit currents greater than 10,000 and less than or equal to 15,000 amperes rms.

[3] Column C specifies the MFD for enclosures that have maximum available three-phase, bolted, short-circuit currents greater than 15,000 and less than or equal to 20,000 amperes rms.

[4] Not Applicable—MSHA does not allow aluminum wall or covers to be 1/4 inch or less in thickness. (See also § 18.31.)

(1) For values not included in the table, the following formulas, on which the table is based, may be used to determine the minimum free distance.

(i) Steel Wall/Cover:

$$MFD = 2.296 \times 10^{-6} \frac{(35 + 105(C))\ (I_{sc})\ (t)}{(C)\ (d)} - \frac{d}{2}$$

(ii) Aluminum Wall/Cover:

$$MFD = 1.032 \times 10^{-5} \frac{(35 + 105(C))\ (I_{sc})\ (t)}{(C)\ (d)} - \frac{d}{2}$$

Where "C" is 1.4 for 2,400 volt systems or 3.0 for 4,160 volt systems; "I_{sc}" is the three-phase, short-circuit current in amperes of the system; "t" is the clearing time in seconds of the outby circuit-interrupting device; and "d" is the thickness in inches of the metal wall/cover adjacent to an area of potential arcing.

(2) The minimum free distance must be increased by 1.5 inches for 4,160 volt systems and 0.7 inches for 2,400 volt systems when the adjacent wall area is the top of the enclosure. If a steel shield is mounted in conjunction with an aluminum wall or cover, the thickness of the steel shield is used to determine the minimum free distances.

(l) *Static pressure testing of explosion-proof enclosures containing high-voltage switchgear.*

(1) *Prototype enclosures.* The following static pressure test must be performed on each prototype design of an explosion-proof enclosure containing high-voltage switchgear prior to the explosion tests.

(i) *Test procedure.*

(A) The enclosure must be internally pressurized to at least the design pressure, maintaining the pressure for a minimum of 10 seconds.

(B) Following the pressure hold, the pressure must be removed and the pressurizing agent removed from the enclosure.

(ii) *Acceptable performance.*

(A) During pressurization, the enclosure must not exhibit:

(*1*) Leakage through welds or casting; or

(*2*) Rupture of any part that affects the explosion-proof integrity of the enclosure.

(B) Following removal of the pressurizing agents, the enclosure must not exhibit:

(*1*) Cracks in welds visible to the naked eye;

(*2*) Permanent deformation exceeding 0.040 inches per linear foot; or

(*3*) Excessive clearances along flame-arresting paths following retightening of fastenings, as necessary.

(2) *Enclosures for production.* Every explosion-proof enclosure containing high-voltage switchgear manufactured after the prototype was tested must undergo one of the following tests or procedures:

(i) The static pressure test specified in paragraph (l)(1)(i) of this section; or

(ii) An MSHA-accepted quality assurance procedure covering inspection of the enclosure.

(A) The quality assurance procedure must include a detailed check of parts against the drawings to determine that—

(*1*) The parts and the drawings coincide; and

(*2*) The requirements stated in part 18 have been followed with respect to materials, dimensions, configuration and workmanship.

(B) [Reserved]

Appendix I to Subpart D [Amended]

■ 3. Add Table 10 to Appendix I to Subpart D of Part 18 to read as follows:

* * * * *

TABLE 10—HIGH VOLTAGE TRAILING CABLE AMPACITIES AND OUTSIDE DIAMETERS

Power conductor	Ampacity*	Outside diameter** (inches)		
Size AWG or kcmil	Amperes per conductor	SHD–GC 2001 to 5000 volts	SHD–CGC 2001 to 5000 volts	SHD–PCG 2001 to 5000 volts
6	93	1.56	1.62	.....
4	122	1.68	1.73	.....
3	140	1.78	1.82	1.94
2	159	1.87	1.91	2.03
1	184	1.95	1.98	2.12
1/0	211	2.08	2.10	2.26
2/0	243	2.20	2.20	2.40
3/0	279	2.36	2.36	2.58
4/0	321	2.50	2.50	2.76
250	355	2.69	2.69	.....
300	398	2.81	2.81	.....
350	435	2.95	2.95	.....
500	536	3.31	3.31	.....

These ampacities are based on single isolated conductor in air, operated with open-circuited shield for a 90 °C conductor temperature and an ambient temperature of 40 °C.

** Tolerances for the outside diameter are +8%/−5%.

PART 75—MANDATORY SAFETY STANDARDS—UNDERGROUND COAL MINES

■ 4. The authority citation for Part 75 continues to read as follows:

Authority: 30 U.S.C. 811.

■ 5. Add §§ 75.823 through 75.834 to subpart I, to read as follows:

§ 75.823 Scope.

Sections 75.823 through 75.834 of this part are electrical safety standards applicable to 2,400 volt continuous mining machines and circuits. A "qualified person" as used in these sections means a person meeting the requirements of § 75.153. Other standards in 30 CFR apply to these circuits and equipment where appropriate.

§ 75.824 Electrical protection.

(a) *Trailing cable protection.* The trailing cable extending to the high-voltage continuous mining machine must be protected by a circuit-interrupting device of adequate interrupting capacity and voltage that provides short-circuit, overload, ground-fault, and under-voltage protection as follows:

(1) *Short-circuit protection.*

(i) The current setting of the device must be the setting specified in the approval documentation or 75 percent of the minimum available phase-to-phase short-circuit current, whichever is less; and

(ii) The time-delay setting must not exceed 0.050 seconds.

(2) *Ground-fault protection.*

(i) Neutral grounding resistors must limit the ground-fault current to no more than 0.5 ampere.

(ii) Ground-fault devices must cause de-energization of the circuit extending to the continuous mining machine at not more than 0.125 ampere. The time-delay of the device must not exceed 0.050 seconds.

(iii) Look-ahead circuits must detect a ground-fault condition and prevent the circuit-interrupting device from closing as long as the ground-fault condition exists.

(iv) Backup ground-fault devices must cause de-energization of the circuit extending to the continuous mining machine at not more than 40 percent of the voltage developed across the neutral grounding resistor when a ground fault occurs with the neutral grounding resistor open. The time-delay setting of the backup device must not exceed 0.25 seconds.

(v) Thermal devices must detect a sustained ground-fault current in the neutral grounding resistor and must de-energize the incoming power. The device must operate at either 50 percent of the maximum temperature rise of the neutral grounding resistor or 302° F (150° C), whichever is less. Thermal protection must not be dependent on control power and may consist of a current transformer and over-current

relay in the neutral grounding resistor circuit.

(vi) A single window-type current transformer that encircles all three-phase conductors must be used to activate the ground-fault device protecting the continuous mining machine. Equipment grounding conductors must not pass through the current transformer.

(vii) A test circuit for the ground-fault device must be provided. The test circuit must inject no more than 50 percent of the current rating of the neutral grounding resistor through the current transformer. When the test circuit is activated, the circuit-interrupting device must open.

(3) *Under-voltage protection.* The under-voltage device must operate on a loss of voltage, de-energize the circuit, and prevent the equipment from automatically restarting.

(b) *Re-closing.* Circuit-interrupting devices must not re-close automatically.

(c) *Onboard Power Circuits.* When a grounded-phase indicator light circuit is used and it indicates a grounded-phase fault, the following corrective actions must be taken:

(1) The machine must be moved immediately to a location with a properly supported roof; and

(2) The grounded-phase condition must be located and corrected prior to placing the continuous mining machine back into operation.

§ 75.825 Power centers.

(a) *Main disconnecting switch.* The power center supplying high voltage power to the continuous mining machine must be equipped with a main disconnecting switch that, when in the open position, de-energizes input to all power transformers.

(b) *Trailing cable disconnecting device.* In addition to the main disconnecting switch required in paragraph (a) of this section, the power center must be equipped with a disconnecting device for each circuit that supplies power to a high-voltage continuous mining machine. A disconnecting device is defined as a disconnecting switch or a cable coupler.

(c) *Disconnecting switches.* Each disconnecting switch must be labeled to clearly identify the circuit it disconnects, and be designed and installed as follows:

(1) Rated for the maximum phase-to-phase voltage of the circuit;

(2) Rated for the full-load current of the circuit that is supplied power through the device.

(3) Allow for visual observation, without removing any covers, to verify that the contacts are open;

(4) Ground all power conductors on the load side when the switch is in the "open and grounded" position;

(5) Can only be locked out in the "open and grounded" position; and

(6) Safely interrupts the full-load current of the circuit or causes the current to be interrupted automatically before the disconnecting switch opens.

(d) *Barriers and covers.* All compartments that provide access to high-voltage circuits must have barriers and/or covers to prevent miners from contacting energized high-voltage circuits.

(e) *Main disconnecting switch and control circuit interlocking.* The control circuit must be interlocked with the main disconnecting switch in the power center so that:

(1) When the main disconnecting switch is in the "open" position, the control circuit can only be powered through an auxiliary switch in the "test" position; and

(2) When the main disconnecting switch is in the "closed" position, the control circuit can only be powered through an auxiliary switch in the "normal" position.

(f) *Interlocks.* Each cover or removable barrier providing access to high-voltage circuits must be equipped with at least two interlock switches. Except when the auxiliary switch is on the "test" position, removal of any cover or barrier that exposes energized high-voltage circuits must cause the interlock switches to automatically de-energize the incoming circuit to the power center.

(g) *Emergency stop switch.* The power center must be equipped with an externally accessible emergency stop switch hard-wired into the incoming ground-wire monitor circuit that de-energizes the incoming high-voltage in the event of an emergency.

(h) *Grounding stick.* The power center must be equipped with a grounding stick to be used prior to performing electrical work to assure that high-voltage capacitors are discharged and circuits are de-energized. The power center must have a label readily identifying the location of the grounding stick. The grounding stick must be stored in a dry location.

(i) *Caution label.* All compartments providing access to energized high-voltage conductors and parts must display a caution label to warn miners against entering the compartments before de-energizing incoming high-voltage circuits.

§ 75.826 High-voltage trailing cables.

High-voltage trailing cables must:

(a) Meet existing trailing cable requirements and the approval requirements of the high-voltage continuous mining machine; and

(b) Meet existing ground-check conductor requirements (§ 75.804) or have a stranded center ground-check conductor not smaller than a No. 16 A.W.G.

§ 75.827 Guarding of trailing cables.

(a) *Guarding.*

(1) The high-voltage cable must be guarded in the following locations:

(i) From the power center cable coupler for a distance of 10 feet inby the power center;

(ii) From the entrance gland for a distance of 10 feet outby the last strain clamp on the continuous mining machine; and,

(iii) At any location where the cable could be damaged by moving equipment.

(2) Guarding must be constructed using nonconductive flame-resistant material or grounded metal.

(b) *Suspended cables and cable crossovers.* When equipment must cross any portion of the cable, the cable must be either:

(1) Suspended from the mine roof; or

(2) Protected by a cable crossover having the following specifications:

(i) A minimum length of 33 inches;

(ii) A minimum width of 17 inches;

(iii) A minimum height of 3 inches;

(iv) A minimum cable placement area of two and one half-inches (2½″) high by four and one-quarter inches (4¼″) wide;

(v) Made of nonconductive material;

(vi) Made of material with a distinctive color. The color black must not be used; and

(vii) Made of material that has a minimum compressive strength of 6,400 pounds per square inch (psi).

§ 75.828 Trailing cable pulling.

The trailing cable must be de-energized prior to being pulled by any equipment other than the continuous mining machine. The cable manufacturer's recommended pulling procedures must be followed when pulling the trailing cable with equipment other than the continuous mining machine.

§ 75.829 Tramming continuous mining machines in and out of the mine and from section to section.

(a) *Conditions of use.* Tramming the continuous mining machine in and out of the mine and from section to section must be done in accordance with movement requirements of high-voltage power centers and portable transformers (§ 75.812) and as follows:

(1) The power source must not be located in areas where permissible equipment is required;

(2) The continuous mining machine must not be used for mining or cutting purposes, unless a power center is used in accordance with §§ 75.823 through 75.828 and §§ 75.830 through 75.833;

(3) Low-, medium-, and high-voltage cables must comply with §§ 75.600–1, 75.907, and 75.826, as applicable; and

(4) The energized high-voltage cable must be mechanically secured onboard the continuous mining machine. This provision applies only when using the power sources specified in paragraphs (c)(2) and (c)(3) of this section.

(b) *Testing prior to tramming.* Prior to tramming the continuous mining machine,

(1) A qualified person must activate the ground-fault and ground-wire monitor test circuits of the power sources specified in paragraph (c) of this section to assure that the corresponding circuit-interrupting device opens the circuit. Corrective actions and recordkeeping resulting from these tests must be in accordance with §§ 75.832(f) and (g).

(2) Where applicable, a person designated by the mine operator must activate the test circuit for the grounded-phase detection circuit on the continuous mining machine to assure that the detection circuit is functioning properly. Corrective actions resulting from this test must be in accordance with § 75.832(f).

(c) *Power sources.* In addition to the power center specified in § 75.825, the following power sources may be used to tram the continuous mining machine.

(1) *Medium-voltage power source.* A medium-voltage power source is a source that supplies 995 volts through a trailing cable (See Figure 1 of this section) to the continuous mining machine. The medium-voltage power source must—

(i) Not be used to back-feed the high-voltage circuits of the continuous mining machine; and

(ii) Meet all applicable requirements for medium-voltage circuits in 30 CFR 75.

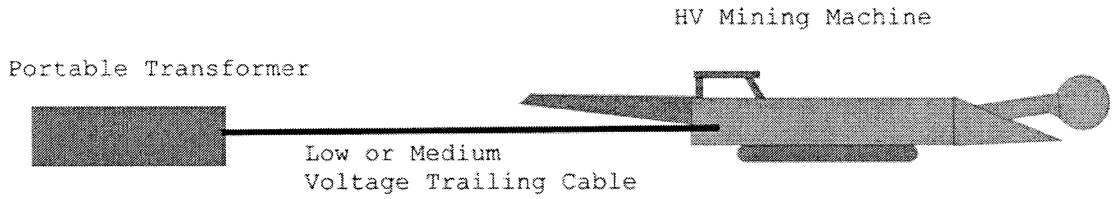

Figure 1-Power Source-75.829(c)(1) 995 volts used for tramming

(2) *Step-up transformer.* A step-up transformer is a transformer that steps up the low or medium voltage to high voltage (See Figure 2 in this section) and must meet the following requirements:

(i) The trailing cable supplying low or medium voltage to the step-up transformer must meet the applicable requirements of 30 CFR part 75;

(ii) The high-voltage circuit output of the step-up transformer supplying power to the continuous mining machine must meet the applicable provisions of § 75.824;

(iii) The step-up transformer enclosure must be—

(A) Securely mounted to minimize vibration on:

(*1*) The continuous mining machine; or

(*2*) A sled/cart that must be connected to the continuous mining machine by a tow-bar and be in close proximity to the mining machine.

(B) Grounded as follows:

(*1*) Connected to the incoming ground conductor of the low- or medium-voltage trailing cable;

(*2*) Bonded by a No. 1/0 A.W.G. or larger external grounding conductor to the continuous mining machine frame; and

(*3*) Bonded by a No. 1/0 A.W.G. or larger external grounding conductor to the metallic shell of each cable coupler.

(C) Equipped with:

(*1*) At least two interlock switches for each of the enclosure covers; and

(*2*) An external emergency stop switch to remove input power to the step-up transformer.

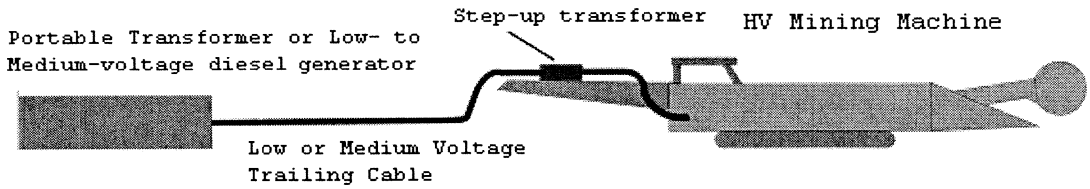

Figure 2 - Power source - 75.829(c)(2) 480 or 995 volts to a step-up transformer to 2300 volts for tramming

§ 75.830 Splicing and repair of trailing cables.

(a) *Splices and repairs.*

(1) Splicing means the mechanical joining of one or more severed conductors in a single length of a cable including the replacement of: Insulation, semi-conductive tape, metallic shielding, and the outer jacket(s).

(2) Repair means to fix damage to any component of the cable other than the conductor.

(3) Splices and repairs to high-voltage trailing cables must be made:

(i) Only by a qualified person trained in the proper methods of splicing and repairing high-voltage trailing cables;

(ii) In a workman-like manner;

(iii) In accordance with § 75.810; and

(iv) Using only MSHA-approved high-voltage kits that include instructions for outer-jacket repairs and splices.

(b) *Splicing limitations.*

(1) Splicing of the high-voltage trailing cable within 35 feet of the continuous mining machine is prohibited.

(2) Only four (4) splices will be allowed at any one time for the portion of the trailing cable that extends from the continuous miner outby for a distance of 300 feet.

§ 75.831 Electrical work; troubleshooting and testing.

(a) *Trailing cable and continuous mining machine electrical work procedures.* Prior to performing electrical work, other than troubleshooting and testing, on the high-voltage trailing cable or the continuous mining machine, a qualified person must de-energize the power center and follow procedures specified in paragraph (1) or (2):

(1) If a trailing cable disconnecting switch is provided:

(i) Open and ground the power conductors, lock out and tag the disconnecting switch; and

(ii) Lock out and tag the plug to the power receptacle.

(2) If a trailing cable disconnecting switch is not provided and a cable coupler is used as a disconnecting device:

(i) Remove the plug from the power receptacle and connect it to the grounding receptacle;

(ii) Lock out and tag the plug to the grounding receptacle; and

(iii) Place a dust cover over the power receptacle.

(b) *Troubleshooting and testing the trailing cable.* During troubleshooting and testing, the de-energized high-voltage cable may be disconnected from the power center only for that period of time necessary to locate the defective condition. Prior to troubleshooting and testing trailing cables, a qualified person must perform the following:

(1) If a trailing cable disconnecting switch is provided:

(i) Open and ground power conductors and lock out and tag the disconnecting switch;

(ii) Disconnect the plug from the power receptacle;

(iii) Lock out and tag the plug; and

(iv) Place a dust cover over the power receptacle.

(2) If a trailing cable disconnecting switch is not provided and a cable coupler is used as a disconnecting device:

(i) Remove the plug from the power receptacle and connect it to the grounding receptacle to ground the power conductors;

(ii) Remove the plug from the grounding receptacle and install a lock and tag on the plug; and

(iii) Place a dust cover over the power receptacle.

(c) *Troubleshooting and testing limitations.* Troubleshooting and testing energized circuits must be performed only:

(1) On low- and medium-voltage circuits;

(2) When the purpose of troubleshooting and testing is to determine voltages and currents;

(3) By qualified persons; and

(4) When using protective gloves in accordance with the following table:

Circuit voltage	Type of glove required
Greater than 120 volts (nominal) (not intrinsically safe)	Rubber insulating gloves with leather protectors.
40 volts to 120 volts (nominal) (both intrinsically safe and non-intrinsically safe).	Either rubber insulating gloves with leather protectors or dry work gloves.
Greater than 120 volts (nominal) (intrinsically safe)	Either rubber insulating gloves with leather protectors or dry work gloves.

(d) *Power center electrical work procedures.* Before any work is performed inside any compartment of the power center, except for troubleshooting and testing energized circuits as specified in paragraph (c) of this section, a qualified person must:

(1) De-energize affected circuits;

(2) Open the corresponding disconnecting switch, lock it out, and tag it to assure the circuit is isolated;

(3) Visually verify that the contacts of the disconnecting switch are open and grounded; and

(4) Discharge all high-voltage capacitors and circuits.

(e) *Locking out and tagging responsibilities.*

(1) When more than one qualified person is performing electrical work, including troubleshooting and testing, each person must install an individual lock and tag. Each lock and tag must be removed only by the persons who installed them.

(2) If the person who installed the lock and tag is unavailable, the lock and tag may be removed by a person authorized by the operator, provided that:

(i) The authorized person is a qualified person; and

(ii) The mine operator assures that the person who installed the lock and tag is aware that the lock and tag have been removed.

§ 75.832 Frequency of examinations; recordkeeping.

(a) *Continuous mining machine examination.* At least once every 7 days, a qualified person must examine each high-voltage continuous mining machine to verify that electrical protection, equipment grounding, permissibility, cable insulation, and control devices are properly installed and maintained.

(b) *Ground-fault test circuit.* At least once every 7 days, and prior to tramming the high-voltage continuous mining machine, a qualified person must activate the ground-fault test circuit to verify that it will cause the corresponding circuit-interrupting device to open.

(c) *Ground-wire monitor test.* At least once every 7 days, and prior to tramming the high-voltage continuous mining machine, a qualified person must examine and test each high-voltage continuous mining machine ground-wire monitor circuit to verify that it will cause the corresponding circuit-interrupting device to open.

(d) *Trailing cable inspections.*

(1) Once each day during the shift that the continuous mining machine is first energized, a qualified person must de-energize and inspect the entire length of the high-voltage trailing cable from the power center to the continuous mining machine. The inspection must include examination of the outer jacket repairs and splices for damage, and assure guarding is provided where required.

(2) At the beginning of each shift that the continuous mining machine is energized, a person designated by the mine operator must de-energize and visually inspect the high-voltage trailing cable for damage to the outer jacket. This inspection must be conducted from the continuous mining machine to the following locations:

(i) The last open crosscut;

(ii) Within 150 feet of the working place during retreat or second mining; or

(iii) Up to 150 feet from the continuous mining machine when the machine is used in outby areas.

(e) *Grounded-phase detection test.* When a grounded-phase test circuit is provided on a high-voltage continuous mining machine, a person designated by the mine operator must activate the test circuit at the beginning of each production shift to assure that the detection circuit is functioning properly.

(f) *Corrective action.* When examinations or tests of equipment reveal a risk of fire, electrical shock, ignition, or operational hazard, the equipment must be immediately removed from service or repaired.

(g) *Record of tests.*

(1) At the completion of examinations and tests required under paragraphs (a), (b), and (c) of this section, the person conducting the examinations and tests must:

(i) Certify by signature and date that the examinations and tests have been conducted.

(ii) Make a record of any unsafe condition found.

(2) Any corrective action(s) must be recorded by the person taking the corrective action.

(3) The record must be countersigned by the mine foreman or equivalent mine official by the end of the mine foreman's or the equivalent mine official's next regularly scheduled working shift.

(4) Records must be maintained in a secure book that is not susceptible to alteration or electronically in a computer system so as to be secure and not susceptible to alteration.

(5) Certifications and records must be kept for at least 1 year and must be made available for inspection by authorized representatives of the Secretary and representatives of miners.

§ 75.833 Handling high-voltage trailing cables.

(a) *Cable handling.*

(1) Miners must not handle energized trailing cables unless they are wearing high-voltage insulating gloves, which include the rubber gloves and leather outer protector gloves, or are using insulated cable handling tools that meet the requirements of paragraph (c) or (d) of this section.

(2) Miners must not handle energized high-voltage cables with any parts of their bodies except by hand in accordance with paragraph (1) above.

(b) *Availability.* Each mine operator must make high-voltage insulating gloves or insulated cable handling tools available to miners handling energized high-voltage trailing cables.

(c) *High-voltage insulating gloves.* High-voltage insulating gloves must meet the following requirements:

(1) The rubber gloves must be designed and maintained to have a voltage rating of at least Class 1 (7,500 volts) and tested every 30 days in accordance with publication ASTM F496–02a, "Standard Specification for In-Service Care of Insulating Gloves and Sleeves" (2002). The Director of the Federal Register approved this incorporation by reference in accordance with 5 U.S.C. 522(a) and 1 CFR part 51. ASTM F496–02a may be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428–2959, call 610–832–9500 or go to *http://astm.org*. ASTM F496–02a is available for inspection at any MSHA Coal Mine Safety and Health District office, at the MSHA Office of Standards, Regulations, and Variances, 1100 Wilson Boulevard, Room 2350, Arlington, VA 22209–3939, 202–693–9440, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030, or go to: *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html*.

(2) The rubber glove portion must be air-tested at the beginning of each shift to assure its effectiveness.

(3) Both the leather protector and rubber insulating gloves must be visually examined before each use for signs of damage or defects.

(4) Damaged rubber gloves must be removed from the underground area of the mine or destroyed. Leather protectors must be maintained in good condition or replaced.

(d) *Insulated cable handling tools.* Insulated cable handling tools must be:

(1) Rated and properly maintained to withstand at least 7,500 volts;

(2) Designed and manufactured for cable handling;

(3) Visually examined before each use for signs of damage or defects; and

(4) Removed from the underground area of the mine or destroyed if damaged or defective.

§ 75.834 Training.

In addition to existing part 48 task training, hazard training, training for qualified persons under existing § 75.153, and annual refresher training, the following specialized training shall be provided and specified in the part 48 plan:

(a) Training for miners who perform maintenance on high-voltage continuous mining machines in high-voltage safety, testing, and repair and maintenance procedures.

(b) Training for personnel who work in the vicinity of high-voltage continuous mining machines in safety procedures and precautions for moving the high-voltage machines or the trailing cables.

■ 6. Amend § 75.1002 by adding paragraph (b)(5) to read as follows:

§ 75.1002 Installation of electric equipment and conductors; permissibility.

* * * * *

(b) * * *

(5) Shielded high-voltage cables supplying power to permissible continuous mining machines.

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