ORAL REVIEW
of
Electricity & Apparatus

When a device, apparatus, a piece of equipment or machinery, or a practice has been approved for use in the mining of coal, who must give the approval?

Answer: The Commissioner of the Office of Mine Safety and Licensing (OMSL)

Are all underground mines in Kentucky classified as “gassy?”

Answer: yes

What is high voltage?

Answer: voltage of 1,000 volts or more

What is an imminent danger?

Answer: "Imminent danger" means the existence of any condition or practice which could reasonably be expected to cause death or serious physical harm before the condition or practice can be abated.

What is low voltage?

Answer: Low voltage means up to and including 660 volts

What is medium voltage?

Answer: Medium voltage means voltages greater than six hundred sixty (660) and up to nine hundred ninety-nine (999) volts;

What does permissible mean?

Answer: **"Permissible" means that any equipment, device, or explosive that has been approved by the United States Bureau of Mines, the Mining Enforcement and Safety Administration, or the Mine Safety and Health Administration meets all requirements, restrictions, exceptions, limitations, and conditions attached to the classification;**

What does “workmanlike manner” mean?

“Workmanlike manner” means consistent with established practices and methods utilized in the coal industry.

What is the unit of measurement for voltage and what is its electrical symbol?

Answer: volts and the symbol for voltage is E.

What is the unit of measurement for current flow and what is its electrical symbol?

Answer: ampere (amps) and the electrical symbol for current is I.

What is the unit of measurement for resistance and what is its electrical symbol?

Answer: ohm and the electrical symbol for resistance is R.

Which electrical current flows in only one direction?

Answer:
Direct current (D.C.)

Which electrical current changes level and reverses direction at regular intervals, usually 60 cycles per second?

Answer:
Alternating current (A.C.)

True or False

An ammeter is used to measure voltage.

Answer:

False: an ammeter is used to measure current flow.

Which instrument is used to measure voltage?

Answer:

Voltmeter

Which instrument is used to measure resistance?

Answer:

Ohmmeter

A series circuit has how many paths for current flow?

Answer:

One

Which electrical current has more than one path for circuit flow?

Answer:

Parallel circuit

What is the circuit called in which its current takes a path outside its intended circuit?

Answer:

Short circuit

What is the term used for a piece of equipment or cable that is being used in excess of its normal, full-load current rating?

Answer:

Overload

What device is used to store energy and must be properly discharged before work is done on electrical circuits or equipment?

Answer:

Capacitor

True or False

According to law, changes can be made to approved electrical equipment after it is taken and used underground, if deemed necessary by the licensee.

Answer:

False, all approved electrical equipment must be maintained in its original condition unless approved changes have been made.

What are the requirements for being qualified and certified to work on electrical equipment?

Answer:

You must successfully complete a series of tests and have at least one (1) year of approved practical electrical experience.

What percent on each written electrical test shall be deemed to be a satisfactory grade?

Answer:

Eighty (80) percent

What type of materials must be used for hanging or suspending trailing cables or high voltage feeder cables?

Answer:

Nonconductive or insulated materials.

What devices must be provided for all power circuits and equipment at the mine?

Answer:

Suitable circuit-interrupting devices.

How shall all power wires and cables be protected?

Answer:

By proper installation or guarding.

State law requires that all ground wires are to have a cross-sectional area of:

Answer:

½ the cross-sectional area of the power conductor.

How shall extra length or long trailing cables be spread out or stored underground?

Answer:

In long open loops or in a figure-eight configuration on a clean, well rock-dusted floor, where the cable can be protected against mechanical injury, but cables suspended in long open loops shall be acceptable.

How many temporary splices are allowed in trailing cables?

Answer:

Only one (1) temporary splice is allowed in a trailing cable.

Other than cable reel equipment, how close can a temporary splice be made to the machine?

Answer:

To within 25 feet of the machine.

Fill in the blanks

The law requires that splices in trailing cables be made in a workmanlike manner, mechanically strong and _____ _____ .

Answer:

Well insulated.

How shall three-phase alternating current circuits used underground be grounded?

Answer:

By a direct or derived neutral which shall be grounded through a suitable resistor at the power center.

Fill in the blanks

According to law, if hand-held electrically driven tools are not double insulated by design, they must be _____ _____.

Answer:

Properly grounded.

Are the frames of all pumps required to be properly grounded?

Answer: Yes

Where must high voltage cables be installed?

Answer: in regularly inspected air courses and haulageways.

How shall they be protected against damage?

Answer: covered or placed so as to afford protection against damage.

When men regularly work or travel under high voltage cables, they must be guarded if they are not at least ____ feet above the ground.

Answer: 6 ½

Are the frames of all underground electrical equipment operated by men required to be grounded?

Answer:

Yes

What devices must be installed at or near the supply end of power circuits?

Answer:

Suitable disconnecting devices and short-circuit protective devices.

What must be provided at the beginning of all branch circuits?

Answer:

Suitable disconnecting devices.

The law requires underground transformer stations, battery charging stations, substations, rectifiers, and water pumps to be housed in noncombustible structures or areas. If this is not done, what must be provided?

Answer:

A suitable fire suppression system.

When these electrical units are housed in a noncombustible area, how shall the installations be ventilated?

Answer:

They shall be ventilated with intake air that is coursed into a return air course or to the surface and not used to ventilate working places; or

(continued)

they shall be ventilated with intake air that is monitored for carbon monoxide or smoke by an atmospheric monitoring system (AMS)

True of False

Monitoring of intake air used to ventilate battery charging stations shall be done with sensors not affected by hydrogen.

Answer: True

How often shall carbon monoxide and smoke sensors be calibrated?

Answer: At least every 30 days.

Are portable power centers, portable transformers, and distribution centers which are essentially fireproof required to be placed on separate splits of air?

Answer:

No, but they must be stationed in well ventilated places outby the last open crosscuts.

What must be located at strategic points along the beltline?

Answer:

Suitable firefighting equipment shall be located at strategic points along the belt.

What must be provided at transfer points along the beltline?

Answer:

Proper-type fire extinguishers

What three devices must be provided with all underground belt conveyors?

Answer:

Slippage and sequence switches and start and stop controls.

At what intervals must start and stop control devices be provided?

Answer:

At intervals not to exceed 1,000 feet.

Are lightening arrestors required to be installed on telephones?

Answer:

Yes, they must be installed where the wires enter the mine and at the buildings on the surface.

Where are insulating mats required to be installed?

Answer:

In front of disconnecting devices and all electrical installations where required.

What tests are to be conducted weekly on ground wires in trailing cables?

Answer:

For open circuit and high resistance

What does the law require when power circuits in tipples, buildings, cleaning plants, etc., and all underground electrical circuits are not in use over a long period of time?

Answer:

They shall be de-energized.

The law requires that all underground power circuits and electrical equipment be de-energized before work is done on the circuits and equipment. When is the exception?

Answer:

When necessary for troubleshooting or testing.

Before electrical work or major mechanical work is performed, what must be done?

Answer:

A suitable disconnect providing visible evidence that the power is disconnected shall be locked open and a tag shall be posted by the individuals performing the work.

When can repairs or maintenance be performed on machinery?

Answer:

Not until the power is off and the machinery is blocked against motion, except where machinery motion is necessary to make adjustment.

What precaution must be taken when electrical circuits cross over or under belt conveyors?

Answer:

The wiring shall be suitably protected.

Switch boxes, contactors, controllers, and all other similar devices shall be kept free of significant accumulations of what?

Answer:

Combustible dust

How high above the ground must high-voltage lines be installed on the surface where there is a possibility of contact by traffic?

Answer:

20 feet

What device shall be installed on all ungrounded exposed power conductors and telephone wires entering a mine regardless of voltage?

Answer:

Lightning arresters.

What other devices shall also be provided?

Answer:

Overload protection and disconnect switches of sizes and ratings approved by the department.

Are all metal buildings where electricity is being used required to be effectively grounded?

Answer:

Yes

Are all transformer tanks required to be effectively grounded?

Answer:

Yes

Switch boxes, contactors, controllers, and all other similar devices shall be kept free of what?

Answer:

Combustible dust.

Surface transformer stations shall be housed or fenced in when lower than how many feet above the earth?

Answer:

15 feet.

When surface transformer stations are fenced in, how high must the fence be?

Answer:

A minimum of six (6) feet.

What does the law require of all electrical equipment except intrinsically safe equipment which is taken inby the last open crosscut and in return airways?

Answer:

It must be permissible.

Who is authorized to reject any modifications to mining equipment which would endanger the health or safety of employees?

Answer:

The commissioner or his authorized representative.

Are headlights required on all mobile and face equipment at all times when in operation?

Answer:

Yes, and they must be properly installed and maintained in a workmanlike manner and in working order to provide maximum illumination and be protected from damage by guarding or locations.

When mining equipment is being operated, how shall it be maintained?

Answer:

In a safe working order.

By law, who is permitted to examine and test electrical equipment and circuits?

Answer:

A certified electrician.

Is it against the law to allow combustible materials, grease, lubricants, or flammable liquids to accumulate where they can create a fire hazard?

Answer:

Yes

All electrical equipment utilized in intake airways outby the last open crosscut shall be maintained in safe operating condition and in accordance with whose instructions?

Answer:

The manufacturer.

Who, according to the law, can be placed in charge of electrical face equipment?

Answer:

Only a qualified person capable of determining the safety of the roof, face, and ribs of the working places and detecting the presence of explosive gas and that person must have a minimum of 45 days of mining experience.

How is the fitness of an electrical face equipment operator determined?

Answer:

They shall undergo an examination to determine their fitness to detect explosive gas and they must have a minimum of forty-five (45) days of actual mining experience before they are permitted to have charge of electrical equipment.

What must be done before electric face equipment can be brought inby the last open crosscut?

Answer:

The equipment operator must make an inspection for explosive gas using an approved gas detection device or instrument in the place where the equipment is to work.

If any explosive gas in excess of one (1) per cent is found in the place, what must be done?

Answer:

The electrical equipment shall not be taken in until the gas is removed.

While the electrical equipment is operating at the face, when must examinations for gas be made?

Answer:

At not more than 20 minute intervals.

If methane gas is found in excess of one percent (1%) at any time, what must be done?

Answer:

The power shall be de-energized from the equipment and left de-energized until the gas is reduced to less than one percent(1%) and the place determined safe by a foreman.

What is the effect on electrical equipment of voltage that is too low?

Answer:

Inefficient operation, abnormal heating, and decreased operating life.

How shall approved electrical equipment be maintained?

Answer:

In its original condition unless approved changes have been made.

What is the most common cause of electrical accidents in coal mines?

Answer:

Failure to open, lock-out, and tag electrical circuits and equipment before working on equipment.

Who is authorized to perform electrical work on circuits or equipment?

Answer:

Only those persons who are qualified and have been certified by the Office of Mine Safety and Licensing as electricians, or trained persons working under direct supervision of a certified electrician.

What types of work require locking-out and tagging a visible disconnecting device when work is to be performed on electrical circuits and equipment?

Answer:

All types of work including electrical, mechanical, and hydraulic.

When disconnecting devices have been locked-out and tagged, who should remove the locks and tags?

Answer:

The person who installed the lock should remove it. In that person's absence, only an authorized person may remove it.

How often shall electrical equipment and wiring be inspected by a qualified electrician?

Answer:

As often as necessary to ensure safe operation.

What are some of the dangers associated with the transmission of electricity into a mine?

Answer:

Electrical shock, fire, and ignition of explosive gases.

What is the purpose of the belt slip switch?

Answer:

To open the control circuit if the belt hangs, stalls, or breaks.

What shall be done with power circuits on idle days and shifts?

Answer:

All power circuits not in use shall be de-energized.

What must be kept in place at all switchboards, power-control switches, and other areas were shock hazards exist?

Answer:

Suitable insulating mats.

What precaution should be taken when electrical circuits are no longer in use?

Answer:

The power should be disconnected and the wiring removed.

What action shall be taken when a potential hazard is found on electrical equipment?

Answer:

The equipment shall be removed from service and tagged-out until the unsafe conditions are corrected.

Why should transformer and distribution enclosures be locked?

Answer:

To prevent unauthorized entry.

What type of explosive gas is liberated from charging batteries?

Answer:

Hydrogen.

What precaution must be taken before an ohmmeter is used to check a circuit?

Answer:

The circuit must be de-energized.

What action should be taken by a mine foreman when he observes electrical protective devices "bridged" out or "blocked" in?

Answer:

The power should be disconnected immediately and the circuit returned to its safe, intended state.

For what is a “tic-tracer” used?

Answer:

A "tic-tracer" is used to test for the presence of voltage without physically touching the conductor or equipment that is being tested.

What precaution shall be taken before removing or replacing fuses?

Answer:

The circuit shall be de-energized.

What tools shall be used when fuses are removed or replaced?

Answer:

Fuse tongs or hot-line tools.

What electrical equipment must be properly labeled and identified?

Answer:

Disconnecting devices and circuit protective devices.

What procedures must be used when mobile equipment travels over trailing cables?

Answer:

The cables must be properly bridged or otherwise protected.

Why is running over trailing cables considered a poor practice?

Answer:

Heavy loads damage the insulation, often resulting in short-circuits and electrical shock hazards.

What are the most common causes of abnormal heating of conductors?

Answer:

Insufficient current-carrying capacity, poor connections, low voltage, and overloads.

How shall trailing cables be clamped to machines?

Answer:

In a manner to protect the cables from damage and to prevent strain on the electrical connections.

What precaution must be taken before attempting to repair a trailing cable?

Answer:

The circuit shall be disconnected by a visible disconnecting device and locked-out and tagged by the electrician who is to do the work. The conductors of high-voltage cables should be disconnected and discharged of any stored capacitive charge by shorting them to each other and to ground.

What are the dangers associated with poorly made splices in trailing cables?

Answer:

Electrical shock, fire, and ignition of explosive gas mixtures.

How should power wires be connected to stationary equipment?

Answer:

By using suitable connectors and proper strain protection.

How must splices in trailing cables be made?

Answer:

In a workmanlike manner, mechanically strong, electrically efficient and effectively insulated and sealed to exclude moisture. Splices should provide mechanical strength and electrical conductivity as near as possible to the original condition of the cable.

What type of device should be used to splice electrical conductors?

Answer:

Suitable connectors.

How shall splices be made in high-voltage cables?

Answer:

Only permanent splices shall be made in accordance with manufacturers' specifications.

How should circuits coming from a power center be protected?

Answer:

By visible disconnects, proper circuit-protective devices and suitable strain protection.

How should electrical equipment be protected against overloads?

Answer:

By properly rated circuit-protective devices (circuit breakers or fuses) and overload relays.

How does the proper use of circuit breakers or fuses afford protection?

Answer:

By automatically opening the circuit when a short-circuit or current-overload condition occurs.

What type of fuses should be used to provide both short-circuit and overload protection?

Answer:

Dual-element fuses.

Against what hazards shall power lines and telephone circuits be protected?

Answer:

Short-circuits and lightning.

How should telephone circuits be protected from lightning and contact with high voltage lines?

Answer:

By the use of lightning arrestors and proper guarding of telephone wires that are installed near high voltage wires.

What is the purpose of the ground-check circuit?

Answer:

To continuously monitor the continuity and connections of the grounding conductor in a cable.

How shall all metal-enclosed or encased electrical circuits be protected?

Answer:

By proper grounding or equivalent protection.

What type protection shall be provided for metal fencing and metal buildings enclosing transformers and switchgear?

Answer:

Metal fencing and metal buildings shall be effectively grounded.

When shall continuity and resistance of grounding circuits be tested?

Answer:

Immediately after their installation and at regular intervals thereafter.

How must single-phase alternating current 120 and 240 volt equipment be grounded?

Answer:

By the use of a third wire connected to the grounded center-tap of the transformer.

How shall three-phase circuits supplying power to portable or mobile equipment used on the surface be protected?

Answer:

By a direct or derived neutral which shall be grounded through a suitable resistor at the power center, and a grounding circuit originating at the grounded side of the grounding resistor which shall extend along with the power conductors and serve as a grounding conductor for the frames of all electrical equipment powered by that circuit.

Do all electrically powered water pumps need to be frame grounded?

Answer:

Yes. Frame grounding is required by state law.

What portable electrical equipment should be grounded?

Answer:

All portable electrical equipment shall be grounded, except approved hand-held tools with double insulation.

For what conditions should ground wires in trailing cables be checked at periodic intervals?

Answer:

They should be checked for open circuits and high resistance connections or splices.

What are the requirements for grounding the frames of small electrical tools and devices?

Answer:

All metal parts on power tools, other than double-insulated hand-held tools, shall be grounded.

An insulated tool or switch that is meant to be held in hand or supported against the body will not be approved with a nameplate rating exceeding how many volts?

Answer:

300 volts AC or DC.

Each hand-held tool shall be provided with a two-pole switch of the type that must be held closed by hand and will open when hand pressure is released. What is this type of switch called?

Answer:

“Dead-man” control type.

What is the maximum separation of a plane flange joint tolerated for permissibility?

Answer:

.004 in.

What is the maximum separation of a step flange joint tolerated for permissibility?

Answer:

.006 in.

Why must cables entering a compartment on permissible equipment be properly packed?

Answer:

To prevent flames from escaping from the compartment in the event of an ignition within it.

On permissible equipment, how much packing must be used under a packing nut along a conductor?

Answer:

At least ½ in. of compressed packing material must extend around the conductor.

How much clearance must be maintained between a packing gland and stuffing box?

Answer:

At least 1/8 in.

The temperature of external surfaces of mechanical or electrical components shall not exceed what temperature under normal operating procedures?

Answer:

302°F.

End of Unit 6