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Pennsylvania Technical Advisory Committee
On Diesel Powered Equipment

Paul Borchick
(724) 485-4414 (office)
(412) 736-9105 (cell)
Email: paulborchick@consolenergy.com

Ron Bowersox
(724) 726-8987 (Home)
(724) 479-8692 (Office)
Email: umwarbowersox@yahoo.com

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Joseph Sbaffoni, Director
Bureau of Mine Safety
Fayette County Health Center
100 New Salem Road, Room 167
Uniontown, Pa. 15401

RE: TAC recommendations for "Conditions of Use of Diesel Powered Equipment in Shaft and Slope Construction Operations in Bituminous Coal Mines"

Dear Mr. Sbaffoni:

Pursuant to Chapter 4, Section 424 (h)(6)(j) of the Safety Laws of Pennsylvania for Underground Bituminous Coal Mines the Technical Advisory Committee for Diesel-Powered Equipment (Diesel TAC) is empowered to make recommendations to the Department of Environmental Protection for conditions of use for diesel-powered equipment in shaft and slope construction operations in coal mines.

By a letter dated March 27, 2006, Joseph A. Sbaffoni, the Department's Director of the Bureau of Mine Safety, requested the Diesel TAC to develop such proposed conditions of use.

The proposed conditions of use were discussed in the regular scheduled TAC meetings on July 19, 2006; October 18, 2006; January 10, 2007 and April 11, 2007 as well as a special meeting devoted to the proposed conditions on February 12, 2007. Public comments were received along with comments from the Bureau of Mine Safety, mining companies and shaft and slope construction companies. Through these meetings and discussions the TAC was able to develop recommendations to be submitted to the Department. The TAC withheld action on their recommendations pending approval of the revised Pennsylvania Mining Law which took effect on January 3, 2009. Changes were made to our recommendation to reflect the "Safety Laws of Pennsylvania for Underground Bituminous Coal Mines" Chapter 4.

The enclosed "Proposed Conditions of Use of Diesel- Powered Equipment in Shaft and Slope Construction Operations in Bituminous Coal Mines" are the TAC recommendations submitted to the Department for review.

Paul Borchick

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Ron Bowersox

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Proposed Conditions of Use of Diesel-Powered Equipment in Shaft and Slope Construction Operations in Bituminous Coal Mines

Pursuant to Chapter 4, Section 424 (h)(6)(j) of the Safety Laws of Pennsylvania for Underground Bituminous Coal Mines the Technical Advisory Committee for Diesel-Powered Equipment (Diesel TAC) is empowered to make recommendations to the Department of Environmental Protection for conditions of use for diesel-powered equipment in shaft and slope construction operations in coal mines. By a letter dated March 27, 2006, Joseph A. Sbaffoni, the Department's Director of the Bureau of Mine Safety, requested the Diesel TAC to develop such proposed conditions of use.

Following are the Diesel TAC's recommended conditions of use for the use of diesel-powered equipment in shaft and slope construction operations in bituminous coal mines. These recommended conditions of use are based primarily on the standards and procedures for the use of diesel-powered equipment in underground bituminous coal mines in Sections 401 through 423 of Chapter 4 of the Safety Laws of Pennsylvania for Underground Bituminous Coal Mines with the modifications in these recommended conditions of use. If any of Sections 401 through 423 of the Act is amended, the Diesel TAC requests the opportunity to reassess these recommended conditions of use in light of any such amendments to the Act.

Recommended Conditions of Use

The Diesel TAC recommends that the following existing provisions of Chapter 4 of the Act, as modified herein, apply to the use of diesel-powered equipment in shaft and slope construction operations in bituminous coal mines:

Section 401. Underground use

(a) Underground use of diesel-powered equipment in slope and shaft construction operations, including mobile equipment, stationary equipment and equipment of all horsepower ratings, may only be approved, operated and maintained as provided in these conditions of use, except for emergency fire-fighting equipment to be used specifically for that purpose.

(b) All diesel-powered equipment shall be attended while in operation with the engine running in underground slope and shaft construction operations. For purposes of this subsection, "attended" shall mean an equipment operator is within sight or sound of the diesel-powered equipment and in compliance with Section 423(b)

c) Diesel-powered equipment may be used in underground slope and shaft construction operations if the diesel-powered equipment uses an engine approved or certified by MSHA, as applicable, for inby use that, when tested at the maximum fuel-air ratio, does not require an MSHA Part 7 approval plate ventilation rate exceeding 75 cfm per rated

horsepower. Should MSHA promulgate new regulations that change the MSHA Part 7 approval plate ventilation rate, the cfm requirement per rated horsepower will be revised either up or down on a direct ratio basis upon recommendation of the Technical Advisory Committee in accordance with Section 424.

Section 402. Diesel-powered equipment package
(a) All diesel-powered equipment shall be approved by the department as a complete diesel-powered equipment package which shall be subject to all of the requirements, standards and procedures set forth in this article.

(b) Diesel engines shall be certified or approved, as applicable, by MSHA and maintained in accordance with MSHA certification or approval and department approval.

Section 403. Exhaust emissions control
(a)(1) Underground diesel-powered equipment intended for use in slope and shaft construction operations shall include an exhaust emissions control and conditioning system that has been laboratory tested with the diesel engine, except as provided in paragraph (3), using the ISO 8178-1 test and has resulted in diesel particulate matter emissions that do not exceed an average concentration of 0.12 mg/m^3 when diluted by one hundred percent of the MSHA Part 7 approval plate ventilation rate for that diesel engine. Should MSHA promulgate new regulations that change the MSHA Part 7 approval plate ventilation rate, the dilution percentage relative to the approval plate ventilation rate will be adjusted either up or down on a direct ratio basis upon recommendation of the Technical Advisory Committee in accordance with Section 424.

(2) The exhaust emissions control and conditioning system shall be required to successfully complete a single series of laboratory tests conducted at a laboratory accepted by the secretary for each diesel engine, except as provided in paragraph (3).

(3) An exhaust emissions control and conditioning system may be approved for multiple diesel engine applications through a single series of laboratory tests, known as the ISO 8178-1 test, only if data is provided to the advisory committee that reliably verifies that the exhaust emissions control and conditioning system will meet, for each diesel engine, the in-laboratory diesel particulate matter standard established by this subsection. Data provided to satisfy this provision shall include diesel particulate matter production rates for the specified engine as measured during the ISO 8178-1 test, if available. If ISO 8178-1 test data for diesel particulate matter production is not available for a specified engine, comparable data may be provided to the advisory committee that reliably verifies that the exhaust emissions control and conditioning system will meet, for the specified diesel engine, the in-laboratory diesel particulate matter standard established by this subsection. This standard shall only be used for in-laboratory testing for approval of diesel-powered equipment for use underground.

(b) The exhaust emissions control and conditioning system shall include the following:
(1) A diesel particulate matter (DPM) filter that has proven capable of a reduction in total diesel particulate matter to a level that does not exceed the requirements of subsection (a)

(1). However, the TAC may evaluate in accordance with Section 424, alternative technologies that have the ability to meet the .12 mg/m^3 standard.

(2) An oxidation catalyst or other gaseous emissions control device capable of reducing undiluted carbon monoxide emissions to 100 ppm or less under all conditions of operation at normal engine operating temperature range.

(3) An engine surface temperature control capable of maintaining significant external surface temperatures below three hundred two degrees Fahrenheit.

(4) A system capable of reducing the exhaust gas temperature below three hundred two degrees Fahrenheit.

(5) An automatic engine shutdown system that will shut off the engine before the exhaust gas temperature reaches three hundred two degrees Fahrenheit and, if water jacketed components are used, before the engine coolant temperature reaches two hundred twelve degrees Fahrenheit. A warning shall be provided to alert the equipment operator prior to engine shutdown.

(6) A spark arrestor system.

(7) A flame arrestor system.

(8) A sampling port for measurement of undiluted and untreated exhaust gases as they leave the engine.

(9) A sampling port for measurement of treated undiluted exhaust gases before they enter the mine atmosphere.

(10) All shaft and slope diesel powered equipment will be permissible, and any additional MSHA regulations for permissible equipment must be met, unless otherwise approved by the Department.

(c) On-board engine performance and maintenance diagnostics systems shall be capable of continuously monitoring and giving readouts for paragraphs (1), (2), (3), (4), (5), (6), (7) and (8) of this subsection. The diagnostics system shall identify levels that exceed the engine and/or component manufacturer's recommendation or the applicable MSHA or bureau requirements as to the following:

(1) Engine speed.
(2) Operating hour meter.
(3) Total intake restriction.
(4) Total exhaust back pressure.
(5) Cooled exhaust gas temperature.
(6) Coolant temperature.
(7) Engine oil pressure.
(8) Engine oil temperature.

Section 404. Ventilation
(a) Minimum quantities of air where diesel-powered equipment is operated shall be maintained pursuant to this Section.

(b) Each specific model of diesel-powered equipment shall be approved by the department before it is taken underground. The department shall require an approval plate that must be attached to each piece of the diesel-powered equipment. The approval plate shall specify the minimum ventilating air quantity for the specific piece of diesel-powered equipment. The minimum ventilating air quantity shall be determined by the bureau based on the amount of air necessary at all times to maintain the exhaust emissions at levels not exceeding the exposure limits established in Section 419.

(c) The minimum quantities of air in any slope or shaft where any individual unit of diesel-powered equipment is being operated shall be at least that specified on the approval plate for that equipment. Air quantity measurements to determine compliance with this requirement shall be made at the individual unit of diesel-powered equipment.

d) Where multiple units are operated, the minimum quantity shall be at least the total of one hundred percent of MSHA's Part 7 approval plate ventilation rate for each unit operating in that slope or shaft. Air quantity measurements to determine compliance with this requirement shall be made at the most downwind unit of diesel-powered equipment that is being operated in that slope or shaft. Should MSHA promulgate new regulations that change the MSHA Part 7 approval plate ventilation rate, the minimum quantity where multiple units are operated shall be revised on a direct ratio basis upon recommendation of the Technical Advisory Committee in accordance with Section 424.

(e) The minimum quantities of air in any slope or shaft where any diesel-powered equipment is operated shall be in accordance with the minimum air quantities required in subsections (a) and (b) and shall be specified in the slope or shaft ventilation plan.

Section 405. Fuel QUALITY AND STORAGE
(a) Diesel-powered equipment shall be used underground only with fuel that meets the standards of the most recently approved United States Environmental Protection Agency (EPA) guidelines for over-the-road fuel. Additionally, the fuel shall also meet the ASTM D975 standards with a flash point of one hundred degrees Fahrenheit or greater at standard temperature and pressure. The operator shall maintain a copy of the most recent delivery receipt from the supplier to verify that the fuel used underground meets this standard.

(b) Diesel fuel shall not be stored in slopes or shafts.

Section 406. Transfer of diesel fuel
(a) Diesel fuel shall be transferred as provided in this section.

(b) When diesel fuel is transferred by means of a pump and a hose equipped with a nozzle containing a self-closing valve, a powered pump may be used only if:
(1) The hose is equipped with a nozzle containing a self-closing valve without a latch-open device; and
(2) The pump is equipped with an accessible emergency shutoff switch.

(c) Diesel fuel shall not be transferred using compressed gas.

(d) Diesel fuel shall not be transferred to the fuel tank of diesel-powered equipment while the equipment's engine is running.

Section 407. Containers
(a) Containers for the transport of diesel fuel shall meet the requirements of this section.

(b) Diesel fuel shall be transported only in containers specifically designed for the transport of diesel fuel.

(c) No more than one safety can, conspicuously marked, shall be transported on a vehicle at any time.

(d) Containers other than safety cans used to transport diesel fuel shall be provided with the following:
(1) Devices for venting.
(2) Self-closing caps.
(3) Vent pipes at least as large as the fill or withdrawal connection, whichever is larger, but not less than one and one-fourth inch nominal inside diameter.
(4) Liquid-tight connections for all container openings that are identified by conspicuous markings and closed when not in use.
(5) Shutoff valves located within one inch of the tank shell on each connection through which liquid can normally flow.

(e) When tanks are provided with openings for manual gauging, liquid-tight caps or covers shall be provided and shall be kept closed when not open for gauging.

(f) Containers used for the transport of diesel fuel shall not exceed a capacity of one hundred gallons.

(g) Containers, other than safety cans, used for the transport of diesel fuel shall be mechanically secured to the transportation unit; provided, however, that the Technical Advisory Committee may develop criteria on a mine by mine basis, in accordance with Section 424, that allows for approved diesel fuel transportation units to be transported on or by a secondary transportation unit to their respective work areas.

(h) Diesel fuel transportation units shall be transported, hoisted or lowered individually and not with any other materials or cars.

(i) Diesel fuel shall not be transported on conveyor belts.

(j) When transporting, hoisting or lowering diesel fuel in containers other than safety cans, a fire extinguisher shall be provided on each end of the transportation unit. The fire extinguishers shall be multipurpose type dry-chemical fire extinguishers containing a nominal weight of twenty pounds.

(k) Diesel fuel transportation units shall have a fire suppression system that meets the requirements of Section 408.

(l) **RESERVED.**

(m) Diesel fuel transportation units shall be attended at all times, except when being hoisted or lowered.

(n) Safety cans shall be used for emergency fueling only.

(o) Safety cans shall be clearly marked, have a maximum capacity of five gallons and be constructed of metal and equipped with a nozzle and self-closing valves.

Section 408. **Fire suppression for equipment and transportation**
(a) Fire suppression systems for diesel-powered equipment and fuel transportation units shall meet the requirements of this Section.

(b) The system must be an automatic multipurpose dry-powder type fire suppression system suitable for the intended application and listed or approved by a nationally recognized independent testing laboratory. Installation requirements are as follows:
(1) The system shall be installed in accordance with the manufacturer's specifications and the limitations of the listing or approval.
(2) The system shall be installed in a protected location or guarded to minimize physical damage from routine operations.
(3) Suppressant agent distribution tubing or piping of the system shall be secured and protected against damage, including pinching, crimping, stretching, abrasion and corrosion.
(4) Discharge nozzles of the system shall be positioned and aimed for maximum fire suppression effectiveness in the protected areas. Nozzles shall also be protected against the entrance of foreign materials such as mud, coal dust or rock dust that could prevent proper discharge of suppressant agent.

(c) The fire suppression system shall provide automatic fire detection and suppression for all of the following:
(1) The engine, transmission, hydraulic pumps and tanks, fuel tanks, exposed brake units, air compressors and battery areas, as applicable, on all diesel-powered equipment.
(2) Fuel containers and electric panels or controls used during fuel transfer operations on fuel transportation units.

(d) The fire suppression system shall include a system fault and fire alarm annunciator that can be seen and heard by the equipment operator.

(e) The fire suppression system shall provide for automatic engine shutdown. Engine shutdown and discharge of suppressant agent may be delayed for a maximum of fifteen seconds after the fire alarm annunciator alerts the operator.

(f) At least two manual actuators shall be provided with at least one manual actuator at each end of the equipment. If the equipment is provided with an operator's compartment, one of the mechanical actuators shall be located in the compartment within easy reach of the operator. For stationary equipment, the two manual actuators shall be located with at least one actuator on the stationary equipment and at least one actuator a safe distance away from the equipment and in intake air.

Section 409. RESERVED.

Section 410. Use of certain starting aids prohibited
The use of volatile or chemical starting aids is prohibited.

Section 411. Fueling
(A) Diesel-powered equipment shall be shut down during fueling.

(b) Diesel fuel and other combustible materials shall be cleaned up and not be permitted to accumulate anywhere in a shaft or slope or on diesel-powered or electric equipment located therein.

(c) At least one person specially trained in the cleanup and disposal of diesel fuel spills shall be on duty at the slope or shaft construction operation when diesel-powered equipment or mobile fuel transportation equipment is being used in such operations or when any underground fueling of diesel-powered equipment is being conducted.

Section 412. Fire and safety training
(a) All employees engaged in slope and shaft construction operations shall receive special instruction related to fighting fires involving diesel fuel. This training may be included in annual refresher training under MSHA regulations or included in the fire drills required under MSHA regulations.

(b) All employees engaged in slope and shaft construction operations shall be trained in precautions for safe and healthful handling and disposal of diesel-powered equipment filters. All used intake air filters, exhaust diesel particulate matter filters and engine oil filters shall be placed in their original containers or other suitable enclosed containers and removed from the slope or shaft to the surface. Arrangements shall be made for safe handling and disposal of these filters within a timely manner after they have reached the surface.

Section 413. Maintenance
(a) Diesel-powered equipment shall be maintained in an approved and safe condition as described in these conditions of use or removed from service. Failure of the slope or shaft construction operator to comply with the maintenance requirements of this

subsection may result in revocation of the department's approval of the complete diesel-powered equipment package, provided appropriate notification has been given to the operator and the procedures of this section have been followed. Upon receiving such notice, the operator shall have thirty days to submit a plan to achieve and maintain compliance. Such plan shall be evaluated by the department, and, upon approval, the operator shall implement the plan. The department shall monitor the operator's compliance. If the department then determines that the operator is unable or unwilling to comply, the department shall revoke the operator's approval.

(b) To acquire and maintain approval of a complete diesel-powered equipment package, the slope or shaft construction company shall comply with the following requirements:
(1) All service, maintenance and repairs of approved complete diesel-powered equipment packages shall be performed by mechanics who are trained and qualified in accordance with Section 422.
(2) Service and maintenance of approved complete diesel-powered equipment packages shall be performed according to:

(i) The specified routine maintenance schedule;
(ii) On-board performance and maintenance diagnostics readings;
(iii) Emissions test results; and
(iv) Component manufacturer's recommendations.

Section 414. Records
(a) A record shall be made of all emissions tests, preoperational examinations and maintenance and repairs of complete diesel-powered equipment packages. The records made pursuant to this section shall meet the requirements of this section.

(b) The person performing the emissions test, examination, maintenance or repair shall certify by date, time, engine hour reading and signature that the emissions test, examination, maintenance or repair was made.

(c) Records of emissions tests and examinations shall include the specific results of such tests and examinations.

(d) Records of maintenance and repairs shall include the work that was performed, any fluids or oil added, parts replaced or adjustments made and the results of any subsequently required emissions testing.

(e) Records of preoperational examinations shall be retained for the previous one hundred-hour maintenance cycle.

(f) Records of emissions tests, one hundred-hour maintenance tests and repairs shall be countersigned once each week by the certified electrician or a certified slope and shaft construction supervisor.

(g) All records, except as specified in subsection (e), required by this section shall be retained until completion of the slope and shaft construction operations at a surface location at or near to the slope or shaft construction site and made available for inspection

by the department's district mine inspector and by and the slope and shaft construction employees and their representatives.

Section 415. Duties of diesel-powered equipment operator
(a) Prior to using a piece of diesel-powered equipment during a shift, the equipment operator shall conduct an examination as follows:
(1) Check the exhaust emissions control and conditioning system components to determine that the components are in place and not damaged or leaking.
(2) Assure that the equipment is clean and free of accumulations of combustibles.
(3) Assure that the machine is loaded safely.
(4) Check for external physical damage.
(5) Check for loose or missing connections.
(6) Check engine oil level.
(7) Check transmission oil level.
(8) Check other fluid levels, if applicable.
(9) Check for hydraulic, coolant and oil leaks.
(10) Check fan, water pump and other belts.
(11) Check the fan for damage.
(12) Check guards.
(13) Check the fuel level.
(14) Check for fuel leaks.
(15) Comply with recordkeeping requirements pursuant to Section 414.

(b) After the engine is started and warmed up, the equipment operator shall conduct an examination as follows:
(1) Check all on-board engine performance and maintenance diagnostics system gauges for proper operation and in-range readings. The equipment operator shall immediately shut down the engine and notify the slope or construction operator if the on-board readings indicate any of the following:
(i) Intake restriction at full engine speed is greater than the manufacturer's recommendation.
(ii) Exhaust restriction at full engine speed is greater than the manufacturer's recommendation.
(iii) Coolant temperature is at or near two hundred twelve degrees Fahrenheit.
(iv) Low engine oil pressure.
(v) High engine oil temperature.
(2) Check safety features, including, but not limited to, the throttle, brakes, steering, lights and horn.
(3) Comply with recordkeeping requirements pursuant to Section 414.

Section 416. Scheduled maintenance
At intervals not exceeding one hundred hours of engine operation, a qualified mechanic shall perform the following maintenance and make all necessary adjustments or repairs or remove the equipment from service:
(1) Wash or steam-clean the equipment.
(2) Check for and remove any accumulations of coal, coal dust or other combustible materials.

(3) Check the equipment for damaged or missing components or other visible defects.
(4) Conduct electrical and safety component inspections.
(5) Replace engine oil and oil filter. The Technical Advisory Committee in accordance with Section 424 may recommend a replacement interval greater than 100 hours.
(6) Check the transmission oil level and add oil, if necessary.
(7) Check hydraulic oil level and add oil, if necessary.
(8) Check the engine coolant level and add coolant, if necessary.
(9) Check all other fluid levels and add fluid, if necessary.
(10) Check for oil, coolant and other fluid leaks.
(11) Inspect the cooling fan, radiator and shroud. Remove any obstructions and make necessary repairs.
(12) Check all belts. Tighten or replace, if necessary.
(13) Check the battery and service as necessary.
(14) Check the automatic fire suppression system.
(15) Check the portable fire extinguisher.
(16) Check the lights.
(17) Check the warning devices.
(18) With the engine operating, check and replace or repair the following:
(i) Oil pressure.
(ii) Intake air restriction at full engine speed.
(iii) Exhaust gas restriction at full engine speed.
(iv) Exhaust flame arrestor.
(v) All gauges and controls.
(19) Conduct repeatable loaded engine operating test in accordance with Section 418.
(20) If the equipment is approved with a non-disposal diesel particulate filter, a smoke dot test of the filtered exhaust must be performed at this time. The results of the smoke dot test shall be recorded on the 100-hour emissions form. If the interpreted smoke dot number is greater than a three the Department shall be notified and shall investigate to determine if the filter is functioning properly.
(21) RESERVED.
(22) Comply with recordkeeping requirements pursuant to Section 414.

Section 417. Emissions monitoring and control
(a) Emissions for diesel-powered equipment shall be monitored and controlled as provided in this section.
(b) When any diesel-powered equipment first enters service at a slope or shaft construction operation, baseline emission values shall be determined by a qualified mechanic. Unless the Technical Advisory Committee in accordance with Section 424 recommends an alternate procedure, the qualified mechanic shall:
(1) Verify that the seal on the engine fuel injector is in place and that the proper fuel pump is on the equipment.
(2) Install a new clean intake air cleaner, measure and record the intake restriction pressure.
(3) Check the level of engine oil.
(4) Change the engine lubrication oil if not fresh.
(5) Check the level of the transmission fluid.

(6) Measure and record the exhaust back pressure. If exhaust gas back pressure is above that recommended by the manufacturer, then steps must be taken to bring the exhaust gas back pressure within the manufacturer's recommended limit prior to beginning the test described in this Section.
(7) Test the brakes.
(8) Place the equipment in a location that is upwind of other diesel-powered equipment.
(9) Set the brakes and chock the wheels.
(10) Install an exhaust gas analyzer into the untreated exhaust gas port.
(11) Start the engine and allow it to warm up to operating temperature.
(12) Put the engine into a loaded condition. For this Section, the loaded condition for the baseline emissions testing shall be determined by the Technical Advisory Committee by determining CO_2 values that are representative of the MSHA lug curve readings for that engine model and horsepower.
(13) Start the exhaust gas analyzer. Allow the engine to operate (in the loaded condition) for a sufficient length of time (not less than 90 second duration) to insure proper CO readings. Record both CO and CO_2 readings. Note: Baseline CO values must be determined by the Technical Advisory Committee based upon MSHA lug curve readings for that engine and horsepower. If the baseline CO values are greater than the MSHA lug curve values, the Technical Advisory Committee shall investigate and either recommend approval or disapproval, or recommend alternate methods of meeting the requirements of this Section.
(14) Comply with recordkeeping requirements pursuant to Section 414.
(15) An alternative to the testing provided in subsections 1-14 may be developed by the Technical Advisory Committee in accordance with Section 424.
(16) Emissions test procedures for this Section shall be submitted to the Technical Advisory Committee in accordance with Section 424 prior to being implemented for each engine and equipment type.

Section 418. Diagnostic testing
At intervals not exceeding once every one hundred hours of engine operation, a qualified mechanic shall perform equipment maintenance diagnostic testing of each piece of diesel-powered equipment in use in slope and shaft construction operations. The qualified mechanic shall:
(1) verify the identification numbers on the equipment;
(2) check the level of the engine lubricating oil;
(3) check the level of the transmission fluid;
(4) set the brakes and chock the wheels;
(5) install the portable CO sampling device into the untreated exhaust port coupling provided in the operator's cab;
(6) start the engine and allow it to warm up to operating temperature;
(7) check the intake restriction and the exhaust back pressure at high idle speed;
(8) if the intake restriction is more than the manufacturer's maximum recommended intake restriction, replace the intake filter with a clean one;
(9) If exhaust gas back pressure is above that recommended by the manufacturer, then steps must be taken to bring the exhaust gas back pressure within the manufacturer's recommended limit prior to beginning the test described in this Section;

(10) Put the engine into a loaded condition. For this Section, loaded condition shall mean that the CO_2 values are representative of the MSHA lug curve values for that engine model and horsepower rating.
(11) Start the exhaust gas analyzer. Allow the engine to operate for a sufficient time (not less than 90 second duration) to insure proper CO readings. Record both CO and CO_2 readings.
(12) Install the exhaust gas analyzer into the treated exhaust port and repeat steps (10) and (11);
(13) If the average CO reading for untreated exhaust gas is greater than twice the baseline established under Section 417(b) or if the average CO reading for treated exhaust gas is greater than 100 ppm, the equipment has failed and must be serviced and retested before it is returned to regular service; and
(14) Comply with recordkeeping requirements pursuant to Section 414.
(15) Emissions test procedures for this Section shall be submitted to the Technical Advisory Committee in accordance with Section 424 prior to being implemented for each engine and equipment type.
(16) An alternative to the testing provided in subsections 1-14 may be developed by the Technical Advisory Committee in accordance with Section 424.

Section 419. **Exhaust gas monitoring and control**
(a) In monitoring and controlling exhaust gases, the ambient concentration of exhaust gases in the slope or shaft atmosphere shall not exceed 35 ppm ceiling for carbon monoxide (CO), 25 ppm ceiling for nitric oxide (NO) and 3 ppm ceiling for nitrogen dioxide (NO_2). The concentration of these exhaust gases shall be measured at the equipment operator's or equipment attendant's position and downwind of the last piece of diesel-powered equipment operating in the slope or shaft. Measurements shall be made weekly or more often if necessary by a qualified person and shall be conducted pursuant to the requirements of this section.
(b) Measurement of exhaust gases shall be made with a sampling instrument no less precise than detector tubes.
(c) If the concentration of any of the gases listed in subsection (a) is seventy-five per cent or more of its exposure limit, changes to the use of the diesel equipment, the slope or shaft ventilation or other modifications to the slope or shaft construction operations shall be made.
(d) If the concentration of any of the gases listed in subsection (a) exceeds the exposure limit, the diesel equipment operating in the slope or shaft shall be removed from service immediately and corrective action taken. After corrective action has been taken by the slope or shaft construction operator, the diesel equipment may be returned to service in its regular operating mode for emissions testing purposes only, and emissions testing shall be conducted immediately to assure that the concentration does not exceed seventy-five per cent of the exposure limit. Corrective action must be taken until the concentration does not exceed seventy-five per cent of the exposure limit before the diesel equipment can be returned to full operation.
(e) In addition to the other maintenance requirements set forth in this article, the slope or shaft construction company shall comply with the following requirements:
(1) Repair or adjustment of the fuel injection system shall only be performed by qualified mechanics authorized by the engine manufacturer.

(2) Complete testing of the emissions system in accordance with Section 418 shall be conducted prior to any piece of diesel-powered equipment being put into service, after any repair or adjustment to the fuel delivery system, engine timing or exhaust emissions control and conditioning system.
(3) Service and maintenance of the intake air filter, exhaust particulate filter and the exhaust system shall be performed at specific time intervals based on the component manufacturer's recommendation, compliance with the engine or emissions control operation specifications and, as needed, based on the on-board diagnostics and/or emissions test results. Accurate records shall be maintained of all such service and maintenance.

Section 420. **Training and general requirements**
(a) All training course instructors and all training plans required by this section and Sections 421 and 422 shall be approved by the department. Operator training and qualification shall meet the requirements of this Section.
(b) Training shall be conducted in the basics of the operation of a diesel engine, Federal and State regulations governing their use, company rules for safe operation, specific features of each piece of equipment and the ability to recognize problems and shall be provided to each equipment operator and the health and safety committee for the slope and shaft construction operation if one exists. This training shall be designed to bring every diesel-powered equipment operator to a level of good understanding of diesel equipment operation. Each operator will be qualified by attending a minimum eight-hour course, including classroom training on diesel fundamentals and equipment-specific hands-on training on the job.
(c) Upon successful completion of both training sessions, the operator shall be issued a Certificate of Qualification that qualifies him or her to operate a specific type of diesel-powered equipment. An operator may be qualified to operate more than one type of equipment by completing additional equipment-specific training covering differences specific to each additional type of equipment.
(d) Refresher training shall be required annually.
(e) The minimum eight-hour training required by subsection (b) shall include instruction in the following classroom subjects:
(1) Engine fundamentals, which shall include an introduction to the function of a diesel engine and recognition of all major components and their functions.
(2) Diesel regulations, which shall include an introduction to Federal and State regulations governing the use of diesel equipment and these conditions of use.
(3) Diesel emissions, which shall include an introduction to diesel emissions and their adverse health effects.
(4) Factors that affect diesel emissions, which shall include a detailed presentation of engine faults and diesel fuel quality and their effect on emissions and the preventive actions that can be taken to minimize emissions levels.
(5) Emissions control devices, which shall include a detailed presentation of the different emissions control devices employed to reduce emissions and details about actions the operator must take to keep the devices in working order.
(6) Diagnostic techniques, which shall include a presentation of techniques that can be employed by the operator to assure the equipment is in safe operating condition and

instruction about how to recognize and diagnose certain engine faults that may cause increases in emissions.
(7) The preoperational inspection, which shall include a presentation of the purpose, benefits and requirements of the preoperational inspection.
(8) Ventilation, which shall include an introduction to special ventilation requirements for areas where diesel-powered equipment will operate.
(9) Fire suppression system, which shall include an introduction to the fire suppression system and its function and when and how to activate the fire suppression manually.
(10) Operating rules, which shall include a detailed presentation of the driving rules, safe driving speeds, traffic control devices and equipment limitations.
(11) Emergency procedures, which shall include discussion of emergency situations, such as fire, diesel fuel spills, component failure, loss of ventilation air and emergency escape procedures and discussion of the potential use of the diesel-powered vehicle as an emergency escape vehicle in case of an emergency situation.
(12) Recordkeeping and reporting procedures, which shall include a presentation on required recordkeeping and reporting procedures for problems or unsafe conditions, high emissions level and preoperational inspections made by the equipment operator.
(f) A new Certificate of Qualification
shall be issued annually after the equipment operator has received the annual refresher training.

Section 421. Equipment-specific training
Equipment-specific hands-on orientation training shall be given in an area of the slope or shaft where the equipment will be operated. This orientation shall be specific to the type and make of the diesel machine and shall be presented in small groups. The following subjects shall be included in the training:
(1) Equipment layout, which shall include familiarization with the layout of the equipment, the operator's compartments and the controls.
(2) Preoperation inspection, which shall include familiarization with the preoperation inspection procedure and review of specific details of the inspection and location of the components to be inspected.
(3) Equipment limitations, which shall include instruction relating to equipment performance, speeds, capacities, blind areas, and the operational environment..
(4) Operating areas, which shall include instruction relating to areas in which the equipment may be operated.
(5) Operation, which shall include familiarization with the controls, gauges and warning devices and safe operating limits of all indicating gauges.
(6) Refueling procedure, which shall include familiarization with fuel handling, permissible refueling areas, spill prevention, cleanup and potential hazards from diesel fuel.
(7) Emergency devices, which shall include instruction relating to the location and use of the fire extinguisher and fire suppression devices.
(8) Driving or operation practice, which shall include supervised operation of the equipment.

Section 422. Diesel mechanic training

(a) Diesel mechanic training and qualification shall meet the requirements of this section.

(b) Diesel mechanics shall be trained and qualified to perform maintenance, repairs and testing of the features of diesel equipment certified by MSHA and the department.

(c) To be qualified, a diesel mechanic must successfully complete a minimum of sixteen hours of a training program approved by the department regarding the general function, operation, maintenance and testing of emissions control and conditioning components. The diesel mechanic must be qualified to perform these tasks on the specific machines used at the slopes or shafts where they are employed. Additional engine-specific training shall be provided to diesel mechanics in accordance with a plan approved by the department.

(d) Annual retraining programs for diesel mechanics shall be required and approved by the department. The annual retraining shall include refresher training as well as new procedure and new technology training as necessary. Such training shall be separate from refresher training required by MSHA and electrical training required by MSHA.

(e) The minimum sixteen-hour diesel mechanic training programs shall be submitted for approval to the department and shall include training in the following minimum subject requirements:

(1) Federal and State requirements regulating the use of diesel equipment and these conditions of use.

(2) Company policies and rules related to the use of diesel equipment.

(3) Emissions control system design and component technical training.

(4) On-board engine performance and maintenance diagnostics system design and component technical training.

(5) Service and maintenance procedures and requirements for the emissions control systems.

(6) Emissions testing procedures and evaluation and interpretation of test results.

(7) Troubleshooting procedures for the emissions control systems.

(8) Fire protection systems test and maintenance.

(9) Fire and ignition sources and their control and elimination.

(10) Fuel system maintenance and safe fueling procedures.

(11) Intake air system design and components technical training and maintenance procedures.

(12) Engine shutdown device tests and maintenance.

(13) Special instructions regarding components, such as the fuel injection system, that shall only be repaired and adjusted by a qualified mechanic who has received special training and is authorized to make such repairs or adjustments by the component manufacturer.

(14) Instruction on recordkeeping requirements for maintenance procedures and emissions testing.

(15) Other subjects determined by the department to be necessary to address specific health and safety needs.

Section 423. Operation of diesel-powered equipment

(a) In addition to other requirements of this article, diesel-powered equipment shall be operated pursuant to the standards set forth in this section.

(b) All diesel-powered equipment shall be attended while in operation with the engine running in slope or shaft construction operations.
(c) Unnecessary idling of diesel-powered equipment shall be prohibited.
(d) All roadways where diesel-powered equipment is operated shall be maintained as free as practicable from bottom irregularities, debris and wet or muddy conditions that will affect control of the equipment.
(e) Operating speeds shall be consistent with conditions of roadways, grades, clearances, visibility and traffic and type of equipment used.
(f) Equipment operators shall have full control of the mobile equipment while it is in motion.
(g) Traffic rules, including speed, signals and warning signs, shall be standardized and posted at each slope and shaft construction operation.
(h) All diesel-powered equipment shall be maintained in a safe and healthful operating condition. Equipment in an unsafe or unhealthful condition or not maintained in accordance with the engine or emissions control operating specifications shall be removed from service immediately and shall not be returned to service until all necessary corrective actions have been taken.
(i) Mobile diesel-powered equipment shall be parked to prevent movement by chocking the wheels, jacking, or turning the equipment into the rib.
(j) For any diesel-powered equipment requiring assistance during normal operation, a plan detailing the method of assistance, the physical connections and direct communications between the operators must be submitted to the Department for approval.