Mine Safety and Health Admin., Labor § 7.99

other mechanical flame arrester designs shall be evaluated under the provisions of §7.107. The flame arrester shall be designed and attached so that it can be removed for inspection and cleaning.

(2) The exhaust system shall allow a wet exhaust conditioner to be used as the exhaust flame arrester provided that the explosion tests of §7.100 demonstrate that the wet exhaust conditioner will arrest flame. When used as a flame arrester, the wet exhaust conditioner shall be equipped with a sensor to automatically activate the safety shutdown system at or above the minimum allowable low water level established by §7.100. Restarting of the engine shall be prevented until the water supply in the wet exhaust conditioner has been replenished above the minimum allowable low water level. All parts of the wet exhaust conditioner and associated components that come in contact with contaminated exhaust conditioner water shall be constructed of corrosion-resistant material. The wet exhaust conditioner shall include a means for verifying that the safety shutdown system operates at the proper water level. A means shall be provided for draining and cleaning the wet exhaust conditioner. The final exhaust gas temperature at discharge from the wet exhaust conditioner shall not exceed 170 °F (76 °C) when tested in accordance with the exhaust gas cooling efficiency test of §7.102. A sensor shall be provided that activates the safety shutdown system before the exhaust gas temperature at discharge from the wet exhaust conditioner exceeds 185 °F (85 °C) when tested in accordance with the safety system control test in §7.103. All parts of the wet exhaust conditioner and associated components that come in contact with contaminated exhaust conditioner water shall be constructed of corrosion-resistant material.

(ii) When a dry exhaust conditioner is used to cool the exhaust gas, the temperature of the exhaust gas at discharge from the diesel power package shall not exceed 302 °F (150 °C) when tested in accordance with the exhaust gas cooling efficiency test of §7.102. A sensor shall be provided that activates the safety shutdown system before the discharge of glowing particles, and it shall be evaluated under the provisions of §7.107.

(3) The exhaust system shall be designed so that improper installation of the flame arrester is impossible.

(4) The exhaust system shall provide a means to cool the exhaust gas and prevent discharge of glowing particles.

(i) When a wet exhaust conditioner is used to cool the exhaust gas and prevent the discharge of glowing particles, the temperature of the exhaust gas at the discharge from the exhaust conditioner shall not exceed 170 °F (76 °C) when tested in accordance with the exhaust gas cooling efficiency test in §7.102. A sensor shall be provided that activates the safety shutdown system before the exhaust gas temperature at discharge from the wet exhaust conditioner exceeds 185 °F (85 °C) when tested in accordance with the safety system control test in §7.103. A means shall be provided to prevent the discharge of glowing particles, and it shall be evaluated under the provisions of §7.107.

(ii) When a dry exhaust conditioner is used to cool the exhaust gas, the temperature of the exhaust gas at discharge from the diesel power package shall not exceed 302 °F (150 °C) when tested in accordance with the exhaust gas cooling efficiency test of §7.102. A sensor shall be provided that activates the safety shutdown system before the exhaust gas temperature at discharge from the wet exhaust conditioner exceeds 185 °F (85 °C) when tested in accordance with the safety system control test in §7.103. A means shall be provided to prevent the discharge of glowing particles, and it shall be evaluated under the provisions of §7.107.

(5) Other means for cooling the exhaust gas and preventing the propagation of flame or discharge of glowing particles shall be evaluated under the provisions of §7.107.

(6) There shall be a connection in the exhaust system for temporary attachment of a device to indicate the total backpressure in the system and collection of exhaust gas samples. This opening shall be closed by a plug or other suitable device that is sealed or locked in place except when in use.


§ 7.99 Critical characteristics.

The following critical characteristics shall be inspected or tested on each diesel power package to which an approval marking is affixed:

(a) Finish, width, planarity, and clearances of surfaces that form any part of a flame-arresting path.

(b) Thickness of walls and flanges that are essential in maintaining the explosion-proof integrity of the diesel power package.

(c) Size, spacing, and tightness of fastenings.

(d) The means provided to maintain tightness of fastenings.
§ 7.100 Explosion tests.

(a) Test procedures. (1) Prepare to test the diesel power package as follows:

(i) Perform a detailed check of parts against the drawings and specifications submitted under § 7.97 to determine that the parts and drawings agree.

(ii) Remove all parts that do not contribute to the operation or ensure the explosion-proof integrity of the diesel power package such as the air cleaner and exhaust gas dilution system.

(iii) Fill coolant system fluid and engine oil to the engine manufacturer’s recommended levels.

(iv) Interrupt fuel supply to the injector pump.

(v) Establish a preliminary low water level for systems using the wet exhaust conditioner as a flame arrester.

(2) Perform static and dynamic tests of the intake system as follows:

(i) Install the diesel power package in an explosion test chamber which is large enough to contain the complete diesel power package. The chamber must be sufficiently darkened and provide viewing capabilities of the flame-arresting paths to allow observation during testing of any discharge of flame or ignition of the flammable mixture surrounding the diesel power package. Couple the diesel power package to an auxiliary drive mechanism. Attach a pressure measuring device, a temperature measuring device, and an ignition source to the intake system. The pressure measuring device shall be capable of indicating the peak pressure accurate to ±1 pound-per-square inch gauge (psig) at 100 psig static pressure and shall have a frequency response of 40 Hertz or greater. The ignition source shall be an electric spark with a minimum energy of 100 millijoules. The ignition source shall be located immediately adjacent to the intake manifold and the pressure and temperature devices shall be located immediately adjacent to the flame arrester.

(ii) For systems using the wet exhaust conditioner as an exhaust flame arrester, fill the exhaust conditioner to the specified high or normal operating water level.

(iii) Fill the test chamber with a mixture of natural gas and air or methane and air. If natural gas is used, the content of combustible hydrocarbons shall total at least 98.0 percent, by volume, with the remainder being inert. At least 80.0 percent, by volume, of the gas shall be methane. For all tests, the methane or natural gas concentration shall be 8.5 ±1.8 percent, by volume, and the oxygen concentration shall be no less than 18 percent, by volume.

(iv) Using the auxiliary drive mechanism, motor the engine to fill the intake and exhaust systems with the flammable mixture. The intake system, exhaust system, and test chamber gas concentration shall not differ by more than ±0.3 percent, by volume, at the time of ignition.

(v) For static tests, stop the engine, actuate the ignition source, and observe the peak pressure. The peak pressure shall not exceed 110 psig. If the peak pressure exceeds 110 psig, construction changes shall be made that result in a reduction of pressure to 110...