

§ 36.26 Composition of exhaust gas.

(a) *Preliminary engine adjustment.* The engine shall be submitted to MSHA by the applicant in such condition that it can be tested immediately at full load and speed. The preliminary liquid-fuel-injection rate shall be such that the exhaust will not contain black smoke and the applicant shall adjust the injection rate promptly to correct any adverse conditions disclosed by preliminary tests.

(b) *Final engine adjustment.* The liquid fuel supply to the engine shall be adjusted so that the undiluted exhaust gas shall contain not more than 0.30 percent, by volume, of carbon monoxide or 0.20 percent, by volume, of oxides of nitrogen (calculated as equivalent nitrogen dioxide, NO₂) under any conditions of engine operation prescribed by MSHA when the intake air mixture to the engine contains 1.5±0.1 percent, by volume, of Pittsburgh natural gas.³

(c) *Coupling or adapter.* The applicant shall provide the coupling or adapter for connecting the engine to MSHA's dynamometer.

NOTE: Preferably this coupling or adapter should be attached to the flywheel of the engine.

Clutches, transmissions, or torque converters ordinarily are not required in the coupling train.

§ 36.27 Fuel-supply system.

(a) *Fuel tank.* (1) The fuel tank shall not leak and shall be fabricated of metal at least 1/16 inch thick, welded at all seams, except that tanks of 5 gallons or less capacity may have thinner walls which shall be preformed or reinforced to provide good resistance to deflection. A drain plug (not a valve or petcock) shall be provided and locked in position. A vent opening shall be provided in the fuel filler cap of such design that atmospheric pressure is maintained inside the tank. The size of the vent opening shall be restricted to prevent fuel from splashing through it. The filler opening shall be so arranged

³ Investigation has shown that for practical purposes, Pittsburgh natural gas (containing a high percentage of methane) is a satisfactory substitute for pure methane in these tests.

that fuel can be added only through a self-closing valve at least 1 foot from the exhaust manifold of the engine, preferably below it. The self-closing valve shall constitute a fuel-tight closure when fuel is not being added. Any part of the self-closing valve that might become detached during the addition of fuel shall be secured to the tank by a chain or other fastening to prevent loss.

(2) The fuel tank shall have a definite position in the equipment assembly, and no provision shall be made for attachment of separate or auxiliary fuel tanks.

(3) Capacity of the fuel tank shall not exceed the amount of fuel necessary to operate the engine continuously at full load for approximately four hours.

(b) *Fuel lines.* All fuel lines shall be installed to protect them against damage in ordinary use and they shall be designed, fabricated, and secured to resist breakage from vibration.

(c) *Valve in fuel line.* A shutoff valve shall be provided in the fuel system, installed in a manner acceptable to MSHA.

NOTE: This shutoff valve is in addition to the normal shutoff provided in the fuel-injection system and also in addition to the air-shutoff valve.

§ 36.28 Signal or warning device.

All mobile diesel-powered transportation equipment shall be provided with a bell, horn, or other suitable warning device convenient to the operator. Warning devices shall be operated manually or pneumatically.

§ 36.29 Brakes.

All mobile diesel-powered transportation equipment shall be equipped with adequate brakes acceptable to MSHA.

§ 36.30 Rerailing device.

All mobile diesel-powered transportation equipment designed to travel on rails in haulage service shall carry a suitable rerailing device.

§ 36.31 Fire extinguisher.

Each unit of mobile diesel-powered transportation equipment shall be fitted with a fire extinguisher carried in a location easily accessible to the

The performance of component equipment shall be observed to determine whether it functions properly.

[Sched. 31, 26 FR 645, Jan. 24, 1961, as amended at 61 FR 55526, Oct. 25, 1996]

§ 36.44 Maximum allowable fuel:air ratio.

(a) When an engine is delivered to MSHA with the fuel-injection system adjusted by the applicant and tests of the exhaust-gas composition (see § 36.43) show not more than 0.30 percent, by volume, of carbon monoxide, the applicant's adjustment of the fuel-injection system shall be accepted. The maximum fuel:air ratio determined from the exhaust-gas composition shall be designated as the maximum allowable fuel:air ratio. The maximum liquid fuel rate (pounds per hour) that produces the maximum allowable fuel:air ratio shall be designated as the maximum allowable fuel rate for operating the equipment at elevations not exceeding 1,000 feet above sea level.

(b) When the carbon monoxide content of the exhaust exceeds 0.30 percent, by volume, only near maximum power output, the maximum fuel:air ratio at which carbon monoxide does not exceed 0.30 percent shall be calculated and designated as the maximum allowable fuel:air ratio. The corresponding calculated liquid fuel rate shall be designated as the maximum allowable fuel rate at elevations not exceeding 1,000 feet above sea level.

NOTE: The applicant may be requested to adjust the liquid fuel rate during tests to determine the maximum allowable fuel:air ratio.

(c) The maximum allowable fuel:air ratio and maximum liquid fuel rates shall be used to calculate a liquid fuel rate-altitude table that shall govern the liquid fuel rate of engines operated at elevations exceeding 1,000 feet above sea level.

§ 36.45 Quantity of ventilating air.

(a) Results of the engine tests shall be used to calculate ventilation (cubic feet of air per minute) that shall be supplied by positive air movement when the permissible mobile diesel-powered transportation equipment is used underground. This quantity shall be stamped on the approval plate. The

quantity so determined shall apply when only one machine is operated.

(b) Determination of the ventilation rate shall be based upon dilution of the exhaust gas with normal air. The most undesirable and hazardous condition of engine operation prescribed by MSHA shall be used in the calculations. The concentration of any of the following individual constituents in the diluted mixture shall not exceed:

- 0.25 percent, by volume, of carbon dioxide (CO₂).
- 0.005 percent, by volume, of carbon monoxide (CO).
- 0.00125 percent, by volume, of oxides of nitrogen (calculated as equivalent nitrogen dioxide, NO₂).

The oxygen (O₂) content of the diluted mixture shall be not less than 20 percent, by volume. The maximum quantity of normal air to produce the above dilution shall be designated the ventilation rate.

NOTE: This ventilation rate will provide a factor of safety for exposure of persons to air mixtures containing harmful or objectionable gases and for minor variations in engine performance.

§ 36.46 Explosion tests of intake and exhaust systems.

(a) Explosion tests to determine the strength of the intake and exhaust systems to withstand internal explosions and the adequacy of the flame arresters to prevent the propagation of an explosion shall be made with the systems connected to the engine or the systems simulated as connected to the engine. The system shall be filled with and surrounded by an explosive natural gas-air mixture. The mixture within the intake and exhaust systems shall be ignited by suitable means and the internal pressure developed by the resultant explosion shall be determined. Tests shall be conducted with the ignition source in several different locations to determine the maximum pressure developed by an internal explosion.

(b) Explosion tests shall be made with the engine at rest and with the flammable natural gas-air mixtures in the intake and exhaust systems. In other tests with the flammable mixture in motion, the engine shall be driven (externally) at speeds prescribed