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 by MSHA but no liquid fuel shall be supplied to the injection valves.

(c) The temperature of the flame arresters in the intake or exhaust systems shall not exceed 212 °F. when an explosion test is conducted. Any water-spray cooling for the exhaust system shall not be operated and water shall not be present in the exhaust cooling boxes except when water is the cooling agent for a cooling box designed to act as a flame arrester, in which case MSHA will prescribe the test conditions.

(d) The explosion tests of the intake and exhaust systems shall not result in:

(1) Discharge of visible flame from any joint or opening.

(2) Ignition of surrounding flammable gas-air mixture.

(3) Development of dangerous afterburning.[4]

(4) Excessive pressures.

§ 36.47 Tests of exhaust-gas cooling system.

(a) The adequacy of the exhaust-gas cooling system and its components shall be determined with the engine operating at the maximum allowable liquid fuel rate and governed speed with 0.5 ±0.1 percent, by volume, of natural gas in the intake air mixture. All parts of the engine and exhaust-gas cooling system shall be at their respective equilibrium temperatures. The cooling spray, if any, shall be operated, and all compartments designed to hold cooling water shall be filled with the quantity of water recommended by the applicant. No cooling air shall be circulated over the engine or components in the cooling system during the test.

(b) Determinations shall be made during the test to establish the cooling performance of the system, the cooling water consumption, high-water level when the system sprays excess water, and low-water level when the cooling system fails.

(c) The final exhaust-gas temperature at discharge from the cooling system, and before the exhaust gas is diluted with air, shall not exceed 170 °F. or the temperature of adiabatic saturation, if this temperature is lower.

(d) Water consumed in cooling the exhaust gas under the test conditions shall not exceed by more than 15 percent that required for adiabatic saturation of the exhaust-gas at the final temperature. Water in excess of that required for adiabatic saturation shall be considered as entrained water. Enough water shall be available in the cooling system or in reserve supply compartments for sustained satisfactory operation for at least 2⅔ hours under the test conditions.

NOTE: This amount is enough to cool the exhaust for an 8-hour shift at one-third load factor.

(e) The adequacy of the automatic fuel shutoff actuated by the temperature of the final exhaust shall be determined with the engine operating under test conditions by withdrawing water until the cooling system fails to function. The final exhaust-gas temperature at which the liquid fuel to the engine is automatically shut off shall be noted. This temperaure shall not exceed 185 °F.

(f) Following the automatic fuel shutoff test in paragraph (e) of this section, the temperature of the control point shall be allowed to fall to 170 °F. At this temperature and with the water replenished in the cooling system, it shall be possible to start the engine.

NOTE: If the cooling system includes a reserve supply water tank, the line or lines connecting it to the cooling compartment may require a suitable flame arrester.

[4] The term ''afterburning'' as used in this part is applied to combustion of a flammable gas-air mixture drawn into the system under test by the cooling of the products from an explosion in the system.

(g) The effectiveness of the automatic engine shut-off, which will operate when the water in the cooling jacket(s) exceeds 212 °F., shall be determined by causing the jacket temperature to exceed 212 °F.

§ 36.48 Tests of surface temperature of engine and components of the cooling system.

(a) The surface temperatures of the engine, exhaust cooling system, and other components subject to heating by engine operation shall be determined with the engine operated as prescribed by MSHA. All parts of the engine, cooling system, and other components shall have reached their respective equilibrium temperatures. The exhaust cooling system shall be operated, but air shall not be circulated over the engine or components. Surface temperatures shall be measured at various places prescribed by MSHA to determine where maximum temperatures develop.

(b) The temperature of any surface shall not exceed 400 °F.

NOTE TO § 36.48: The engine may be operated under test conditions prescribed by MSHA while completely surrounded by a flammable mixture. MSHA reserves the right to apply combustible materials to any surface for test. Operation under such conditions shall not ignite the flammable mixture.

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

§ 36.49 Tests of exhaust-gas dilution system.

The performance and adequacy of the exhaust-gas dilution system shall be determined in tests of the complete equipment. The engine, at temperature equilibrium, shall be operated in normal air as prescribed by MSHA. Samples of the undiluted exhaust gas and of the diluted exhaust gas, at location(s) prescribed by MSHA, shall be considered with the data obtained from the engine test (see § 36.43) to determine that the concentrations of carbon dioxide, carbon monoxide, oxides of nitrogen, and aldehydes in the diluted exhaust shall be below the required concentrations specified in § 36.25(f)(1).

§ 36.50 Tests of fuel tank.

The fuel tank shall be inspected and tested to determine whether: (a) It is fuel-tight, (b) the vent maintains atmospheric pressure within the tank, and (c) the vent and closure restrict the outflow of liquid fuel.

SUBCHAPTERS C–F [RESERVED]