(ii) At least 5 minutes after the occurrence of the highest temperature recorded, if continuous OEI power or maximum continuous power is used.

(5) The speeds must be those used in determining the takeoff flight path under § 29.59.

(b) *Category B*. For each category B rotorcraft, cooling must be shown during takeoff and subsequent climb as follows:

(1) Each temperature must be stabilized while hovering in ground effect with—

(i) The power necessary for hovering;

(ii) The appropriate cowl flap and shutter settings; and

(iii) The maximum weight.

(2) After the temperatures have stabilized, a climb must be started at the lowest practicable altitude with takeoff power.

(3) Takeoff power must be used for the same time interval as takeoff power is used in determining the takeoff flight path under § 29.63.

(4) At the end of the time interval prescribed in paragraph (a)(3) of this section, the power must be reduced to maximum continuous power and the climb must be continued for at least five minutes after the occurance of the highest temperature recorded.

(5) The cooling test must be conducted at an airspeed corresponding to normal operating practice for the configuration being tested. However, if the cooling provisions are sensitive to rotorcraft speed, the most critical airspeed must be used, but need not exceed the speed for best rate of climb with maximum continuous power.

[Doc. No. 5084, 29 FR 16150, Dec. 3, 1964, as amended by Amdt. 29–1, 30 FR 8778, July 13, 1965; Amdt. 29–26, 53 FR 34219, Sept. 2, 1988]

§ 29.1049 Hovering cooling test procedures.

The hovering cooling provisions must be shown—

(a) At maximum weight or at the greatest weight at which the rotorcraft can hover (if less), at sea level, with the power required to hover but not more than maximum continuous power, in the ground effect in still air, until at least five minutes after the occurrence of the highest temperature recorded; and

(b) With maximum continuous power, maximum weight, and at the altitude resulting in zero rate of climb for this configuration, until at least five minutes after the occurrence of the highest temperature recorded.

Induction System

§ 29.1091 Air induction.

(a) The air induction system for each engine and auxiliary power unit must supply the air required by that engine and auxiliary power unit under the operating conditions for which certification is requested.

(b) Each engine and auxiliary power unit air induction system must provide air for proper fuel metering and mixture distribution with the induction system valves in any position.

(c) No air intake may open within the engine accessory section or within other areas of any powerplant compartment where emergence of backfire flame would constitute a fire hazard.

(d) Each reciprocating engine must have an alternate air source.

(e) Each alternate air intake must be located to prevent the entrance of rain, ice, or other foreign matter.

(f) For turbine engine powered rotorcraft and rotorcraft incorporating auxiliary power units—

(1) There must be means to prevent hazardous quantities of fuel leakage or overflow from drains, vents, or other components of flammable fluid systems from entering the engine or auxiliary power unit intake system; and

(2) The air inlet ducts must be located or protected so as to minimize the ingestion of foreign matter during takeoff, landing, and taxiing.

(Secs. 313(a), 601, 603, 604, Federal Aviation Act of 1958 (49 U.S.C. 1354(a), 1421, 1423, 1424), sec. 6(c), Dept. of Transportation Act (49 U.S.C. 1655(c)))

[Doc. No. 5084, 29 FR 16150, Dec. 3, 1964, as amended by Amdt. 29–3, 33 FR 969, Jan. 26, 1968; Amdt. 29–17, 43 FR 50601, Oct. 30, 1978]

§ 29.1093 Induction system icing protection.

(a) *Reciprocating engines*. Each reciprocating engine air induction system must have means to prevent and eliminate icing. Unless this is done by other means, it must be shown that, in air free of visible moisture at a temperature of 30 °F., and with the engines at 60 percent of maximum continuous power—

(1) Each rotorcraft with sea level engines using conventional venturi carburetors has a preheater that can provide a heat rise of 90 °F.;

(2) Each rotorcraft with sea level engines using carburetors tending to prevent icing has a preheater that can provide a heat rise of 70 °F.;

(3) Each rotorcraft with altitude engines using conventional venturi carburetors has a preheater that can provide a heat rise of 120 °F.; and

(4) Each rotorcraft with altitude engines using carburetors tending to prevent icing has a preheater that can provide a heat rise of 100 °F.

(b) *Turbine engines.* (1) It must be shown that each turbine engine and its air inlet system can operate throughout the flight power range of the engine (including idling)—

(i) Without accumulating ice on engine or inlet system components that would adversely affect engine operation or cause a serious loss of power under the icing conditions specified in appendix C of this Part; and

(ii) In snow, both falling and blowing, without adverse effect on engine operation, within the limitations established for the rotorcraft.

(2) Each turbine engine must idle for 30 minutes on the ground, with the air bleed available for engine icing protection at its critical condition, without adverse effect, in an atmosphere that is at a temperature between 15° and 30 °F (between −9° and −1 °C) and has a liquid water content not less than 0.3 grams per cubic meter in the form of drops having a mean effective diameter not less than 20 microns, followed by momentary operation at takeoff power or thrust. During the 30 minutes of idle operation, the engine may be run up periodically to a moderate power or thrust setting in a manner acceptable to the Administrator.

(c) *Supercharged reciprocating engines.* For each engine having a supercharger to pressurize the air before it enters the carburetor, the heat rise in the air caused by that supercharging at any altitude may be utilized in determining compliance with paragraph (a) of this section if the heat rise utilized is that which will be available, automatically, for the applicable altitude and operation condition because of supercharging.

(Secs. 313(a), 601, and 603, 72 Stat. 752, 775, 49 U.S.C. 1354(a), 1421, and 1423; sec. 6(c), 49 U.S.C. 1655 (c))

[Amdt. 29–3, 33 FR 969, Jan. 26, 1968, as amended by Amdt. 29–12, 41 FR 55473, Dec. 20, 1976; Amdt. 29–13, 42 FR 15046, Mar. 17, 1977; Amdt. 29–22, 49 FR 6850, Feb. 23, 1984; Amdt. 29–26, 53 FR 34219, Sept. 2, 1988]

§ 29.1101 Carburetor air preheater design.

Each carburetor air preheater must be designed and constructed to—

(a) Ensure ventilation of the preheater when the engine is operated in cold air;

(b) Allow inspection of the exhaust manifold parts that it surrounds; and

(c) Allow inspection of critical parts of the preheater itself.

§ 29.1103 Induction systems ducts and air duct systems.

(a) Each induction system duct upstream of the first stage of the engine supercharger and of the auxiliary power unit compressor must have a drain to prevent the hazardous accumulation of fuel and moisture in the ground attitude. No drain may discharge where it might cause a fire hazard.

(b) Each duct must be strong enough to prevent induction system failure from normal backfire conditions.

(c) Each duct connected to components between which relative motion could exist must have means for flexibility.

(d) Each duct within any fire zone for which a fire-extinguishing system is required must be at least—

(1) Fireproof, if it passes through any firewall; or

(2) Fire resistant, for other ducts, except that ducts for auxiliary power units must be fireproof within the auxiliary power unit fire zone.

(e) Each auxiliary power unit induction system duct must be fireproof for a sufficient distance upstream of the auxiliary power unit compartment to prevent hot gas reverse flow from burning through auxiliary power unit ducts