

§ 1204.4

16 CFR Ch. II (1-1-02 Edition)

antenna system, shall be integral with, or not readily removable from, at least one of the antenna sections or parts involved in the joint or shall be necessary in order to complete the joint.

(b) *Feed cable.* When compliance with the requirements of this standard depends on the insulating or other properties of the feed cable, at least 50 feet of the cable shall be supplied by the manufacturer with the antenna system.

(c) *Electrical protection.* Antenna systems shall be manufactured so that if all points within the protection zone of an antenna system were tested by the Insulating Material Effectiveness Test of § 1204.4(d) of this subpart, and the Antenna-Mast System Test of § 1204.4(e) of this subpart, the current measured by the current monitoring device connected to the mast would be no greater than 5.0 milliamperes rms and no electrical breakdown of the antenna system's insulating material would occur.

§ 1204.4 Electric shock protection tests.

(a) *Safety precautions.* For tests involving high voltage, the following recommended minimum safety precautions should be followed:

(1) At least one test operator and one test observer (preferably one with cardiopulmonary resuscitation (CPR) training) should be present at every test.

(2) The test area (outdoors or indoors) should secure against accidental intrusion by other persons during tests.

(3) Test areas located indoors should be ventilated to avoid buildup of potentially hazardous concentrations of gaseous byproducts which may result from the tests.

(4) Fire extinguishers should be easily accessible in case materials on the test specimen ignite.

(5) "High Voltage Test" warning devices should be activated before start of a test.

(6) Emergency phone numbers should be posted.

(b) *Test conditions.* (1) *Specimens.* All specimens shall be tested as supplied by the manufacturer, following assembly in accordance with the manufacturer's instructions except as provided in paragraph (e)(2) of this section.

(2) *Temperature.* Ambient temperature shall be in the range from 32 °F (0 °C) to 104 °F (40 °C)

(3) *Relative humidity.* Ambient relative humidity shall be in the range of from 10 to 90 percent.

(4) *Voltage.* Voltage, phase to ground, of the power line or test probe shall be 14.5 kilovolts rms, 60 hertz.

(5) *Conditioning.* Prior to testing, all specimens shall be exposed for at least 4 hours to the ambient test area environment.

(c) *Test equipment.* (1) High voltage source capable of delivering at least 15 mA rms at 14.5 kV rms, 60 Hz. The source should have an automatic internal cut-off actuated by a preset current level.

(2) Instrumentation to measure the rms voltage applied to the antenna system.

(3) Current monitoring device to indicate hazardous components of the total rms current flowing to ground through the mast. One configuration of the circuitry for the current monitoring device (shown in Figure 1) consists of three parallel branches as follows. One branch consists of a resistor in series with a true-rms milliammeter with a maximum error of 5% of the reading in the frequency range of 50Hz to 10MHz (the total of the resistor and the internal resistance of the milliammeter is to be 1000 ohms). A parallel branch consists of a 1000 ohm resistor in series with a 0.08 microfarad capacitor. Another parallel branch should consist of a spark gap rated at 50 to 100 volts as a meter protection device. A different current monitoring device may be used if the measured value of the rms current corresponds to that indicated by the configuration described above.

(4) For the Insulating Material Effectiveness Test:

(i) High voltage electrode or test rod consisting of ¼ in. (6.4 mm) diameter aluminum rod.

(ii) Support jig, structure, or hanger made of insulating material which is capable of holding antenna system test specimens electrically isolated from all surrounding structures or ground.

(5) For the Antenna-Mast System Test, a high voltage test facility, as

shown in Figures 2 and 3, which includes a single power line spanning between two poles 95 to 105 feet (29 to 32 meters) apart, a tensioning device to adjust the cable sag to from 9 to 12 inches (23 to 30 cm), and a pivot fixture (Figure 2), for holding the base of an antenna-mast system, which can be moved horizontally to adjust the distance to the cable. The cable consists of ¼ in. diameter 7 by 19 galvanized steel aircraft cable. The low point of the cable shall be between 28 and 29 feet (8.5 to 8.8 meters) above a horizontal plane through the pivot axis of the pivot fixture.

(d) *Insulating Material Effectiveness Test procedure.* (1) A short piece of typical tubular mast shall be attached to the antenna system to be tested, in accordance with mounting instructions provided with the antenna system by the manufacturer.

(2) If a feed cable is provided with the antenna system, it shall be used in the test. If no cable is provided with the antenna system, a RG-213 cable shall be used in the test (Mil Spec. MIL-C-17/75C, 15 March 1977). In either case, the cable shall be connected to the antenna system, installed parallel to the mast, and secured by taping or similar means at one point on the mast. The side of the bottom end of the cable also shall be secured to the mast.

(3) With the antenna system properly supported and isolated from ground and with the current monitoring device connected to the mast, the test rod shall be connected to the high voltage source and brought into contact with the antenna system at any point within the protection zone (see §1204.2(k) of this subpart). For each contact point, the voltage shall be increased from 0 to 14.5 kV at a rate of at least 2 kV per second and held at 14.5 kV for 5.0 minutes. Current shall be monitored and the maximum recorded.

(e) *Antenna-Mast System Test procedure.* (1) The antenna system to be tested shall be attached to a mast in accordance with mounting instructions provided by the manufacturer. The mast shall be assembled of commercially available 1¼ inch outside diameter 16 gauge tubular steel sections, commonly sold for antenna-mast installations in 5 and 10 foot lengths. The

slip joints between the mast sections shall be secured (as with screws) to prohibit rotational or longitudinal movement at the joint. The length of the mast shall be such that when it is mounted in the pivot fixture of the high voltage test facility, the distance from the pivot to the uppermost point on the antenna system is 41.75 to 42.25 feet (12.7 to 12.9 meters).

(2) If a feed cable is provided with the antenna system, it shall be used in the test. If no cable is provided with the antenna system, a RG-213 feed cable shall be used in the test for specification of an RG-213 cable see (Mil. Spec. MIL-C-17/75C, 15 March 1977). In either case, the cable shall be connected to the antenna system, installed parallel to the mast, and secured by taping or similar means every two feet along the length of the mast. The side of the bottom end of the cable also shall be secured to the mast.

(3) The antenna-mast system shall be mounted in the pivot fixture. The pivot fixture shall be adjusted so that the point of impact between the antenna and the power line takes place at any desired point within the antenna's protection zone. The antenna-mast system shall then be erected to a position of up to 5° from the vertical, leaning toward the simulated power line (see Figure 4). The antenna-mast system shall then be released and allowed to fall against the power line. The test may be performed with different test positions such that the antenna system flexes after impact and slides off the power line and or so that it remains in contact with the power line for 5.0 minutes. Current flow from the antenna-mast system to ground shall be monitored and recorded for each test.

(f) *Interpretation of Results.* An antenna shall pass the Insulating Material Effectiveness Test or the Antenna-Mast System Test if no electrical breakdown occurs and if no current reading exceeds 5 mA rms.

§ 1204.5 Manufacturer's instructions.

(a) For all antennas covered under this part 1204, the following statement shall be included in the manufacturer's instructions, in addition to the material required by 16 CFR 1402.4(a)(1)(ii):