

## Chapter E 810

## RADIO AND TELEVISION EQUIPMENT

E 810.01	Scope	E 810.24	Mechanical protection
E 810.02	Application of other chapters	E 810.25	Run in straight line
E 810.03	Community television antenna	E 810.26	Grounding electrode
E 810.04	Radio noise suppressors	E 810.27	Inside or outside building
E 810.11	Material	E 810.28	Size
E 810.12	Supports	E 810.29	Common ground
E 810.13	Avoidance of contacts with conductors of other systems	E 810.51	Other rules
E 810.14	Splices	E 810.52	Size of antenna
E 810.15	Grounding	E 810.53	Size of lead-in conductors
E 810.16	Size of wire-strung antenna	E 810.54	Clearance on building
E 810.17	Size of lead-in	E 810.55	Entrance to building
E 810.18	Clearances	E 810.56	Protection against accidental contact
E 810.19	Electric supply circuits used in lieu of antenna	E 810.57	Lightning arresters; transmitting stations
E 810.20	Lightning arresters; receiving stations	E 810.58	Other rules
E 810.21	Material	E 810.59	Size of protective ground
E 810.22	Insulation	E 810.60	Size of operating grounding conductor
E 810.23	Supports	E 810.70	Clearance from other conductors
		E 810.71	General

## A. GENERAL

**E 810.01 Scope.** This chapter shall apply to radio and television receiving equipment and to amateur radio transmitting and receiving equipment, but shall not apply to equipment and antennas used for coupling carrier current to power line conductors.

*Note 1:* It is recommended that the administrative authority be freely consulted as to the specific methods to be followed in any case of doubt relative to installation of antenna conductors and that the National Electrical Safety Code, part 5, be followed.

*Note 2:* See Wisconsin Administrative Code section Ind 52.22 for additional requirements for receiving antennas.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.02 Application of other chapters.** Wiring from the source of power to and between devices connected to the interior wiring system shall comply with chapters E 100 to E 400, inclusive, except as modified by sections E 640.03, E 640.04 and E 640.05. Wiring for radio-frequency and audio-frequency equipment and loud speakers shall comply with chapter E 640.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.03 Community television antenna.** The antenna shall comply with the requirements of this chapter. The distribution system shall comply with chapter E 800.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.04 Radio noise suppressors.** Radio interference eliminators, interference capacitors or radio noise suppressors connected to power supply leads shall be of a type approved for the purpose. They shall not be exposed to physical damage.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**B. RECEIVING EQUIPMENT ONLY****Antenna Systems—General**

**E 810.11 Material.** Antenna and lead-in conductors shall be of hard-drawn copper, bronze, aluminum alloy, copper-clad steel or other high-strength, corrosion-resistant material. Soft-drawn or medium-drawn copper may be used for lead-in conductors where the maximum span between points of support is less than 35 feet.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.12 Supports.** Outdoor antenna and lead-in conductors shall be securely supported. They shall not be attached to poles or similar structures carrying electric light or power wires or trolley wires of more than 250 volts between conductors. Insulators supporting the antenna conductors shall have sufficient mechanical strength to safely support the conductors. Lead-in conductors shall be securely attached to the antenna.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.13 Avoidance of contacts with conductors of other systems.** Outdoor antenna and lead-in conductors from an antenna to a building shall not cross over electric light or power circuits and shall be kept well away from all such circuits so as to avoid the possibility of accidental contact. Where proximity to electric light and power service conductors of less than 250 volts between conductors cannot be avoided, the installation shall be such as to provide a clearance of at least 2 feet. It is recommended that antenna conductors be so installed as not to cross under electric light or power conductors.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.14 Splices.** Splices and joints in antenna spans shall be made with approved splicing devices or by such other means as will not appreciably weaken the conductors.

*Note:* Soldering may ordinarily be expected to weaken the conductor. Therefore, the joint should be mechanically secure before soldering.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.15 Grounding.** Masts and metal structures supporting antennas shall be permanently and effectively grounded, without intervening splice or connection.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**Antenna Systems—Receiving Station**

**E 810.16 Size of wire-strung antenna.** (1) Outdoor antenna conductors for receiving stations shall be of a size not less than given in table E 810.16(1).✓

(2) **SELF-SUPPORTING ANTENNAS.** Outdoor antennas, such as vertical rods or dipole structures, shall be of noncorrodible materials and of strength suitable to withstand ice and wind loading conditions, and shall be located well away from overhead conductors of electric light and power circuits of over 150 volts to ground so as to avoid the possibility of the antenna or structure falling into or accidental contact with such circuits.

TABLE E 810.16 (1)

## SIZE OF RECEIVING-STATION OUTDOOR ANTENNA CONDUCTORS

Material	Minimum Size of Conductors		
	When Maximum Open Span Length is		
	Less than 35 feet	35 feet to 150 feet	Over 150 feet
Aluminum alloy, hard-drawn copper.....	19	14	12
Copper-clad steel, bronze or other high strength material.....	20	17	14

*Note:* For very long span lengths larger conductors will be required, depending on the length of the span and the ice and wind loading.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.17 Size of lead-in.** Lead-in conductors from outside antenna for receiving stations, shall, for various maximum open span lengths, be of such size as to have a tensile strength at least as great as that of the conductors for antenna as specified in section E 810.16. Where the lead-in consists of 2 or more conductors which are twisted together or are enclosed in the same covering or are concentric, the conductor size shall, for various maximum open span lengths, be such that the tensile strength of the combination will be at least as great as that of the conductors for antenna as specified in section E 810.16.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.18 Clearances.** (1) ON BUILDINGS OUTSIDE. Lead-in conductors attached to buildings shall be so installed that they cannot swing closer than 2 feet to the conductors of circuits of 250 volts or less between conductors, or 10 feet to the conductors of circuits of more than 250 volts between conductors except that in the case of circuits not exceeding 150 volts between conductors, where all conductors involved are supported so as to insure permanent separation, the clearance may be reduced but shall not be less than 4 inches. The clearance between lead-in conductors and any conductor forming a part of a lightning rod system shall be not less than 6 feet unless the bonding referred to in section E 250.086 is accomplished.

(2) ANTENNAS AND LEAD-INS—INDOORS. Indoor antennas and indoor lead-ins shall not be run nearer than 2 inches to conductors of other wiring systems in the premises unless:

(a) Such other conductors are in metal raceways or cable armor, or

(b) Unless permanently separated from such other conductors by a continuous and firmly fixed nonconductor such as porcelain tubes or flexible tubing.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.19 Electric supply circuits used in lieu of antenna.** Where an electric supply circuit is used in lieu of an antenna, the device by which the radio receiving set is connected to the supply circuit shall be specially approved for the purpose.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

### Lightning Arresters

**E 810.20 Lightning arresters; receiving stations.** Each conductor of a lead-in from an outdoor antenna shall be provided with a lightning arrester approved for the purpose, except that where the lead-in conductors are enclosed in a continuous metallic shield the lightning arrester may be installed to protect the shield or may be omitted where the shield is permanently and effectively grounded. Lightning arresters shall be located outside the building, or inside the building between the point of entrance of the lead-in and the radio set or transformers, and as near as practicable to the entrance of the conductors to the building. The lightning arrester shall not be located near combustible material nor in a hazardous location as defined in chapter E 500. ✓

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

### Grounding Conductors—General

**E 810.21 Material.** The grounding conductor shall, unless otherwise specified, be of copper, aluminum, copper-clad steel, bronze, or other corrosion-resistant material.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.22 Insulation.** The grounding conductors may be uninsulated.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.23 Supports.** The grounding conductors shall be securely fastened in place and may be directly attached to the surface wired over without the use of insulating supports. Where proper support cannot be provided the size of the grounding conductor shall be increased proportionately.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.24 Mechanical protection.** The grounding conductor shall be protected where exposed to physical damage or the size of the grounding conductor shall be increased proportionately to compensate for the lack of protection.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.25 Run in straight line.** The grounding conductor shall be run in as straight a line as practicable from the antenna mast and/or lightning arrester to the grounding electrode.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.26 Grounding electrode.** The grounding conductor shall be connected to a metallic underground water piping system as specified in section E 250.081. Where the building is not supplied with a water system the connection shall be made to the metal frame of the building when effectively grounded or to a grounding electrode as specified in section E 250.083. At a penthouse or similar location the ground conductor may be connected to a water pipe or rigid conduit.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

### Grounding Conductors—Receiving Stations

**E 810.27 Inside or outside building.** The grounding conductor may be run either inside or outside the building.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.28 Size.** The grounding conductor shall be not smaller than No. 10 copper or No. 8 aluminum or No. 17 copper-clad steel or bronze.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.29 Common ground.** A single grounding conductor may be used for both protective and operating purposes.

*Note:* Where a single conductor is so used, the ground terminal of the equipment should be connected to the ground terminal of the protective device.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

### C. Amateur Transmitting and Receiving Stations

#### Antenna System

**E 810.51 Other rules.** In addition to conforming to the requirements of part C, antenna systems for amateur transmitting and receiving stations shall also comply with sections E 810.11 to E 810.15 inclusive.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.52 Size of antenna.** Antenna conductors for amateur transmitting and receiving stations shall be of a size not less than given in table E 810.52.✓

TABLE E 810.52

SIZE OF AMATEUR-STATION OUTDOOR ANTENNA CONDUCTORS

Material	Minimum Size of Conductors	
	When Maximum Open Span Length is	
	Less than 150 feet	Over 150 feet
Hard-drawn copper.....	14	10
Copper-clad steel, bronze or other high strength material.....	14	12

*Note:* For very long span length larger conductors will be required, depending on the span length and the ice and wind loadings.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.53 Size of lead-in conductors.** Lead-in conductors for transmitting stations shall, for various maximum span lengths, be of a size at least as great as that of conductors for antenna as specified in section E 810.52.✓

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.54 Clearance on building.** Antenna conductors for transmitting stations, attached to buildings, shall be firmly mounted at least 3 inches clear of the surface of the building on nonabsorptive insulating supports, such as treated pins or brackets, equipped with insulators having not less than 3-inch creepage and air-gap distances. Lead-in conductors attached to buildings shall also conform to these requirements, except when they are enclosed in a continuous metallic shield which is permanently and effectively grounded. In this latter case the metallic shield may also be used as a conductor.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.55 Entrance to building.** Except where protected with a continuous metallic shield which is permanently and effectively grounded, lead-in conductors for transmitting stations shall enter buildings by one of the following methods:

(1) Through a rigid, noncombustible, nonabsorptive insulating tube or bushing.

(2) Through an opening provided for the purpose in which the entrance conductors are firmly secured so as to provide a clearance of at least 2 inches.

(3) Through a drilled window pane.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.56 Protection against accidental contact.** Lead-in conductors to radio transmitters shall be so located or installed as to make accidental contact with them difficult.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.57 Lightning arresters; transmitting stations.** Each conductor of a lead-in for outdoor antenna shall be provided with a lightning arrester or other suitable means which will drain static charges from the antenna system.

(1) EXCEPTION NO. 1. Where protected by a continuous metallic shield which is permanently and effectively grounded.

(2) EXCEPTION NO. 2. Where the antenna is permanently and effectively grounded.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

#### Grounding Conductors—General

**E 810.58 Other rules.** All grounding conductors for amateur transmitting and/receiving stations shall comply with sections E 810.21 to E 810.27 inclusive.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.59 Size of protective ground.** The protective ground conductor for transmitting stations shall be as large as the lead-in, but not smaller than No. 10 copper, bronze, or copper-clad steel.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.60 Size of operating grounding conductor.** The operating grounding conductor for transmitting stations shall be not less than No. 14 copper or its equivalent.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

#### Interior Installation—Transmitting Stations

**E 810.70 Clearance from other conductors.** Except as provided in chapter E 640, all conductors inside the building shall be separated at least 4 inches from the conductors of any other light or signal circuit unless separated therefrom by conduit or some firmly fixed non-conductor such as porcelain tubes or flexible tubing.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

**E 810.71 General.** Transmitters shall comply with the following:

(1) ENCLOSING. The transmitter shall be enclosed in a metal frame or grille, or separated from the operating space by a barrier or other equivalent means, all metallic parts of which are effectually connected to ground.

(2) **GROUNDING OF CONTROLS.** All external metallic handles and controls accessible to the operating personnel shall be effectually grounded.

*Note:* No circuit in excess of 150 volts between conductors should have any parts exposed to direct contact. A complete dead-front type of switchboard is preferred.

(3) **INTERLOCKS ON DOORS.** All access doors shall be provided with interlocks which will disconnect all voltages in excess of 350 volts between conductors when any access door is opened.

(4) **AUDIO-AMPLIFIERS.** Audio-amplifiers which are located outside the transmitter housing shall be suitably housed and shall be so located as to be readily accessible and adequately ventilated.

**History:** Cr. Register, April, 1964, No. 100, eff. 5-1-64.

