

Chapter E 128

MISCELLANEOUS REQUIREMENTS FOR
OVERHEAD LINES

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E 128.01 Supporting structures. (1) **POLES AND TOWERS.** (a) *Rubbish.* Poles and towers should be placed, guarded, and maintained so as to be exposed as little as practicable to brush, grass, rubbish, or building fires.

(b) *Guarding poles.* 1. Protection against mechanical injury. Where poles and towers are exposed to abrasion by traffic or to other damage which would materially affect their strength, they shall be protected by guards.

2. Protection against climbing. On closely latticed poles or towers carrying supply conductors exceeding 300 volts, either guards or warning signs shall be used except as follows: See section E 121.05(3)✓

a. Exception 1: Where the right of way is completely fenced.

b. Exception 2: Where the right of way is not completely fenced, provided the poles or towers are not adjacent to roads, regularly traveled thoroughfares, or places where people frequently gather, such as schools or public playgrounds.

(c) *Warning signs.* 1. On poles or towers. For warning signs on poles or towers, see sections E 128.01(1)(b)2. and E 121.05(3).

2. On bridge fixtures. Structures attached to bridges for the purpose of supporting conductors shall be plainly marked with the name, initials, or trademark of the utility responsible for the attachment and, in addition, where the voltage exceeds 750 volts, by the following sign or its equivalent: "Danger-High Voltage" (See section E 121.05 (3)).

(d) *Grounding metal poles.* Metal poles not guarded or isolated shall always be specially grounded where in contact with metal-sheathed cable or the metal cases of equipment operating at voltages exceeding 750 volts. Metal poles not guarded, isolated, or specially grounded should always be considered as imperfectly grounded and the insulators supporting line conductors as well as the strain insulators in attached span wires should therefore, have a suitable margin of safety and be maintained with special care to prevent leakage to the pole as far as practicable.

(e) *Pole steps; Metal steps.* Steps closer than 6½ feet from the ground or other readily accessible place shall not be placed on poles.

(f) *Identification of poles.* Poles, towers and other supporting structures on which are maintained electrical conductors shall be so constructed, located, marked, or numbered as to facilitate identification by employees authorized to work thereon. Date of installation of such structures shall be recorded where practicable by the owner.

(g) *Obstructions.* All poles and towers should be kept free from posters, bills, tacks, nails, and other unnecessary obstructions, such as through bolts not properly trimmed.

(2) **CROSSARMS.** (a) *Location.* In general, crossarms should be maintained at right angles to the axis of the pole and to the direction of the attached conductors, and at crossings should be attached to that face of the structure away from the crossing, unless special bracing or double crossarms are used.

Note: Double crossarms are generally used at crossings, unbalanced corners, and dead-ends in order to permit conductor fastenings at two insulators and so prevent slipping, although single crossarms might provide sufficient strength. To secure extra strength, double crossarms are frequently used and crossarm guys are sometimes used.

(b) *Bracing.* Crossarms shall be securely supported, by bracing if necessary, so as to support safely loads to which they may be subjected, including linemen working on them. Any crossarm or buckarm, except the top one, shall be capable of supporting a vertical load of 225 pounds at either extremity in addition to the weight of the conductors.

(3) **UNUSUAL CONDUCTOR SUPPORTS.** Where conductors are attached to structures other than those used solely or principally for supporting the lines, all rules shall be complied with as far as they apply and such additional precautions as may be deemed necessary by the administrative authority shall be taken to avoid injury to such structures or to the person using them. The supporting of conductors on trees and roofs should be avoided where practicable.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 128.02 Tree trimming. (1) **GENERAL.** Where trees exist near supply-line conductors, they shall be trimmed, if practicable, so that neither the movement of the trees nor the swinging or increased sagging of conductors in wind or ice storms or at high temperatures will bring about contact between the conductors and the trees. (See sections 86.03, 86.16 and 182.017, Wis. Stats., 1959).

(a) *Exception:* For the lower-voltage conductors, where trimming is difficult, the conductor may be protected against abrasion and against grounding through the tree by interposing between it and the tree a sufficiently nonabsorptive and substantial insulating material or device.

(2) **AT WIRE CROSSINGS AND RAILROAD CROSSINGS.** The crossing span and the next adjoining spans shall be kept free, as far as practicable, from overhanging or decayed trees which might fall into the line.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 128.03 Guying. (1) **WHERE USED.** When the loads to be imposed on poles, towers, or other supporting structures are greater than can safely be supported by the poles or towers alone, additional strength shall be provided by the use of guys, braces, or other suitable construction. Guys shall be used also, where necessary, wherever con-

ductor tensions are not balanced, as at corners, angles, dead-ends, and changes of grade of construction.

Note: This is to prevent undue increase of sags in adjacent spans as well as to provide sufficient strength for those supports on which the loads are considerably unbalanced.

(2) **STRENGTH.** The strength of the guy shall meet the requirements of chapter E 126 for the grade of construction that applies. When guys are used with wood or other poles or towers capable of considerable deflection before failure, the guys shall be able to support the entire load in the direction in which they act, the pole acting simply as a strut.

(3) **POINT OF ATTACHMENT.** The guy should be attached to the structure as near as practicable to the center of the conductor load to be sustained, but for voltages exceeding 8,700 volts the insulation afforded by wood crossarms and poles should not be reduced any more than necessary.

(4) **GUY FASTENINGS.** Guys should be stranded and where attached to anchor rods should be protected by suitable guy thimbles or their equivalent. Cedar and other soft wood poles around which any guy having a strength of 10,000 pounds or more is wrapped should be protected by the use of suitable guy shims and, where there is a tendency for the guy to slip off the shim, guy hooks or other suitable means of preventing this action should be used. Shims are not necessary in the case of supplementary guys, such as storm guys.

(5) **GUY GUARDS.** The ground end of a guy attached to a ground anchor shall be provided with a conspicuous guard not less than 8 feet long. In selecting the type of guard material, consideration shall be given to exposure to damage. Where there are multiple guys attached to an anchor only one need be guarded. Guards need not be used in inaccessible locations or where the presence of other objects makes contact unlikely.

Note: Recommendation: It is recommended that in exposed or poorly lighted locations such guards be painted white or some other conspicuous color.

(6) **INSULATING GUYS FROM METAL POLES.** Where anchors would otherwise be subject to electrolysis, guys attached to metal poles or structures and not containing guy insulators should be insulated from the metal pole or structure by suitable blocking.

(7) **ANCHOR RODS.** Anchor rods shall be installed so as to be in line with the pull of the attached guy when under load, except in rock or concrete. The anchor rod shall have an ultimate strength in the eye and shank equal to that required of the guy.

(8) **GROUNDING.** The anchored end of guys attached to wood poles carrying circuits of more than 15,000 volts shall be effectively grounded (see chapter E 103 for method) wherever this part of the guy has a clearance of less than 8 feet to ground.

(a) Exception 1: This does not apply to guys in rural districts.

(b) Exception 2: This does not apply if the guy contains an insulator which will meet the requirements of section E 128.04(1)(b) for the highest voltage liable to be impressed on it.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 128.04 Insulators in guys attached to poles and towers. (1) PROPERTIES OF GUY INSULATORS. (a) Material. 1. Grade B. Guy insulators

shall be made of wet process porcelain, wood, or other material of suitable mechanical and electrical properties.

2. Grades C, D, and N. No requirements are made for material.

(b) *Electrical strength.* Guy insulators shall have a dry flash-over voltage at least double the normal line voltage and a wet flash-over voltage at least as high as the normal line voltage between conductors.

(c) *Mechanical strength.* Guy insulators shall have a mechanical strength at least equal to that required of the guys in which they are installed.

(2) **USE OF GUY INSULATORS.** (a) *One insulator.* An insulator shall be located in each guy which is attached to a pole or structure carrying any supply conductors of more than 300 volts and not more than 15,000 volts, or in any guy which is exposed to such voltages. This guy insulator shall be located not less than 8 feet above the ground.

1. Exception 1: A guy insulator is not required where the guy is grounded under the conditions set forth in section E 128.04(2)(d).

2. Exception 2: A guy insulator is not required if the guy is attached to a pole on private right of way carrying no supply circuits whose voltage exceeds 550 volts or where transmitted power exceeds 3,200 watts.

3. Exception 3: A guy insulator is not required if all supply conductors are in a cable having a grounded metal sheath or insulated conductors lashed to a grounded messenger.

(b) *Two insulators.* Where a guy attached to any pole carrying communication or supply conductors or both, is carried over or under overhead supply conductors of more than 300 volts and where hazard would otherwise exist, 2 or more guy insulators shall be placed so as to include the exposed section of the guy between them as far as possible. Neither insulator shall be within 8 feet of the ground.

1. Exception: Those insulators are not required where the guy is grounded under the conditions set forth in section E 128.04(2)(d).

(c) *Relative location of insulators in guys located one above the other.* Where guys in which it is necessary to install insulators are so arranged that one crosses or is above another, insulators shall be so placed that in cases any guy sags down upon another the insulators will not become ineffective.

(d) *Insulators not required.* Insulators are not required in guys under any of the following conditions:

1. Where the guy is electrically connected to grounded steel structures or to an effective ground connection on wood poles.

2. Where the guys are uniformly effectively grounded throughout any system of overhead lines.

3. Where the guys are connected to a line conductor grounded as specified in section E 103.02(2)(e).✓

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 128.05 Span-wire insulators. (1) **MECHANICAL STRENGTH.** Span-wire insulators shall have a mechanical strength at least equal to that required of the span wire in which they are installed.

(2) **USE OF SPAN-WIRE INSULATORS.** All span wires, including bracket span wires, shall have a suitable strain insulator (in addition to an insulated hanger if used) inserted between each point of support of the span wire and the lamp or trolley contact conductor supported,

except that single insulation, as provided by an insulated hanger, may be permitted when the span wire or bracket is supported on wooden poles supporting only trolley, railway feeder, or communication conductors used in the operation of the railway concerned. In case insulated hangers are not used, the strain insulator shall be located so that in the event of a broken span wire the energized part of the span wire cannot be reached from the ground.

(a) *Exception*: This rule does not apply to insulated feeder taps used as span wires.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 128.06 Overhead conductors. (1) **IDENTIFICATION.** All conductors of electrical supply and communication lines should be arranged to occupy definite positions throughout, as far as practicable, or shall be so constructed, located, marked, or numbered, or attached to distinctive insulators or crossarms, as to facilitate identification by employees authorized to work thereon. This does not prohibit systematic transposition of conductors.

(2) **BRANCH CONNECTIONS.** (a) *Accessibility.* Connections of branches to supply circuits, service drops, and equipment in overhead construction shall be readily accessible to authorized employees. When possible, connections should be made at poles or other structures.

(b) *Clearance.* Branch connections shall be supported and placed so that swinging or sagging cannot bring them in contact with other conductors, or interfere with the safe use of pole steps, or reduce the climbing or lateral working space.

(3) **COMMON NEUTRAL.** Primary and secondary circuits may utilize a single conductor as a common neutral if such conductor is grounded as indicated in sections E 103.02(2)(d) and (e).

(4) **SERVICE DROPS.** Service drops shall comply with NEC-1971 sections 230-21 through 230-27 except as changed in volume 2 (see section E 230.24) and except as otherwise provided in volume No. 1.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68; am. (4), Register, April, 1972, No. 196, eff. 5-1-72.

E 128.07 Equipment on poles. (1) **IDENTIFICATION.** All equipment of electrical supply and communication lines should be arranged to occupy definite positions throughout, as far as practicable, or shall be constructed, located, marked, or numbered so as to facilitate identification by employees authorized to work thereon.

(2) **LOCATION.** Transformers, regulators, lightning arresters, and switches when located below conductors or other attachments shall be mounted outside of the climbing space. This equipment shall be so placed that unguarded conductors entering the equipment will have clearances from ground specified in table 2, subsection E 123.03(3).

(3) **GUARDING.** Current-carrying parts of switches, automatic circuit-breakers, and lightning arresters shall be suitably enclosed or guarded if all the following conditions apply:

- (a) If of more than 300 volts, and
- (b) If located on the climbing side of the pole less than 20 inches from the pole center, and
- (c) If located below the top crossarm.

(4) **HAND CLEARANCE.** All current-carrying parts of switches, fuses, lightning arresters, also transformer connections and other connec-

tions which may require operation or adjustment while alive and are exposed at such times, shall be arranged so that in their adjustment while alive the hand need not be brought nearer to any other current-carrying part at a different voltage than the clearances from pole surfaces required in table 9, section E 123.06(1)(c)1. for conductors of corresponding voltages. (See also sections E 142.03 (1), (2) and (3), for clearances from live parts).

(5) **STREET-LIGHTING EQUIPMENT.** (a) *Clearance from pole surface.* All exposed metal parts of lamps and their supports (unless effectively insulated from the current-carrying parts) shall be maintained at the following distances from the surface of wood poles:

	Inches
1. In general -----	20
2. If located on the side of the pole opposite the designated climbing side -----	5

Exception: This does not apply where lamps are located at pole tops.

(b) *Clearance above ground.* Street lamps shall be mounted at not less than the following heights above ground:

	Feet
1. Over walkways -----	10
2. Over roadways—	
Connected to circuits of 150 volts or less -----	14
Connected to circuits of more than 150 volts -----	15

Note: Drops to street lights need have no greater clearance than the street lights themselves.

(c) *Horizontal clearances.* Arc and incandescent lamps in series circuits should have at least 3 feet horizontal clearance from windows, porches, and other spaces accessible to the general public.

(d) *Material of suspension.* The lowering rope or chain for lighting units arranged to be lowered for examination or maintenance, shall be of a material and strength designed to withstand climatic conditions and to sustain the lighting unit safely. The lowering rope or chain, its supports, and fastenings shall be examined periodically.

(e) *Insulators in suspension ropes.* Effective insulators as specified in section E 128.04(1), shall be inserted at least 8 feet from the ground in metallic suspension ropes or chains supporting lighting units of series circuits.

(f) *Arc-lamp disconnectors.* A suitable device shall be provided by which each arc lighting unit on series circuits of more than 300 volts may be safely and entirely disconnected from the circuit before the lamp is handled unless the lamps are always worked on from suitable insulating stools, platforms, or tower wagons, or handled with suitable insulating tools, and treated as under full voltage of the circuit concerned.

(g) *Grounding lamp posts.* Metal lamp posts shall be effectively grounded.

(6) **TRANSFORMERS.** Transformers mounted on arms or poles on public thoroughfares shall be at a height above ground not less than 10 feet where over walkways and not less than 15 feet where over roadways.

(a) *Exception:* Where it is the established practice to mount trans-

formers at lesser distances above ground, such practice may be continued if the reduced mounting heights are carefully maintained.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 128.08 Protection for exposed overhead communication lines. (1) **OPEN WIRE.** Communication lines for public use and fire-alarm lines shall be treated as follows if at any point they are exposed to supply (including trolley) lines of more than 400 volts.

(a) At stations for public use they shall be protected by one of the methods specified in NEC-1971 Article 800 except as changed in volume 2 (see sections E 800.02 and E 800.21).

(b) Elsewhere they shall be isolated by elevation or otherwise guarded so as to be inaccessible to the public.

(2) **METAL-SHEATHED CABLE.** Metal-sheathed cables and messengers shall be isolated or grounded in conformity with the general requirements of chapter E 121.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68; am. (1) (a), Register, April, 1972, No. 196, eff. 5-1-72.

E 128.09 Circuits of one class used exclusively in the operation of circuits of another class. (1) **OVERHEAD COMMUNICATION CIRCUITS, USED EXCLUSIVELY IN THE OPERATION OF SUPPLY CIRCUITS.** (a) *Choice of method.* Communication circuits used exclusively in the operation of supply lines may be run either as ordinary communication circuits or as supply circuits under the conditions specified in section E 128.09(1) (c) and (d), respectively. After selection of the type of communication-circuit construction and protection for any section which is isolated, or is separated by transformers, such construction and protection shall be consistently adhered to throughout the extent of such isolated section of the communication system.

(b) *Guarding.* Communication circuits used in the operation of supply lines shall be isolated by elevation or otherwise guarded at all points so as to be inaccessible to the public.

(c) *Where ordinary communication line construction may be used.* Communication circuits used in the operation of supply lines may be run as ordinary communication conductors under the following conditions:

1. Where such circuits are below supply conductors in the operation of which they are used (including high voltage trolley feeders) at crossings, conflicts, or on commonly used poles, provided:

a. Such communication circuits occupy a position below all other conductors or equipment at crossings, conflicts or on commonly used poles.

b. Such communication circuits and their connected equipment are adequately guarded and are accessible only to authorized persons.

c. The precautions in Wis. Adm. Code chapter E 144 and NEC-1971 Article 800 except as changed in volume 2 (see sections E 800.02 and E 800.21) have been taken.

d. Where such circuits are below supply conductors in the operation of which they are used and are above other supply or communication conductors at wire crossings, conflicts, or on the same poles, provided the communication circuits are protected by fuseless lightning arresters, drainage coils, or other suitable devices to prevent the communication circuit voltage from normally exceeding 400 volts.

Note: The grades of construction for communication conductors with inverted levels apply.

(d) *Where supply line construction must be used.* Communication circuits used in the operation of supply lines shall comply with all requirements for the supply lines with which they are used, where they do not comply with the provisions of section E 128.09(1)(c)1. or 2.

1. Exception 1: Where the voltage of supply conductors concerned exceeds 8,700, the communication conductors need only meet the requirements for supply conductor of 5,000 to 8,700 volts.

2. Exception 2: Where the supply conductors are required to meet grade C, the size of the communication conductors may be the same as for grade D (see section E 126.03(9)(b)) for spans up to 150 feet.

(2) **SUPPLY CIRCUITS USED EXCLUSIVELY IN THE OPERATION OF COMMUNICATION CIRCUITS.** Circuits used for supplying power solely to apparatus forming part of a communication system may be run either in open wire or in aerial or underground cable as follows:

(a) Where run in open wire, such circuits shall have the grades of construction, clearances, insulation, etc. prescribed elsewhere in part 2 for supply or communication circuits of the voltage concerned.

(b) Where run in aerial or underground cable and the following requirements are met, the grades of construction, clearances, separations, locations, etc. prescribed elsewhere in part 2 for communication cables shall apply.

1. Such cables are covered with effectively grounded continuous metal sheaths or are carried in metal cable rings on effectively grounded messengers.

2. All circuits in such cables are owned or operated by one party and are maintained only by qualified employees.

3. Supply circuits included in such cables are terminated at points accessible only to qualified employees.

4. Communication circuits brought out of such a cable, if they do not terminate in a repeater station or terminal office, shall be so protected or arranged that in the event of a failure within the cable, the voltage on these communication circuits will not exceed 400 volts.

5. Terminal apparatus for the power supply shall be arranged so that live parts are inaccessible when such supply circuits are energized.

a. Exception: The provisions of sections E 128.09 (2) (a) and (b), do not apply to supply circuits of 550 volts or less and which carry power not in excess of 3,200 watts, covered in section E 122.01 (2) (c).

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68; am. (1) (c) 1. c., Register, April, 1972, No. 196, eff. 5-1-72.

E 128.10 Overhead electric railway construction. (1) **TROLLEY CONTACT CONDUCTOR SUPPORTS.** All overhead trolley-contact conductors shall be supported and arranged so that the breaking of a single contact conductor fastening will not allow the trolley conductor, live span wire, or current-carrying connection to come within 10 feet (measured vertically) from the ground, or from any platform accessible to the general public. Span-wire insulation for trolley contact conductors shall comply with section E 128.05.

(2) **HIGH-VOLTAGE CONTACT CONDUCTORS.** Every trolley contact conductor of more than 750 volts in urban districts where not on fenced right of way shall be suspended so as to minimize the liability of a

break, and, as far as practicable, so that if broken at a single point, it cannot fall within 12 feet (measured vertically) from the ground or any platform accessible to the general public.

(3) **THIRD RAILS.** Third rails shall be protected where not on fenced rights of way by adequate guards composed of wood or other suitable material.

(4) **PREVENTION OF LOSS OF CONTACT AT RAILROAD CROSSINGS.** Trolley contact conductors shall be arranged as set forth in either section E 128.10(4) (a) or (b), at grade crossings with interurban or other heavy-duty or high-speed railroad systems.

(a) The trolley contact conductor shall be provided with live trolley guards of suitable construction, or,

(b) The trolley contact conductor shall be as far as practicable at the same height above its own track throughout the crossing span and the next adjoining spans. Where a uniform height above rail is not adhered to, the change shall be made in a very gradual manner. Where the crossing span exceeds 100 feet, catenary construction shall be used.

1. Exception: This rule does not apply where the system is protected by interlocking derails or by gates.

(5) **GUARDS UNDER BRIDGES.** (a) *Where guarding is required.* Guarding is required where the trolley contact conductor is so located that a trolley pole leaving the conductor can make simultaneous contact between it and the bridge structure.

(b) *Nature of guarding.* Guarding shall consist of substantial inverted trough of nonconducting material located above the contact conductor, or other suitable means of preventing contact between the trolley pole and the bridge structure.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.