Chapter E 124

GRADES OF CONSTRUCTION

E 124.01 General. For the purposes of chapter E 126, "Strength requirements," and chapter E 127, "Line insulators," conductors and their supporting structures are classified under the grades specified in this chapter on the basis of the relative hazard existing.

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E 124.02 Application of grades of construction to different situations. (1) SUPPLY CABLES. For the purpose of these rules supply cables are divided into 2 classes as follows:

(a) *Specially installed cables.* In this class are included supply cable having effectively grounded continuous metal sheath, or insulated conductors supported on and lashed together with an effectively grounded messenger, installed in accordance with subsection E 126.02(7)(a).

Note: Such cables are sometimes permitted to have a lower grade of construction than open-wire supply conductors of the same voltage.

(b) *Other cables.* In this class are included all other supply cables.

Note: Such cables are required to have the same grade of construction as open-wire supply conductors of the same voltage.

(2) TWO OR MORE CONDITIONS. In any case where two or more conditions affecting the grade of construction exist, the grade of construction used shall be the highest one required by any of the conditions.

(3) ORDER OF GRADES. For supply and communication conductors and supporting structures, the relative order of grades is B, C, and N, grade B being the highest. Where grades D and N are specified for communication lines, grade D is the highest.

Note: Grade D cannot be directly compared with the series B and C, but subsection E 124.02 (4) (c) 3. provides for cases where these two conditions are present.

(4) AT CROSSINGS. (a) *Grade of upper line.* Conductors and supporting structures of a line crossing over another line shall have the grade of construction specified in sections E 124.02(4)(c), E 124.03 and E 124.04.

(b) *Grade of lower line.* Conductors and supporting structures of a line crossing under another line need only have the grades of construction which would be required if the line at the higher level were not there.

(c) *Multiple crossings.* 1. Where a line crosses in one span over two other lines. The grade of construction of the uppermost line shall be not less than the highest grade which would be required of either one of the lower lines if it crossed the other lower line.

Example: If a 2,300-volt line crosses in the same span over a communication line and a direct-current trolley contact conductor of more than 750 volts, the 2,300-volt line is required to comply with grade B construction at the crossing.

This is a double crossing and introduces a greater hazard than where the upper supply line crosses the communication line only.

2. Where one line crosses over a span in another line, which span is in turn involved in a second crossing. The grade of construction for the highest line shall be not less than that required for the next lower line.

a. Exception: This requirement does not apply when the 2 upper lines are of such nature and have such circuit protection that the danger of causing a break in the lower of these 2 lines by mechanical or electrical contact is eliminated.

3. Where communication conductors cross over supply conductors and railroad tracks in the same span. The grades of construction shall be in accordance with table 13.

TABLE 13

GRADES OF CONSTRUCTION FOR COMMUNICATION CONDUCTORS CROSSING OVER RAILROAD TRACKS AND SUPPLY LINES

When crossing over—	Communication conductor grades
Railroad tracks and supply lines of 0 to 750 volts, or specially installed supply cables of all voltages	D
Railroad tracks and supply lines exceeding 750 volts	B

Recommendation: It is recommended that the placing of communication conductors above supply conductors at crossings, conflicts, or on jointly used poles be avoided unless the supply conductors are trolley contact conductors and their associated feeders.

(5) CONFLICTS. (a) *How determined.* Where 2 lines are adjacent (except at crossing spans) the distance between them and the relative heights above ground of poles and of conductors on each line determine whether conflict exists, and, if so, whether the conflict is a structure conflict (see definition) or a conductor conflict (see definition), or both.

(b) *Conductor conflict.* At conductor conflicts the grade of construction of the conflicting conductor shall be as required by subsection E 124.02(4)(c) and section E 124.03.

(c) *Structure conflict.* At structure conflicts, the grade of construction of the conflicting structure shall be as required by section E 124.04.

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E 124.03 Grades of construction for conductors. The grades of construction required for conductors of all classes in different situations are given in tables 14 and 15. For the purpose of these tables certain classes of circuits are treated as follows:

(1) STATUS OF CONSTANT-CURRENT CIRCUITS. The grade of construction for a constant-current supply circuit involved with a communication circuit and not in specially installed cable shall be based on either its current rating or on the open-circuit voltage rating of the trans-

former supplying such circuit, as set forth in tables 14 and 15. In all other cases the grade of construction for a constant-current circuit shall be based on its nominal full-load voltage.

(2) STATUS OF RAILWAY FEEDERS AND TROLLEY CONTACT CONDUCTORS. In determining grades of construction where railway feeders and trolley contact conductors are involved they shall be considered as other supply conductors of the same voltage.

(a) *Exception:* Direct-current trolley circuits exceeding 750 volts where crossing over, conflicting with, or on jointly used poles with and above communication circuits, shall have the grades of construction specified in table 14 for direct-current railway feeders.

(3) STATUS OF COMMUNICATION CIRCUITS USED EXCLUSIVELY IN THE OPERATION OF SUPPLY LINES. In determining grades of construction where communication circuits used exclusively in the operation of supply lines are concerned, they shall be considered as ordinary communication circuits when run as such (see subsection E 128.09(1)(c)) and as supply circuits when run as such (see subsection E 128.09(1)(d)).

(a) *Exception:* Communication circuits located below supply circuits with which they are used shall not require such supply circuits to meet any rules for grade of construction other than that the sizes of such supply conductors shall not be less than required for grade C (see subsection E 126.02(6)(b)).

(4) STATUS OF FIRE-ALARM CONDUCTORS. In determining grades of construction where fire-alarm conductors are concerned, they shall be considered as other communication circuits.

(a) *Exception:* Fire-alarm conductors shall always meet grade D where the span length is from 0 to 150 feet, and grade C where the span length exceeds 150 feet.

(5) STATUS OF NEUTRAL CONDUCTORS OF SUPPLY CIRCUITS. Supply-circuit neutral conductors, which are effectively grounded throughout their length in accordance with subsection E 103.02(2)(d) and are not located above supply conductors of more than 750 volts, shall have the same grade of construction as supply conductors of not more than 750 volts, except that they need not meet any insulation requirements. Other neutral conductors shall have the same grade of construction as the phase conductors of the supply circuits with which they are associated.

E 124.04 Grades of supporting structures. (1) POLES OR TOWERS. The grade of construction shall be that required for the highest grade of conductors supported.

Note: See section 182.018, Wis. Stats., 1959 for additional R. R. crossing requirements.

(a) *Exception 1:* The grade of construction of jointly used poles, or poles used only by communication lines, need not be increased merely because of the fact that communication wires carried on such poles cross over trolley contact conductors of 0 to 750 volts.

(b) *Exception 2:* Poles carrying grade C or D fire-alarm conductors, where alone, or where concerned only with other communication conductors, need meet only the requirements of grade N.

TABLE 14

GRADES OF CONSTRUCTION FOR SUPPLY CONDUCTORS ALONE, AT CROSSINGS, AT CONFLICTS, OR ON SAME POLES WITH OTHER CONDUCTORS

Supply Conductors at Higher Levels (a) / Conductors, Tracks and Rights of Way at Lower Levels			Constant-potential supply conductors other than direct current railway feeders										Constant current supply conductors		Direct current railway feeders			Communication conductors used exclusively in the operation of, and run as, supply lines
			0 to 750 Volts		750 to 8700 Volts				Exceeding 8700 Volts						0 to 750 Volts	Exceeding 750 Volts		
			Urban	Rural	Urban		Rural		Urban		Rural							
			Open or Cable	Open or Cable	Open	Cable	Open	Cable	Open	Cable	Open	Cable	Open	Cable	Open or Cable	Open	Cable	Open or Cable
Exclusive private rights of way			N	N	N(b)	N	N	N	N(b)	N(b)	N	N	B, C, or N See E 124.03 (1)		B, C or N See E 124.03 (2)			C or N See E 124.03 (3)
Common or Public rights of way			N	N	C	N	N	N	B(c)	C	N	N						
Railroad tracks—Main or Minor			B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Street-railway tracks having no overhead contact conductor			N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Constant-potential supply conductors	0–750 Volts	Open or Cable	N	N	C	N	N	N	B(c)	C	C(d)	N	B, C or N See E 124.03 (1)		B, C or N See E 124.03 (2)			B, C or N See E 124.03 (3)
	750 to 8700 Volts	Open	C(e)	N	C	C	N	N	B(c)	C	N	N						
		Cable	N	N	C	N	N	N	B(c)	C	N	N						
	Exceeding 8700 Volts	Open	B(e)	C(e)	B	B	N	N	B(c)	C	N	N						
		Cable	C(e)	N	C	N	N	N	B(c)	C	N	N						
Constant current supply conductors—Open or Cable			B, C or N See E 124.03 (1)										B, C or N See E 124.03 (1)		B, C or N See E 124.03 (1) & (2)			B, C or N See E 124.03 (1) & (3)
Direct current railway feeders—Open or Cable			B, C or N See E 124.03 (2)										B, C or N See E 124.03 (1) & (2)		B, C or N See E 124.03 (2)			B, C or N See E 124.03 (2) & (3)
Trolley contact conductors—Alternating or Direct current																		
Communication conductors, Open or Cable, used exclusively in the operation of supply lines			B, C or N See E 124.03 (3)										B, C or N See E 124.03 (1) & (3)		B, C or N See E 124.03 (2) & (3)			B, C or N See E 124.03 (3)
Communication conductors—Urban or Rural, Open or Cable (f)			N	N	B(g)(h)	C	B(g)(h)	C	B(h)	C	B(h)	C	B(h)(i)	C or N see E 124.03 (1)	N	B(h)	C	B, C or N See E 124.03 (3)

(a) The words "open" and "cable" appearing in the headings have the following meanings as applied to supply conductors: "Cable" means the specially installed cables described in E 124.02 (1) (a). "Open" means open wire and also supply cables not "specially installed."

(b) Where lines are located so that they can fall outside the exclusive private rights of way into urban districts, the construction shall comply with the grades specified for lines not on exclusive private rights of way for corresponding voltages.

(c) If circumstances within a given area warrant it, supply conductors need only meet the requirements of grade C construction if the supply circuits are so constructed, operated, and maintained that such circuits will be promptly deenergized, both initially and following subsequent breaker operations, in the event of a contact with lower supply conductors or other grounded objects.

(d) Grade N construction may be used, if crossing over or conflicting with, supply services only.

(e) If the wires are service drops, they may have grade N sizes and sags as set forth in tables 28 and 29 (rule E 126.04 (5)).

(f) Grade N construction may be used where the communication conductors consist only of not more than 1 insulated twisted-pair or parallel-lay conductor, or where 2 or more such insulated conductors are involved and these consist of service drops not grouped together in a single run.

(g) Grade C construction may be used, if the voltage does not exceed 8,700 volts.

(h) The supply conductors need only meet the requirements of grade C construction if both of the following conditions are fulfilled:

(1) The supply and communication circuits are so constructed, operated and maintained that the supply voltage will be promptly removed from the communication plant by deenergization or other means, both initially and following subsequent breaker operations in the event of a contact with the communication plant.

(2) The voltage and current impressed on the communication plant in the event of a contact with the supply conductors are not in excess of the safe operating limit of the communication protective devices.

(i) Grade C construction may be used if the current cannot exceed 7.5 amperes or the open-circuit voltage of the transformer supplying the circuit does not exceed 2,900 volts.

TABLE 15
GRADES OF CONSTRUCTION FOR COMMUNICATION CONDUCTORS WHEN ALONE, OR IN UPPER POSITION AT CROSSINGS, AT CONFLICTS, OR ON JOINT POLES

Conductors, tracks and rights of way at lower levels		Communication conductors at higher levels (a)	Communication conductors, rural or urban, open or cable, including communication conductors run as such, but used exclusively in the operation of supply lines
Exclusive private rights-of-way			N
Common or Public rights-of-way			N
Railroad tracks			D
Street-railway tracks having no overhead contact wire			N
Constant-potential supply conductors (b)	0 to 750 volts	Open or cable	N
	750 to 5000 v.	Open or cable	C
	5000 to 7500 v.	Open	B
		Cable	C
	Exceeding 7500 volts (f)	Open	B
		Cable	C
Constant current supply conductors (b)	0 to 7.5 amp.	Open (c)	C
	Exceeding 7.5 amp.	Open (c)	(d) B
Direct-current railway feeders (b)	0 to 750 volts	Open or cable	N
	Exceeding 750 v.	Open or cable	B
Trolley Contact Conductors	0 to 750 volts	A.C. or D.C.	C
	Exceeding 750 v.	A.C.	(e), B, or C
		D.C.	B
Communication conductors, open or cable used exclusively in the operation of Supply Lines			(f) B, C, or N
Communication conductors, open or cable, urban or rural			N

Footnotes to table 15

(a) It is recommended that the placing of communication conductors above supply conductors at crossings, conflicts, or jointly used poles be avoided if practicable, unless the supply conductors are trolley contact conductors and their associated feeders.

(b) The words "open" and "cable" appearing in the headings have the following meaning as applied to supply conductors: "Cable" means the specially installed cables described in subsection E 124.02(1)(a). "Open" means open wire and also supply cables not "specially installed."

(c) Where constant-current circuits are in specially installed cable, they are considered on the basis of the nominal full-load voltage.

(d) Grade C construction may be used if the open-circuit voltage of the transformer supplying the circuit does not exceed 2,900 volts.

(e) See subsection E 124.03(2).

(f) See subsection E 124.03(3).

History: Cr. Register, November, 1961, No. 71, eff. 12–1–61.

(c) *Exception 3:* Poles carrying supply service loops of 0 to 750 volts shall have at least the grade of construction required for supply line conductors of the same voltage.

(d) *Exception 4:* Where communication lines cross over supply conductors and a railroad in the same span and grade B is required by

subsection E 124.02(4) (c)3. for the communication conductors, due to the presence of railroad tracks, the grade of the poles or towers shall be D.

(e) *Exception 5:* At structure conflicts even though no conductor conflict exists, the grade of construction which would be required by section E 124.03 if the conductors were in conflict, shall be applied to the pole or tower.

Note: This requirement may result in a higher grade of construction for the pole or tower than for the conductors carried thereon.

(f) *Exception 6:* In the case where a structure conflict does not exist, but any conductor is in conductor conflict, the grade of construction of the pole or tower is not required to meet the conductor grade due to the conductor conflict.

(2) CROSSARMS. The grade of construction shall be that required for the highest grade of conductors carried by the crossarm concerned.

(a) *Exception 1:* The grade of construction of crossarms carrying only communication conductors need not be increased merely because of the fact that such conductors cross over trolley contact conductors of 0 to 750 volts.

(b) *Exception 2:* Crossarms carrying grade C or D fire-alarm conductors, where alone or where concerned with other communication conductors need meet only the requirements for grade N.

(c) *Exception 3:* Crossarms carrying supply service loops of 0 to 750 volts shall have at least the grade of construction required for supply line conductors of the same voltage.

(d) *Exception 4:* Where communication lines cross over supply conductors and a railroad in the same span and grade B is required by subsection E 124.02(4) (c)3. for the communication conductors due to the presence of railroad tracks, the grade of the crossarm shall be D.

(3) PINS, INSULATORS, AND CONDUCTOR FASTENINGS. The grade of construction shall be that required for the conductor concerned.

(a) *Exception 1:* The grade of construction of pins, insulators, and conductor fastenings carrying only communication conductors need not be increased merely because of the fact that such conductors cross over trolley contact conductors of 0 to 750 volts.

(b) *Exception 2:* In case of grade C or D fire-alarm conductors where alone or where concerned only with other communication conductors, pins, insulators, and conductor fastenings need meet only the requirements for grade N.

(c) *Exception 3:* In the case of supply service loops of 0 to 750 volts, pins, insulators, and conductor fastenings shall have at least the same grade of construction as required for supply line conductors of the same voltage.

(d) *Exception 4:* Where communication lines cross over supply conductors and a railroad in the same span, and grade B is required by section E 124.02 for the communication conductors due to the presence of railroad tracks, the grade of pins, insulators, and conductor fastenings shall be grade D.

(e) *Exception 5:* In case communication conductors are required to meet grade B or C, the insulators need meet only the requirements for mechanical strength for these grades.

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