

Summary of Major 2007 NESC Changes

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Section 1

013C--New. Requires the inspection rules and work rules of the current edition to be used for inspection of, or work on, all installations, both existing and new.

018--New. The NESC text is revised in appropriate places to show the appropriate numbers of significant digits to support new Rule 018 that requires results of calculations to be rounded off to the nearest significant digit, unless otherwise instructed in a rule. This will eliminate questions about whether such language as “shall be not less than” requires rounding up, instead of rounding off. *NOTE that Rule 230A4 requires the results of clearances calculations to be rounded up to the next whole number or decimal to match the decimal system used in the rule or table.*

Section 2 — Definitions

Overvoltage—New. Defines voltages above normal voltages resulting from switching surges, temporary (transient voltages), etc.

Readily Climbable—Revised and Moved to supporting structure. Would now require an 8-ft gap from the ground to the first handhold or foothold OR between the lowest two handholds/footholds.

Shield wire—Revised. Addresses overhead ground wires, static wires, and surge protection wires.

Section 3 — References

Updates, additions and removals

Section 9 — Grounding Methods

92D—Revised. Adds another level of action for addressing objectionable current; i.e., determining the source and taking corrective action. Additional text further defines the term “objectionable current.” A new *NOTE* states that some current will always be present in the grounding conductors of an AC electrical system

094A1 NOTE--Revised. Metallic water system piping is no longer the preferred grounding electrode.

094B2—Revised. Minimum diameters for ground rods are now specified to decimal sizes within the NESC to replace existing nominal dimensions. Reduced tolerance ranges of NEMA GR-1 are not allowed.

094B7—New. Will allow a directly embedded steel pole to be used as a grounding electrode, under specified conditions: (a) backfill of native earth or conductive material, (b) NLT 5 ft of exposed embedded length, (c) pole diameter NLT 5 in & (d) NLT ¼ in thick. Other dimensions are allowed if supported by qualified engineering study.

096C--Revised. New *NOTE 2* states that the intent of the 4-grounds-in-each mile requirement is to ensure that grounds are distributed at ¼ mile or smaller intervals, but some intervals may exceed ¼ mile.

096D--Clarified. The ground resistance of electrodes for single-grounded (unigrounded or delta) systems must be low enough to meet the requirements of 096A (low enough to minimize hazards to personnel and permit prompt operation of protective devices) and not exceed 25 Ω. If not, other methods must be used to meet 096A. Two parallel electrodes may not be enough—may require a different system.

097D2—Revised. Requires guarding of the secondary grounding conductor according to Rule 093D2 when primary and secondary grounding conductors are separated.

097G—Revised. Now *requires* the bonding of electric supply and communication system grounding systems on joint-use structures. Previously, this was a *should* rule.

099C—Clarified. Clearly states that all separate electrodes on supply and communication systems shall be bonded together at buildings or other served structures. New *NOTE 2* justifies the bonding.

Part 1 — Electric Supply Stations

102 Application of Rules—New. Refers user to 013.

103 Referenced sections—New. Refers user to Sections 1, 2, 3, & 9.

110B2d—Clarified. Corrects omission; access to stored parts in stations also allows persons escorted by qualified personnel.

123C--Revised; 173C--deleted. A provision in Rule 123C that indicated that grounding could be omitted on conductors <25 kV with visible openings that are tagged was removed, as was related provisions in Rule 173C. This language was placed in the code in the 1970 revision apparently in anticipation of such allowance by the work rules that never happened and is not contemplated. This action matches Tentative Interim Amendment shown in the back of the 2002 NESC.

124A1 and Table 124-1—Clarified. These changes correct the apparent mismatch between the starting voltage limit of *151 V phase-to-phase* in Table 124-1 and the starting voltage limit of *above 150 V phase-to-ground* in Rule 124A1. The intention was to exempt 120-240 V. The rule now refers to *above 300 V phase-to-phase* and the table will now refer to *between .301-.6 kV phase-to-phase*.

124C3—Revised. A new *NOTE* was added to reinforce the preference for locating the supplemental railing or fence barrier as close as practical to the parts being protected from contact by workers, but also far enough away to allow appropriate working room with expected working methods and tools (such as hot sticks).

Part 2 — Overhead General

212—Addition. New *NOTE* referencing IEEE 776-1992 and IEEE 1137-1991 for information on susceptiveness of communication lines to induced voltages from proximate power lines.

215C2 & 279—Revised; 215C3-C6—New. The application and use requirements for guy insulators were moved from Rule 279 to Rule 215C, so that all requirements for using guy insulators as an alternate to grounding guys will be in one place. The required location limits adverse effects if a guy is cut or broken. Anchor guy and span guys, span wires carrying luminaires or traffic signals, and span wires carrying trolley or electric railway contact conductors are appropriately differentiated. Specific requirements for using insulators in lieu of grounding guys and span wires are added in Rule 215C. Rule 279 retains the strength requirements for guy insulators.

215C7—New. Insulators used to limit galvanic corrosion are required to meet the strength requirements of 279A1c and must be installed so that (a) the upper portion is grounded to meet 215C and (b) the insulator is located below exposed energized conductors or parts.

217A1a—Revised. Elevates the following from *NOTE* status to Rule status: *This rules does not require protection or marking of structural components located outside of the traveled ways of roadways or established parking areas.*

217C—New; 264E—Revised. Existing requirements for protection and marking of guys moved from Rule 264E to a new Rule 217C.

218A—Revised. Updates the tree trimming rule to refer to appropriate vegetation management practices and illustrates factors to consider in

determining extent of vegetation management program. The correct term *pruning* replaces *trimming*.

223A4—Revised. The former *NOTE* was elevated to rule status. A new *NOTE* was added to reference IEEE 487-2000 and IEEE 1590-2003 for information on voltages induced on communication circuits in the vicinity of supply stations with large ground currents.

Part 2 — Overhead Clearances

Section 23—General clarification for neutral clearances. Rules and tables have been revised to specifically indicate if supply neutrals meeting Rule 230E1 are allowed to have different clearances from supply conductors of 0-750 V. Some tables had separate categories for such neutrals and others included them within the 0-750 V category; this caused confusion.

Section 23—General clarification for decimal values. Rules and tables have been revised to show the appropriate levels of decimal accuracy desired for each clearance. Some tables have greater decimal places below 3 m (10 ft) than above those values.

Section 23—General revision for recognizing overhead shield wires. Rules and tables have been revised to include the term *overhead shield wires* along with the former, all-inclusive but less specific term *surge protection wires*.

230A4—New. Requires the resultants of calculations in Section 23 to be rounded up to the same level of decimal places as the rule or table requiring the calculation, regardless of the number of significant digits in the values used in the calculation. EXAMPLES are given.

230B Measurement of clearance and spacing—Moved. Relocated to 230A3 to make room for the new 230B.

230B Ice and wind loading for clearances—New. Copies the existing Figure 250-1 and Table 250-1 into Section 23 and re-labels the loading districts as ice zones. The radial ice is used to calculate sag at 32 °F. The radial ice, wind pressure and temperature combination is used in calculating inelastic deformation included in sag.

230I—Clarified. The clearances of Section 23 are not intended to be maintained during the course of, or as a result of, abnormal events such as, but not limited to, actions of others, weather events in excess of those described under Section 23, etc.

231A—Revised. New EXCEPTION 2 allows utility and fire authority to agree on lesser clearances.

231B3—Clarified. Roads, streets, or highways with narrow rights-of-way are all special cases that must be resolved consistent with limitations and conditions, regardless of whether urban or rural.

Table 232-1, Footnotes 7 & 8—Clarified. Both Footnotes clearly state the original intent: i.e., to limit application of the reduced clearances allowed by the footnotes only to residential buildings that are too low to allow the main table values to be met. These reduced clearances allowed for service drops in Table 232-1 Categories 3 and 5 were never meant to be applied to commercial/industrial service drops.

Table 232-1, Category 10 & Table 232-2, Category 2b—Revised. This change now allows the reduced clearances of Category 10 where vehicles under the line are unlikely to apply in urban areas as well as rural areas.

Table 232-2—Revised & Clarified. Switch handles, platforms, and braces were added to the first column along with support arms. Former Footnote 1 was moved to FN 6 and applied to the middle column of Category 1b for driveways, etc. FN 1 now consists of the previous FN 1b, which is the only portion that was used in Category 1d.

Table 232-2, Footnote 5 & Table 232-3, Footnote 2—Revised. Now matches the 2002 change to Table 232-1 by including riders on large animals other than horses. This change provides clearances for rigid

parts in circus and zoo areas where camels and elephants are ridden and the ranches/zooos that raise these animals.

233B1--Revised. The voltage adder for adjacent line horizontal clearances will now start at 22 kV as with other rules, instead of 129 kV. The basic vertical clearance in Table 233-1 is 2 ft and the basic horizontal clearance in Rule 233B1 is 5 ft. The extra 3 ft horizontal clearance limits the opportunity for contact between swinging lines during storms. The 1981 revision of Rule 233 effectively removed the extra 3 ft as the voltage approached 129 kV. The 2007 revision restores the required extra 3 ft horizontal storm clearance at all voltages.

234C2 & 239G1, Exception 1—Revised. Restored the limitation on reduced clearances for metal-clad supply cables meeting Rule 230C1a, as was originally the case. Rule 230C1 includes two kinds of supply cables. Rule 230C1a requires a continuous metallic sheath or shield over the insulation. Rule 230C1b allows a semiconducting sheath or shield with suitable mechanical drainage, such as URD supply cable with concentric neutral. The 230C1b cables are not considered as guarded under Rule 234C2 for clearances to buildings and also require a conduit or covering when traversing the communication space down the pole under Rule 239G.

234C3d—Revised, Exception 1—Revised & Exception 2—Deleted. The rule now directly specifies clearances required for service drop conductors over roofs or balconies using criteria formerly in Exception 2 and eliminates the need for the present undefined *shall not be readily accessible* language and the undefined *special* tools. This change increases the readability of the rule and decreases the opportunity for misunderstanding, but is not a fundamental change in requirements. Rule 234C3d(1) now includes a fundamental change in the basic clearance above a roof or balcony from 2.45 m (8 ft) to 3.0 m (10 ft) and extends coverage of the rule to porches or attached decks over which they pass, in order to appropriately reflect expected activities in these areas. The reductions allowed in existing Exceptions 1 and 2 are retained in the revised Exception 1.

Table 234-1, Footnote 3—Revised. The term *special* modifying tools for entry was deleted in accordance with changes to 234C3d.

234E, EXCEPTION 2—Revised. Water slides and other fixed, pool-related structures were added along with diving platforms.

Figure 234-4(b)—Revised. This figure was corrected for inadvertent changes made in the 1997 Edition when the 1993 code was translated with new publication software.

235B1b—Clarification. This rule limits the opportunity for midspan contact due to swinging conductors. Horizontal clearances between conductors at the attachments on the supporting structures are measured to the surfaces of the conductors themselves and do not include armor rods, tie wires or other fasteners.

235C, 235C1 & Table 235-5—Clarification and Revision. To limit the opportunity for confusion, this change directly refers users to the correct sub-rules for clearances between supply and communication lines in their respective spaces (Table 235-5), between communication lines in the communication space (Rule 235H), and communication lines in the supply space (Table 235-5).

The rule plainly specifies no clearance requirement between a Rule 230E1 neutral and a Rule 230C3 supply cable. This change responded to a recent Interpretation based upon unintended present language that would not allow the widespread present safe practice of attaching the neutral/messenger of a triplex cable to an existing neutral bracket for support. See the related changes to Rule 235G.

Further, the change specifies no clearance requirement between two ungrounded, open supply conductors of the same phase, same circuit, and same utility. *This may be appropriate only so long as both are always energized or de-energized and cannot have different voltage*

levels; otherwise Rule 235A3 and normal clearances need to apply to recognize the level of voltage that can be between the conductors if one is grounded for work while the other is still energized.

235C2b(1)(a)—Clarification. The required midspan vertical clearance between conductors/cables supported on the same supporting structures is intended to be 75% of the basic value required at the structure by Table 235-5 plus the full amount of any voltage adder. The 75% reduction only applies to the basic value and results of calculations within the voltage ranges of the table, not any voltage adder for additional voltage beyond the table values.

235C2b(1)(c)—Revised. This revision changes and clarifies the conditions of loading mismatch required for vertical clearances between the upper conductor or cable and the lower conductor or cable for the design winter condition and design summer condition. For the summer condition, a minimum value for the maximum operating temperature is 120 °F.

235F—Clarification. With respect to circuits of different voltage classifications located in the supply space on the same support arm, a neutral conductor is considered to have the same voltage classification as the circuit with which it is associated.

235G—Revised. Rule 235G will now explicitly allow the long-existing safe practice of attaching a multiplex neutral to an existing neutral bracket, so long as (a) the clearances at midspan meet Rule 235G and the newly numbered Table 235-8 that contains the existing values in the previously unnumbered table and (b) the energized, insulated conductors of the multiplex cable are held away from chafing on the existing supply neutral at the attachment. See the related changes to Rules 235C and 235C1.

235I2—Clarification. The former references to a radio frequency of 0-750 V are appropriately changed to a radio frequency of 3 kHz to 300 GHz. A new *NOTE 2* references new 420Q on radiation limits for workers near antennas.

Table 235-5, Row 2d, Column 5—Revised. The clearance between conductors of different utilities where an upper line of >8.7 kV is above a lower line of >22 kV is changed from 16 inches plus the voltage adder to 40 inches plus the voltage adder, to match Rows 2a, 2b, and 2c(1).

Table 235-5 Heading—Revised. The heading will include notification that the calculations required inside the table use voltages between conductors, as well as the requirement to use the phase-to-ground voltage to enter the table column and row headings. See Rule 235A3.

Table 235-5 Footnote 5—Revised. Fiber optic cables and insulated communication cables located in the supply space and carried on a grounded messenger will now be allowed to have clearances from communication cables in the communication space of 30 inches at the structure and 12 inches at midspan—if the messengers are bonded together, similar to the present allowance for 230E1 neutrals. Entirely dielectric fiber optic cables have no conductive messenger to bond to communication messengers.

235E1—New Notes 1 & 2. These notes send the user to 235I for the appropriate parts of Table 235-6 to use for clearances to antennas in the supply space and to 236D1 for antenna clearances in the communication space, respectively.

Table 235-6—Clarification. Neutrals meeting Rule 230E1 are recognized differently from phase conductors of 0-8.7 kV.

235G—Revised. Longitudinal runs on racks and cables on messengers are obstructions to climbing (and are prohibited) unless the location, size and quantity allow climbing past them by qualified workers.

239A2—Revised. Limitations on placing cables of different voltages or different utilities in the same conduit duct or under the same U-

guard are directly specified. Secondary and primary voltage supply cables can be in the same duct or U-guard if the primary cable meets Rule 350B. Supply and communication owned by the same utility may be in the same duct or U-guard. Communication cables owned by different utilities may be in the same duct or U-guard only *if all agree*.

239A6 & 239D2—Revised. The former backing plate requirement in 239A6 was moved to 239D2 so that a backing plate would not be required on U-guards above the level of 8 ft above ground. U-guards are specifically recognized for protection along with conduits.

Part 2 — Overhead Strengths & Loadings

Tables 242-1 and 242-2—Revised. Grade B construction will now be required over navigable waterways requiring waterway crossing permits, in addition to railroad tracks and limited access highways. Recent storm rescue efforts were hampered by lines down over waterways used for rescue. This will limit line failure due to storm winds alone coming across unsheltered water.

250—Revised & 250D—New. A new combined freezing rain ice and concurrent wind loading from ASCE 7 is added in Rule 250D. The existing loading district map will also be retained to take care of areas where rime ice or hoar frost may cause a greater loading.

250C—Revised. The extreme-wind height adjustment system and gust response factor system in 2002 was simplified for application to structures by using the wind pressure at 2/3rds of the height of the structure for structure considerations. This revision allows for more specific determinations of wind loading for large tower arms and similar facilities located at or near the top of the structure.

252B2c, Exception—Revised. A reduction of force coefficients (shape factors) based upon a qualified engineering study is now allowed.

253 & 261 and Tables 253-2 and 261-1B—Revised. A sunset date for the use of the alternate method was set for July 31, 2010.

Table 253-1—Revised. The distinction between Grade B *at crossing* and Grade B *elsewhere* is eliminated to simplify the requirements and eliminate confusion. Rule 250C Extreme Wind load factors change with wind speed.

261A3, 261C3 and 261D3—New; Rules 253 and 260B and Tables —Revised. This change recognizes appropriate overload factors for fiber-reinforced polymer portions of structures, crossarms, guys, etc.

Tables 253-2 and 261-1A—Clarification. Footnotes revised to clarify that the limits on deterioration of strength, replacement, and rehabilitation for structures apply also to components of structures.

Tables 261A and 261B—Revised. Crossarms and braces are added to the strength factor tables to reflect the requirements of Rules 261D1, 261D2a(1), and 261D2a(2).

Rule 261A2e—Deleted. The former *average strength of three poles* wood pole rule was deleted. It is not appropriate to install poles with less strength than normally required. Such action is not permitted for other materials. The rule was only appropriate in very short span construction, where significant guying could be achieved from conductors attached to neighboring poles. This is rarely the case with the large conductors and cables with large sags in use today.

261D5b (existing 261D4b) —Revised. Now allows crossarm braces used only to sustain unbalanced vertical loads to be designed only for those unbalanced loads: i.e., without an overload factor being applied.

261H1, NOTE—Revised. While the limits of Rule 261H1b reduce the opportunity for conductors damage due to aeolian vibration, they may not prevent it in all cases.

Rule 261N—New. A new Rule 261N Climbing and Working Steps and Attachments was added with a *NOTE* to refer users to IEEE Std 1307-1996 *IEEE Standard for Fall Protection for Utility Work*. Loadings

must be not less than twice the maximum intended load—the MIL is not less than 300 lb.

Table 263-1—Revised. The distinction between urban and rural locations for minimum sizes of Grade N supply line conductors was removed and the table values were consolidated.

279—Revised. The application and use requirements for guy insulators were moved from Rule 279 to Rule 215C, so that all requirements for using guy insulators as an alternate to grounding guys will be in one place. Rule 279 retains the strength requirements for guy insulators.

New Rule 279A3b, CP 2620, p. 568. Specifications for insulators used in guys to (a) limit galvanic corrosion or (b) increase the BIL insulation level at the top of the pole are added. Grounding of the anchor guy below insulators used for BIL purposes is required.

Part 3 Underground

311C—New. This change mirrors existing Rule 230A2d in the underground rules to allow emergency placement of some cables directly upon the ground. This is useful in achieving time restoration of service until a permanent fix can be accomplished, if an existing cable faults out of service.

NOTE 2 under the title of Section 32 and Rule 350H—Revised. Clarifies that single-duct conduit not a part of a *conduit system*, such as so-called *cable-in-duct*, required to meet rules for direct-buried cables.

342A—Revised. Grounding of underground cable metallic shields, sheaths or concentric neutrals is required only if exposed to personnel.

350F—Moved to 384C. Now applies the bonding requirements to all above-ground padmounted equipment within 6 ft of each other, regardless of whether fed from cable in conduit or direct-buried cable.

351C1 & 351C2—Revision. The 5 ft *horizontal* clearance of Rule 351C1 will apply only to below ground pools. Cable may not be installed under above-ground pools, as a result of the addition of “other structures” to 351C2 and a new *NOTE* under Rule 351C1 referring the user to 351C2 for above-ground pools.

352E and 352F—New. This prohibits supply and communication cables in the same conduit duct, unless owned by the same utility, and prohibits multiple communication cables in the same duct, unless all utilities involved are in agreement.

Part 4 — Work Rules

410A3 & 420I2 and Tables 410-1 & 410-2—New. As of January 2009, employers must (a) have completed arc-exposure analysis based upon available fault current, arc duration, and employee distance from the arc and (b) require employees to wear clothing or a clothing system with an appropriate arc rating. Tables of voltage, fault current, and maximum clearing time are matched with appropriate clothing system calorie designations. The basis for the calorie designations is given so that users can determine if separate calculations are required for their exposures. Apparel of acetate, nylon, polyester, or polypropylene is prohibited.

420B2—New. A new rule requiring operators of mechanized equipment to be qualified was added in response to concerns about operators of guided boring and directional drilling operators.

420Q—New. Exposure of workers near communication antennas of 3 kHz to 300 GHz shall not be exposed to excessive radiation levels. OSHA 29 CFR 1910.97 and 1910.268, FCC Bulletin 65, and IEEE Std C95.1-1999 are referenced.

423D2—New. Existing utilities must be exposed before using guided boring or directional drilling for placing new cables on a crossing path.

432 & Table 431-1—Revised. The minimum approach distances from communication workers to exposed energized parts has been revised,

based upon changes in IEEE Std 516. In addition, MADs at higher altitudes are now shown in the table.

441A and Tables 441-1, 2, 3, 4, & 5—Revised. This includes extensive modifications of the minimum approach distances to exposed energized parts based upon changes in IEEE Std 516, including stated distances at various altitudes, and extensive requirements for engineering analysis and temporary transient control.

Revised Rule 441A3b, CP 2560, p. 662. Rubber gloves will be required when working *within the reach or extended reach* of the minimum approach distances listed in Table 441-1.

441A3d—New. A new Rule 441A3d is added to specify that (a) cover-up used to insulate phase-to-phase exposure be rated for phase-to-phase voltage and (b) all other cover-up be rated for not less than phase-to-ground voltage. Voltage exposure of the worker is based upon conductor spacing, worker position, the task being performed, work rules, etc. There were extensive comments by subcommittee members in the Preprint that are instructive on this subject.

441A4—Revised. New 441A4a gives requirements for work above 72.5 kV Ø-Ø that must be met if the maximum per-unit overvoltage factor T has not been determined from an engineering analysis and the additional constraints of 441A4b are not met. Temporary transient overvoltage control devices (TTOCD) are allowed by 441A4b to reduce the per-unit overvoltage factor used to determine MADs.

441A5—New. Specifies how to determine T with TTOCD in place.

441A7—Revised. Former 441A6 specifies how the MADs in Tables 441-1, -2, -3, and -4 were determined.

441B4—Revised. Workers are now required to test suspension insulator units for failure before shorting out units in a string.

445B—Revised. Where multiple phase grounding cables are connected to the same point, all of the phase connections must be removed before the ground connections, unless a hazard of accidental contact of the still-grounded conductor with ungrounded parts could occur. In that case, the phase grounding conductors can be removed individually.

Part 4 — Appendixes

Appendix A—Revised. The portions of the 1990-2002 Appendix A that explained the derivation of clearance requirements prior to 1990 was removed; only the present system is shown.

Revised Table A-1—Revised. The table of mechanical and electrical clearance components was rearranged for ease of reading and metric numbers were added.

Table A-2a—Revised. The table of reference components was revised to have the same row headings used in the tables in Rule 232.

Appendix B—New. Explains the loading to be used to determine conductor creep and sags for clearance purposes.

Appendix C—New. Gives examples demonstrating the application of the extreme wind loading requirements of 250C.

Appendix D—New. Explains how to determine the maximum anticipated per-unit overvoltage factor T at a work site, with 1 example.

Appendix E—Revised. The bibliography formerly in Appendix B was revised for new references and updated effective dates.