Edison Electric INSTITUTE

Power by Association

January 10, 2017

TO: EEI Occupational Safety & Health Executive Committee
EEI Occupational Safety & Health Committee
EEI Industrial Hygiene Subcommittee
EEI Regulatory Review Task Force

FROM: EEI OSHA Team

Re: **Final Extension of Enforcement Date for Determining Maximum Anticipated Per-unit Transient Overvoltages for the Electric Power Generation, Transmission, and Distribution Industry– 29 CFR Sections 1910.269(l)(3)(ii) and 1926.960(c)(1)**

On December 22, 2016, the Occupational Safety and Health Administration (OSHA) issued a memorandum setting out a final extension of the enforcement date for determining maximum anticipated per-unit transient overvoltages (commonly known as "T values") for voltages over 72.5 kilovolts (kV). The compliance date for determining T values for voltages over 72.5 kV is July 1, 2017. A copy of the memorandum is attached.

On April 11, 2014, OSHA promulgated a final rule revising the Electric Power Generation, Transmission and Distribution standard for general industry (29 C.F.R. § 1910.269) as well as revised standards for Power Transmission and Distribution for construction (29 C.F.R. Part 1926, Subpart V). EEI, the Utility Line Clearance Coalition, and the Tree Care Industry Association challenged the standards in the United States Court of Appeals for the District of Columbia. The parties ultimately entered into a settlement agreement that required OSHA to issue compliance guidance in the form of Q&As on the Final Rules and extend compliance dates for certain provisions, including the compliance dates associated with T values for voltages over 72.5 kV.

In the Q&A compliance guidance, EEI and OSHA agreed that employers could use the methodologies set out in IEEE Standard 516-2009 entitled *Guide for Maintenance Methods on Energized Power Lines* or "other recognized and generally accepted good engineering practices" to calculate T values. *See Q&A on the Final Rule at Question 23*. At the time of the settlement negotiations, the IEEE 516-2009 standard did not include specific information regarding steps employers could take to reduce T values during live work. OSHA agreed that compliance with Sections 1910.269(l)(3)(ii) and 1926.960(c)(1)(ii) would be delayed until information from the IEEE 516 Committee regarding this issue was publicized.

On September 12, 2016, the IEEE 516 Committee presented a paper entitled *Practical Approaches to Reducing Transient Overvoltage Factors for Live Work*. If the employer follows the recommendations in the paper, then the industry-accepted T values included in the IEEE 516-2009 standard may be used to calculate minimum approach distances for voltages over 72.5 kV.

According to the December 22, 2016 memorandum issued by OSHA, the IEEE 516 paper "constitutes an engineering analysis of electric power systems operating at over 72.5 kilovolts." As such, "employers can follow the guidance in the paper to comply with 29 CFR 1910.269(l)(3)(ii) and 29 CFR 1926.960(c)(1)(ii)."

Employers have until July 1, 2017, to take one of the following steps: 1) implement the T values established in Tables R-9 and V-8, along with the corresponding minimum approach distances; or 2) establish that the conditions set out in the paper and summarized in OSHA's memorandum are in place, and use the associated T values in Table A and the corresponding minimum approach distances in Table B.

Additional Information

The OSH Provisions and Compliance Guidance Concerning T Values

Sections 1910.269(l)(3)(ii) and 1926.960(c)(1)(ii) state:

> No later than April 1, 2015, for voltages over 72.5 kilovolts, the employer shall determine the maximum anticipated per-unit transient overvoltage, phase-to-ground, through an engineering analysis or assume a maximum anticipated per-unit transient overvoltage, phase-to-ground, in accordance with [Table R-9 for 1910.269 and Table V-8 for Subpart V]….[1] The employer shall make any engineering analysis conducted to determine maximum anticipated transient overvoltage available upon request to employees and to the Assistant Secretary or designee for examination and copying.

29 C.F.R. § 1910.269(l)(3)(ii); 29 C.F.R. § 1926.960(c)(1)(ii).

The OSHA standards provide employers with two options with regard to T values for voltages over 72.5 kV: 1) use the default values in Table R-9 for maintenance work covered by Section 1910.269, or Table V-8 for construction work covered by Subpart V; 2) or conduct an engineering analysis that includes information specific to the characteristics of the system operated by the employer. The T values are then used to determine the appropriate minimum approach distances that must be used.

At the time of the settlement negotiations, the IEEE 516-2009 standard did not include significant information regarding steps employers could take to reduce T values during live work. Also, OSHA included language in the preamble regarding breaker prestrikes and restrikes that was confusing to the industry in that it implied the probability of restrike/prestrike must be considered in calculating T values.[2] As a result, the parties acknowledged that the IEEE 516-

[1] The omitted language addresses the use of portable protective gaps.

[2] OSHA stated in the preamble that breaker prestrike and restrike "are the same type of event," and cited a report regarding Bonneville Power Administration ("BPA") as showing that "although the overall probability that circuit breakers in general will restrike or prestrike may be low, OSHA concludes that the probability that a

2009 Committee was in a position to identify practices that would effectively limit T values on electrical systems operating at over 72.5 kV. OSHA agreed that compliance with Sections 1910.269(l)(3)(ii) and 1926.960(c)(1)(ii) would be delayed until the information from the IEEE 516 Committee regarding this issue was publicized.

Practical Impact and Guidance for EEI Members

As stated, Sections 1910.269(l)(3)(ii) and 1926.960(c)(1)(ii) allow employers to use the default T values provided in Tables R-9 and V-8, or to perform an engineering analysis to determine the T values. According to the memorandum issued by OSHA, the IEEE 516 paper "constitutes an engineering analysis of electric power systems operating at over 72.5 kilovolts." As such, "employers can follow the guidance in the paper to comply with 29 CFR 1910.269(l)(3)(ii) and 29 CFR 1926.960(c)(1)(ii)." OSHA summarizes the steps required in the paper as follows:

- The employer responsible for the circuit on which employees are working selects and maintains circuit breakers to minimize the probability of circuit breaker restrike;
- Live-line work is not performed while lightning is visible at the worksite;
- Reclosing is blocked on the circuit on which employees are working;
- Line switching is not performed on the circuit on which employees are working;
- Capacitor switching is disabled on the circuit on which the employees are working; and
- When the work is on a line operating at 550.1 to 800.0 kilovolts, nominal, the line length is limited to 322 kilometers (200 miles).

If this guidance is followed, employers are permitted to use the industry-accepted T values in the IEEE 516-2009 standard and reproduced in Table A in OSHA's memorandum.

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particular circuit breaker will restrike or prestrike may be high enough that it cannot be ignored." *See* 79 *Fed. Reg.* 20316, 20432 (April 11, 2014).

In the Q&A on the final rule, OSHA clarified this issue by confirming that employers are not required to assume that restrikes and prestrikes will occur, and stating (in part):

> Employers may institute measures (such as selecting circuit breakers designed to keep the probability of restrikes extremely low, installing and operating them so as to not to increase the probability of restrike, maintaining them in accordance with manufacturer's instructions, and establishing and implementing administrative measures to prevent the use of other devices to switch circuits on which employees are working) to reduce the probability of restrike to a negligible level. Employers may then ignore the potential for restrike in calculating maximum transient overvoltages as long as those measures are in place.
>
> In contrast to restrikes, circuit switching devices will generally exhibit prestriking in normal operation. OSHA does not presently have any evidence suggesting whether prestrikes do or do not have an effect on maximum transient overvoltage in all circumstances. OSHA believes that employers will generally be able to conclude that prestrikes have no meaningful effect on the maximum transient overvoltage and will defer to an employer's reasonable findings in this regard.

Q&A on the Final Rule at Question 24.

Table A--Industry Accepted Values of Maximum Per-Unit Transient Overvoltage

Voltage Range (kV)	Maximum per-unit transient overvoltage, phase-to-ground
72.6 to 362	3.0
363 to 550	2.4
551 to 800	2.0

The Table A values lead to the minimum approach distances set out in Table B to the memorandum.

Table B—Alternative Minimum Approach Distances for Voltages of More Than 72.5 kV * † ‡

Voltage Range, Phase-to-Phase (kV)	Phase-to-Ground Exposure		Phase-to-Phase Exposure	
	m	ft (ft, in **)	m	ft (ft, in ‡)
72.6 to 121.0	1.02	3.3 (3 ft, 4 in)	1.27	4.2 (4 ft, 3 in)
121.1 to 145.0	1.16	3.8 (3 ft, 10 in)	1.46	4.8 (4 ft, 10 in)
145.1 to 169.0	1.30	4.3 (4 ft, 4 in)	1.65	5.4 (5 ft, 5 in)
169.1 to 242.0	1.72	5.6 (5 ft, 8 in)	2.55	8.4 (8 ft, 5 in)
242.1 to 362.0	2.76	9.1 (9 ft, 2 in)	4.49	14.7 (14 ft, 9 in)
362.1 to 420.0	2.50	8.2 (8 ft, 3 in)	4.17	13.7 (13 ft, 9 in)
420.1 to 550.0	3.62	11.9 (11 ft, 11 in)	6.18	20.3 (20 ft, 4 in)
550.1 to 800.0	4.83	15.8 (15 ft, 10 in)	8.47	27.8 (27 ft, 10 in)

* Employers may use the minimum approach distances in this table provided the worksite is at an elevation of 900 meters (3,000 feet) or less. If employees will be working at elevations greater than 900 meters (3,000 feet) above mean sea level, the employer may determine minimum approach distances by multiplying the distances in this table by the correction factor in 29 CFR 1910.269 Table R-5, or 29 CFR Part 1926, Subpart V, Table V-4, corresponding to the altitude of the work.

† Employers may use the phase-to-phase minimum approach distances in this table provided that no insulated tool spans the gap and no large conductive object is in the gap.

‡ The clear live-line tool distance must equal or exceed the values for the indicated voltage ranges.

** OSHA is providing the distance in feet and inches, rounded up, for convenience only.

According to OSHA's memorandum, "[e]mployers may use the minimum approach distances in Table B, provided the conditions listed in this memorandum apply and the employer follows the notes to the table."

If you have any questions, please contact any member of the EEI OSHA Team. Thank you.

EEI OSHA Team (listed alphabetically)

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U.S. Department of Labor

Occupational Safety and Health Administration
Washington, D.C. 20210

Reply to the attention of:

DEC 22 2016

MEMORANDUM FOR: REGIONAL ADMINISTRATORS

FROM: DOROTHY DOUGHERTY
DEPUTY ASSISTANT SECRETARY

THOMAS GALASSI
DIRECTOR, DIRECTORATE OF ENFORCEMENT PROGRAMS

DEAN MCKENZIE
DIRECTOR, DIRECTORATE OF CONSTRUCTION

SUBJECT: Enforcement of minimum approach distance requirements in 29 CFR 1910.269 and 29 CFR Part 1926, Subpart V

On April 11, 2014, OSHA promulgated a final rule revising the general industry and construction standards for work on electric power generation, transmission and distribution installations. On February 13, 2015, OSHA entered into a settlement agreement with the Edison Electric Institute, the Utility Line Clearance Coalition, and the Tree Care Industry Association resolving legal challenges to that final rule. As part of that settlement, OSHA issued a memorandum (dated February 18, 2015) with the subject line "29 CFR 1910.269 and 29 CFR Part 1926, Subpart V—Enforcement dates." The memorandum adopted a delayed enforcement date for certain minimum approach distance requirements in 29 CFR 1910.269 and 29 CFR Part 1926, Subpart V. On January 20, 2016, OSHA issued a second memorandum (subject line, "29 CFR 1910.269 and 29 CFR Part 1926, Subpart V—Enforcement dates for minimum approach distances") further delaying enforcement of those requirements. This memorandum further extends those enforcement dates as follows:

> Until **June 30, 2017**, for voltages of 169.1 kilovolts and more: (i) no citations will be issued under 29 CFR 1910.269(l)(3)(ii) or 29 CFR 1926.960(c)(1)(ii), which require the employer to determine the maximum anticipated per-unit transient overvoltage; and (ii) OSHA will accept compliance with the minimum approach distances in Table 6 or Tables 10 to 13 in Appendix B to 29 CFR 1910.269 as compliance with 29 CFR 1910.269(l)(3)(i) and 29 CFR 1926.960(c)(1)(i).
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> Until **June 30, 2017**, for voltages of 72.6 to 169.0 kilovolts, no citations will be issued under 29 CFR 1910.269(l)(3)(ii) or 29 CFR 1926.960(c)(1)(ii), which require the employer to determine the maximum anticipated per-unit transient overvoltage, provided the employer assumes a maximum anticipated per-unit transient overvoltage, phase-to-ground, of 3.0 per unit.

OSHA does not expect to further extend these enforcement dates. OSHA is adopting the following policy for enforcement of the minimum approach distance requirements in 29 CFR 1910.269 and 29 CFR 1926.960 beginning on July 1, 2017:

For voltages over 72.5 kilovolts, 29 CFR 1910.269(l)(3)(ii) and 29 CFR 1926.960(c)(1)(ii) require the employer to determine the maximum anticipated per-unit transient overvoltage, phase to ground, through an engineering analysis or assume a maximum anticipated per-unit transient overvoltage, phase-to-ground, in accordance with Table R-9 or Table V-8, respectively. On September 12, 2016, the Institute of Electrical and Electronics Engineers (IEEE) presented a paper titled, "Practical Approaches to Reducing Transient Overvoltage Factors for Live Work" at its ESMO 2016 conference in Columbus, OH. That paper describes practices that can be adopted[1] to reduce maximum transient overvoltages to "industry-accepted values" given in IEEE 516-2009[2] and shown in the following table:

Table A--Industry Accepted Values of Maximum Per-Unit Transient Overvoltage

Voltage Range (kV)	Maximum per-unit transient overvoltage, phase-to-ground
72.6 to 362	3.0
363 to 550	2.4
551 to 800	2.0

The IEEE committee responsible for developing this paper performed research to determine, based on sound engineering principles, what practices are necessary to limit transient overvoltages on electric power systems operating at over 72.5 kilovolts. As a result of this research, the committee developed recommendations that, if followed, limit maximum transient overvoltages to the values listed in Table A. OSHA has concluded that the paper constitutes an engineering analysis of electric power systems operating at over 72.5 kilovolts and that employers can follow the guidance in the paper to comply with 29 CFR 1910.269(l)(3)(ii) and 29 CFR 1926.960(c)(1)(ii). Consequently, for voltages exceeding 72.5 kilovolts, OSHA will accept compliance with minimum approach distances calculated in accordance with 29 CFR 1910.269 Table R-3 or 29 CFR Part 1926, Subpart V, Table V-2, as applicable, using values of maximum per-unit transient overvoltage, phase-to-ground, as listed in Table A of this memorandum provided all of the following conditions are in place:

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[1] In most cases, the entity that operates the system (typically an electric utility) will implement these practices. When a contract employer must comply with the minimum approach distance requirements in §§1910.269 and 1926.960, the entity operating the system would be the host employer. To apply the maximum transient overvoltages set in Table A, the host employer and contract employer will need to coordinate their work rules and procedures in accordance with 29 CFR 1910.269(a)(3)(iii) or 29 CFR 1926.950(c)(3), as applicable, so that the practices outlined in this memorandum are adhered to.

[2] IEEE Std 516–2009, *IEEE Guide for Maintenance Methods on Energized Power Lines.*

- The employer responsible for the circuit on which employees are working selects and maintains circuit breakers to minimize the probability of circuit breaker restrike;
- Live-line work is not performed while lightning is visible at the worksite;
- Reclosing is blocked on the circuit on which employees are working;
- Line switching is not performed on the circuit on which employees are working;
- Capacitor switching is disabled on the circuit on which employees are working; and
- When the work is on a line operating at 550.1 to 800.0 kilovolts, nominal, the line length is limited to 322 kilometers (200 miles).

Table B lists minimum approach distances calculated in accordance with 29 CFR 1910.269 Table R-3 and 29 CFR Part 1926, Subpart V, Table V-2 using values for maximum transient overvoltage, phase-to-ground, from Table A.[3] Employers may use the minimum approach distances in Table B, provided the conditions listed in this memorandum apply and the employer follows the notes to that table. Employers that do not meet these conditions must establish minimum approach distances in accordance with 29 CFR 1910.269(l)(3) or 29 CFR 1926.960(c)(1), as applicable.

[3] OSHA developed Table B by extracting the values for the minimum approach distances for phase-to-ground and phase-to-phase exposures from Table 14 through Table 21 in Appendix B to 29 CFR 1910.269 (or the equivalent Table 7 through Table 14 in Appendix B to 29 CFR Part 1926, Subpart V) corresponding to the voltage range in Table B and the maximum transient overvoltage, phase-to-ground, from Table A. Note that Table B does not replace any of the tables in 29 CFR 1910.269 or 29 CFR Part 1926, Subpart V.

Table B—Alternative Minimum Approach Distances for Voltages of More Than 72.5 kV [*] [†] [‡]

Voltage Range, Phase-to-Phase (kV)	Phase-to-Ground Exposure		Phase-to-Phase Exposure	
	m	ft (ft, in [**])	m	ft (ft, in [‡])
72.6 to 121.0	1.02	3.3 (3 ft, 4 in)	1.27	4.2 (4 ft, 3 in)
121.1 to 145.0	1.16	3.8 (3 ft, 10 in)	1.46	4.8 (4 ft, 10 in)
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169.1 to 242.0	1.72	5.6 (5 ft, 8 in)	2.55	8.4 (8 ft, 5 in)
242.1 to 362.0	2.76	9.1 (9 ft, 2 in)	4.49	14.7 (14 ft, 9 in)
362.1 to 420.0	2.50	8.2 (8 ft, 3 in)	4.17	13.7 (13 ft, 9 in)
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550.1 to 800.0	4.83	15.8 (15 ft, 10 in)	8.47	27.8 (27 ft, 10 in)

[*] Employers may use the minimum approach distances in this table provided the worksite is at an elevation of 900 meters (3,000 feet) or less. If employees will be working at elevations greater than 900 meters (3,000 feet) above mean sea level, the employer may determine minimum approach distances by multiplying the distances in this table by the correction factor in 29 CFR 1910.269 Table R-5, or 29 CFR Part 1926, Subpart V, Table V-4, corresponding to the altitude of the work.

[†] Employers may use the phase-to-phase minimum approach distances in this table provided that no insulated tool spans the gap and no large conductive object is in the gap.

[‡] The clear live-line tool distance must equal or exceed the values for the indicated voltage ranges.

[**] OSHA is providing the distance in feet and inches, rounded up, for convenience only.