


MINIMUM APPROACH DISTANCES

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* References to ITC are references to ITC Holdings Corp. together with all of its subsidiaries, unless otherwise noted.

1. INTRODUCTION

- 1.1. In 2014, the Occupational Safety and Health Administration (OSHA) revised safety regulations which were specific to the electric power generation, transmission, and distribution industry. As a result, 29 CFR 1910.269 and 29 CFR 1926 Subpart V were revised. The revised rules included requirements for employers to establish Minimum Approach Distances.
- 1.2. The purpose of this procedure is to set forth the criteria to be used when assessing the minimum approach distances when work is performed, by Qualified Electrical Workers.

2. SCOPE AND RESPONSIBILITY

- 2.1. This procedure applies to all ITC employees and contractors working on equipment and projects involving ITC assets and/or equipment. The information contained in this procedure is general in nature and is not a substitute for the knowledge of qualified individuals. It is not meant to replace the advice of ITC engineering or agents of ITC. If you have specific needs or concerns not addressed in this procedure and the information contained in the references contact an ITC Safety representative.

3. REFERENCES

- 3.1. OSHA 29 CFR 1910.269
- 3.2. OSHA 29 CFR 1926 Subpart V
- 3.3. Switching Surge Analysis to Determine the Maximum Anticipated Transient Overvoltages for 345 kV and 230 kV Lines (ITC/METC), by Mitsubishi Electric

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- 3.4. Switching Surge Analysis to Determine the Maximum Anticipated Transient Overvoltages for 345 kV and 230 kV Lines (ITCMW), by Mitsubishi Electric.
- 3.5. Switching Surge Analysis to Determine the Maximum Anticipated Transient Overvoltages for 345 kV and 230 kV Lines (ITCGP), by Mitsubishi Electric.
- 3.6. IEEE Guide for Maintenance Methods on Energized Power Lines, IEEE Standard 516-2009, May, 2009
- 3.7. Practical Approaches to Reducing Transient Overvoltages Factors for Live Work, ESMOL Subcommittee, IEEE, September, 2016
- 3.8. 2017 ITC Safety Handbook

4. PRECAUTIONS

- 4.1. Unless properly protected, qualified personnel must maintain Minimum Approach Distances (MAD) from uninsulated and energized equipment.
- 4.2. The MAD values contained in this procedure apply only to the ITC Holdings operating systems.
- 4.3. Reduced air pressure at high altitudes causes a reduction in the electrical strength of an air gap. Minimum approach distances should be increased by 3 percent for every 1000 feet of increased altitude above 300 feet.
- 4.4. **NOTE:** Tables A-1, A-2, A-3, and A-4 are subsets of Table A “Minimum Approach Distances” from the “ITC Safety Handbook”.

5. PROCEDURE

- 5.1. For the voltage classes from 0.05 kV to 72.5 kV the following Minimum Approach Distance values, **Table A-1** shall apply.

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Table A-1

Nominal Voltage in kilovolts (kV) phase to phase	Distance	
	Phase to ground exposure (feet – inches)	Phase to phase exposure (feet – inches)
0.05 kV – 0.300 kV	Avoid Contact	-
0.301 kV – 0.750 kV	1 ft. 2 in.	1 ft. 2 in.
0.751 kV – 5.0 kV	2 ft. 1 in.	2 ft. 1 in.
5.1 kV – 15.0 kV	2 ft. 2 in.	2 ft. 3 in.
15.1 kV – 36.0 kV	2 ft. 7 in.	3 ft. 0 in.
36.1 kV – 46.0 kV	2 ft. 10 in.	3 ft. 3 in.
46.1 kV – 72.5 kV	3 ft. 4 in.	4 ft. 4 in.

- 5.2. For the voltage classes from 72.6 kV to 169.0 kV the per-unit transient overvoltage values (T-value) are established at 3.5 p.u. As a result, the following **Table A-2** Minimum Approach Distances shall apply.

Table A-2

Nominal Voltage in kilovolts (kV) phase to phase	Distance	
	Phase to ground exposure (feet – inches)	Phase to phase exposure (feet – inches)
72.6 kV – 121.0 kV	3 ft. 9 in.	4 ft. 8 in.
121.1 kV – 145.0 kV	4 ft. 4 in.	5 ft. 5 in.
145.1 kV – 169.0 kV	4 ft. 10 in.	6 ft. 5 in.

- 5.3. For the voltage classes from 169.1 kV to 362.0 kV the transient overvoltage values are 3.0 p.u. provided that surge arrestors are in service at both ends of the circuit. **Table A-3** Minimum Approach Distances shall apply.

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Table A-3

Nominal Voltage in kilovolts (kV) phase to phase	Distance	
	Phase to ground exposure (feet – inches)	Phase to phase exposure (feet – inches)
169.1 kV – 242.0 kV	5 ft. 8 in.	8 ft. 5 in.
242.1 kV – 362.0 kV	9 ft. 2 in.	14 ft. 9 in.

5.4. For the voltage classes from 169.1 kV to 362.0 kV, if surge arrestors are not in service at both ends of the circuit. The following guidelines shall apply to achieve a TOV value of 3.0 p.u.:

- 5.4.1. Reclosing is blocked at both ends of a circuit on which personnel are working.
- 5.4.2. Breakers have been maintained to minimize breaker restrike as part of the ITC Breaker Maintenance Program.
- 5.4.3. Line switching is not being performed on the circuit once personnel are working.
- 5.4.4. Table **A-3** Minimum Approach Distances shall apply.

5.5. For the voltage classes from 169.1 kV to 362.0 kV, if the reclosing is not blocked at both ends of the circuit, and surge arrestors are not in service at both ends of a line the following T-Values apply:

230 kV is 4.52 p. u.

345 kV is 4.93 p.u.

As a result, **Table A-4** Minimum Approach Distances shall apply.

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Table A-4

Nominal Voltage in kilovolts (kV) phase to phase	Distance	
	Phase to ground exposure (feet – inches)	Phase to phase exposure (feet – inches)
169.1 kV – 242.0 kV	8 ft. 6 in.	13 ft. 9 in.
242.1 kV – 362.0 kV	17 ft. 10 in.	27 ft. 7 in.

5.6. When an unqualified (electrical) person is working in an elevated position near overhead power lines or working on the ground in the vicinity of the overhead power lines the person may not approach or bring any conductive object closer to the unguarded, energized overhead line than the following distances:

5.6.1. For voltages to ground of 50 kV or below – 10 feet (305cm)

5.6.2. For voltages to ground above 50 kV – 10 feet (305 cm) plus 4 inches (10 cm), for every additional 10 kV over 50 kV.

5.7. When cranes or equipment are operating under transmission and/or distribution lines Table E (from the ITC Safety Handbook) shall apply.

Table E

Nominal Voltage in kilovolts (kV) phase to phase	Minimum Clearance- Boom Lowered
Up to 0.75 kV	4 ft.
Over 0.75 kV to 50 kV	6 ft.
Over 50 kV to 345 kV	10 ft.
Over 345 kV to 750 kV	16 ft.
Over 750 kV to 1,000 kV	20 ft.

5.8. Minimum Approach Distances for Qualified Line Clearance Tree Trimmers
(See Table F, ITC Safety Handbook)

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Table F

Nominal Voltage kV Phase to Phase	Includes 19.10.269 elevation factor, Sea level to 5,000 feet*		Includes 19.10.269 elevation factor, Sea level to 5,001 – 10,000 feet*		Includes 19.10.269 elevation factor, Sea level to 10,001 – 14,000 feet*	
	ft. - in.	m	ft. – in.	m	ft. – in.	m
0.051 to 0.30	Avoid Contact		Avoid Contact		Avoid Contact	
0.301 to 0.75	1 - 01	0.33	1 -03	0.38	1 - 04	0.41
0.751 to 15.0	2 - 05	0.70	2 - 09	0.81	3 - 00	0.88
15.1 to 36.0	3 - 00	0.91	3 - 05	1.04	3 - 09	1.00
36.1 to 46.0	3 - 04	1.01	3 – 10	1.16	4 - 02	1.09
46.1 to 72.5	4 – 02	1.26	4 - 09	1.44	5 - 02	1.30
72.6 to 121.0	4 - 06	1.36	5 - 02	1.55	5 - 07	1.68
138.0 to 145.0	5 - 02	1.58	5 - 11	1.80	6 - 05	1.96
161.0 to 169.0	6 - 00	1.80	6 - 10	2.06	7 - 05	2.23
230.0 to 242.0	7 - 11	2.39	9 - 00	2.73	9 - 09	2.95
345.0 to 362.0	13 - 02	3.99	15 - 00	4.56	16 - 03	4.94
500.0 to 550.0	19 - 00	5.78	21 - 09	6.60	23 - 07	7.16
765.00 to 800.0	27 – 04	8.31	31 - 03	9.50	33 - 10	10.29

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Minimum Approach Distances Unqualified Tree Trimmers

(See Table G, ITC Safety Handbook)

Nominal voltage in (kV) Phase to Phase	Distance	
	feet - inch	meters
0.0 to 1.0	10 - 00	3.05
1.1 to 15.0	10 - 00	3.05
15.1 to 36.0	10 - 00	3.05
36.1 to 50.0	10 - 00	3.05
50.1 to 72.5	10 - 09	3.28
72.6 to 121.0	12 - 04	3.76
138.0 to 145.0	13 - 02	4.00
161.0 to 169.0	14 - 00	4.24
230.0 to 242.0	16 - 05	4.97
345.0 to 362.0	20 - 05	6.17
500.0 to 550.0	26 - 08	8.05
765.0 to 800.0	35 - 00	10.55

6. ATTACHMENTS

6.1. SAF-078-A1 Circuits which need surge arrestor mitigation

7. MISCELLANEOUS

7.1. N/A

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8. APPROVALS

Owner: _____ <E-Signature on file> _____ Date: 07/11/2017

Approver: _____ <E-Signature on file> _____ Date: 07/12/2017

9. REVISION HISTORY

Date Published	Revision Number	Individual Making Edits	Reason / Comments
07/12/17	000	A. Smith	Updated minimum approach distances as a result of changes to the OSHA regulation in 29 CFR 1910.269 and 29 CFR, 1926 Subpart V. The enforcement date for this standard is effective July 1, 2017

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