



2014 OSHA Electric Power Standards

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Objectives

- ▶ Review “big four” OSHA Electric Power Standards.
- ▶ Review compliance dates.

General Industry OSHA Rules

▶ Revised

- ▶ 29 CFR 1910.269- Electric Power Generation, Transmission and Distribution Lines and Equipment
- ▶ 29 CFR 1910.137- Electrical Protective Equipment
- ▶ 29 CFR 1910.136 Foot Protection

Construction OSHA Rules

▶ New

- ▶ 29 CFR 1926.97- Electrical Protective Equipment

▶ Revised

- ▶ 29 CFR part 1926 Subpart V- Electric Power Transmission and Distribution Lines and Equipment

1910.269 or Subpart V?



Background

- ▶ The Final Rule was released on April 11, 2014.
- ▶ The Effective date is July 10, 2014.
 - ▶ Enforcement extension until October 31, 2014

Compliance Dates

- ▶ Arc Flash Hazard Analysis by Jan 1, 2015
- ▶ Arc flash protection programs by April 1, 2015
- ▶ New calculated MAD tables or the Alternate tables by April 1, 2015
- ▶ Fall Protection systems by April 1, 2015

Standards Alignment

- ▶ An employer that complies with 1910.269 will be considered in compliance with requirements of Subpart V standards unless other reference are made to construction subparts.

Regulatory Language

- ▶ OSHA modified language throughout to:
 - ▶ Improve 'performance' language, and
 - ▶ Raise awareness and emphasize the employer's responsibility for worker safety.
 - ▶ An example is rule 1910.269(q)(2)(vii):
 - ▶ Old Rule: Pulling lines and accessories shall be repaired or replaced when defective.
 - ▶ New Rule: The employer shall repair or replace defective pulling lines and accessories.

Significant Rule Changes

- ▶ Minimum Approach Distance
- ▶ Hazards of Electric Arcs
- ▶ Host Employers and Contract Employers
- ▶ Fall Protection Systems

Minimum Approach Distances (MAD)

Minimum Approach Distance

- ▶ Requires employers to establish minimum approach distances.



Major Change

- ▶ Major change in determining MAD
 - ▶ Not uniform throughout the US
 - ▶ Altitudes- *Reduced air pressure at high altitudes causes a reduction in the electrical strength of an air gap.*
 - ▶ Dielectric strength of air- *Pressure, temperature, humidity of the air, etc.*
 - ▶ Atmospheric effect- *Hot and dry work conditions result in reduced electrical strength.*
 - ▶ Other factors- *Transient overvoltages, broken insulators, etc.*

Major Change

- ▶ Line insulator lengths and structural clearances have, over the years, come closer to the minimum approach distances used by workers.



Maximum Anticipated Per Unit Transient Overvoltage (TOV)

- ▶ Added requirements for the employer to determine the maximum anticipated per unit transient overvoltage (TOV) phase-to-ground.
- ▶ Requires the employer to make engineering analysis data available to OSHA for examination and copying.

Default MAD for Generation & Distribution

TABLE V-5—ALTERNATIVE MINIMUM APPROACH DISTANCES (IN METERS OR FEET AND INCHES) FOR VOLTAGES OF 72.5 kV AND LESS ¹

Nominal voltage (kV) phase-to-phase	Distance			
	Phase-to-ground exposure		Phase-to-phase exposure	
	m	ft	m	ft
0.50 0.300 ²	Avoid contact		Avoid contact	
0.301 to 0.750 ²	0.33	1.09	0.33	1.09
0.751 to 5.0	0.63	2.07	0.63	2.07
5.1 to 15.0	0.65	2.14	0.68	2.24
15.1 to 36.0	0.77	2.53	0.89	2.92
36.1 to 46.0	0.84	2.76	0.98	3.22
46.1 to 72.5	1.00	3.29	1.20	3.94

¹ 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 shall determine minimum approach distances by multiplying the distances in this table by the correction factor in Table V-4 corresponding to the altitude of the work.

² For single-phase systems, use voltage-to-ground.

Default MAD for Transmission

TABLE V-6—ALTERNATIVE MINIMUM APPROACH DISTANCES (IN METERS OR FEET AND INCHES) FOR VOLTAGES OF MORE THAN 72.5 kV ^{1 2 3}

Voltage range phase to phase (kV)	Phase-to-ground exposure		Phase-to-phase exposure	
	m	ft	m	ft
72.6 to 121.0	1.13	3.71	1.42	4.66
121.1 to 145.0	1.30	4.27	1.64	5.38
145.1 to 169.0	1.46	4.79	1.94	6.36
169.1 to 242.0	2.01	6.59	3.08	10.10
242.1 to 362.0	3.41	11.19	5.52	18.11
362.1 to 420.0	4.25	13.94	6.81	22.34
420.1 to 550.0	5.07	16.63	8.24	27.03
550.1 to 800.0	6.88	22.57	11.38	37.34

¹ 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 shall determine minimum approach distances by multiplying the distances in this table by the correction factor in Table V-4 corresponding to the altitude of the work.

² 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.

³ The clear live-line tool distance shall equal or exceed the values for the indicated voltage ranges.

Protection from Flames and Electric Arcs



Principle Requirements

- ▶ Assess workplace for hazards from flames or electric arcs.
- ▶ If there is exposure, estimate incident energy.
- ▶ Prohibit clothing when incident energy could ignite clothing.
- ▶ Require FR under certain conditions.
- ▶ Select clothing with an arc rating greater than the estimated incident energy.

Appendix E Guidelines

- ▶ Assessment guidelines with examples.
- ▶ Estimating available heat energy.
- ▶ Selecting an appropriate calculation method.
- ▶ Selecting reasonable input parameters (in particular, distance to arc and arc gap).
- ▶ Tables for single-phase arc in open air
- ▶ Selecting protective clothing and other protective equipment.

Incident-Energy Calculation Method

Table 3—Selecting a Reasonable Incident-Energy Calculation Method¹

Incident-Energy Calculation Method	600 V and Less ²			601 V to 15 kV ²			More than 15 kV		
	1Φ	3Φa	3Φb	1Φ	3Φa	3Φb	1Φ	3Φa	3Φb
NFPA 70E-2012 Annex D (Lee equation)	Y-C	Y	N	Y-C	Y-C	N	N ³	N ³	N ³
Doughty, Neal, and Floyd	Y-C	Y	Y	N	N	N	N	N	N
IEEE Std 1584b-2011	Y	Y	Y	Y	Y	Y	N	N	N
ARCPRO	Y	N	N	Y	N	N	Y	Y ⁴	Y ⁴

Table 6—Incident Heat Energy for Various Fault Currents, Clearing Times, and Voltages of 4.0 to 46.0 kV: Rubber Insulating Glove Exposures Involving Phase-to-Ground Arcs in Open Air Only**

Voltage Range (kV)**	Fault Current (kA)	Maximum Clearing Time (cycles)			
		4 cal/cm ²	5 cal/cm ²	8 cal/cm ²	12 cal/cm ²
4.0 to 15.0	5	46	58	92	138
	10	18	22	36	54
	15	10	12	20	30
	20	6	8	13	19
15.1 to 25.0	5	28	34	55	83
	10	11	14	23	34
	15	7	8	13	20
	20	4	5	9	13
25.1 to 36.0	5	21	26	42	62
	10	9	11	18	26
	15	5	6	10	16
	20	4	4	7	11
36.1 to 46.0	5	16	20	32	48
	10	7	9	14	21
	15	4	5	8	13
	20	3	4	6	9

Flames and Electric Arcs

- ▶ The employer is responsible for ensuring each employee exposed to hazards from flames and electric arcs does not wear clothing that could melt or ignite and continue to burn.

FR Clothing

- ▶ Outer layer of clothing to be flame resistant (FR) when an employee is exposed to contact with energized circuit parts >600 V,
- ▶ When an electric arc could ignite flammable material in the work area which could ignite clothing,
- ▶ When molten metal or electric arcs from faulted conductors could ignite clothing,
- ▶ When the incident energy exceeds 2 cal/cm^2
 - ▶ Required to have an Arc Rating

Body Protection

- ▶ Added requirements for covering the entire body with protective clothing and other protective equipment with an arc rating greater than or equal to the estimated heat energy when incident heat energy exceeds 2 cal/cm^2 .



Hand Protection

- ▶ Arc rated hand protection is not required when rubber insulating gloves with protectors are worn or when heavy duty leather gloves are worn for incident heat energy levels less than 14 cal/cm²



Foot Protection

- ▶ Arc rated foot protection is not required when heavy duty work shoes or boots are worn.



Head and Face Protection

Exposure	Minimum head and face protection		
	None *	Arc-rated faceshield with a minimum rating of 8 cal/cm ² *	Arc-rated hood or faceshield with balaclava
Single-phase, open air	2–8 cal/cm ²	9–12 cal/cm ²	13 cal/cm ² or higher. [†]
Three-phase	2–4 cal/cm ²	5–8 cal/cm ²	9 cal/cm ² or higher. [‡]

* These ranges assume that employees are wearing hardhats meeting the specifications in § 1910.135 or § 1926.100(b)(2), as applicable.

[†] The arc rating must be a minimum of 4 cal/cm² less than the estimated incident energy. Note that § 1926.960(g)(5)(v) permits this type of head and face protection, with a minimum arc rating of 4 cal/cm² less than the estimated incident energy, at any incident energy level.

[‡] Note that § 1926.960(g)(5) permits this type of head and face protection at any incident energy level.

Care and Maintenance

- ▶ Requires employers to properly maintain FR and arc-rated clothing.
 - ▶ *OSHA stated “These provisions make PPE maintenance the responsibility of employers, not employees”.*
 - ▶ *Laundry Service*
 - ▶ *Home*



Required Dates

- ▶ Incident energy calculations must be completed prior to January 1, 2015.
- ▶ Flame resistant (FR) clothing must be purchased and worn as determined through the required assessment prior to April 1, 2015.
- ▶ Arc rated (AR) clothing must be purchased and worn as determined through the required assessment prior to April 1, 2015.

Information Transfer 1910.269(a)(3)



Information Transfer

- ▶ Host employer:
 - ▶ An employer that operates, or that controls the operating procedures for, an electric power generation, transmission, or distribution installation on which a contract employer is performing **covered work**.
- ▶ Contract employer:
 - ▶ An employer, other than a host employer, that performs **covered work** under contract.
 - ▶ Includes subcontractors



Host Employers & Contract Employers

- ▶ Basic communication rules.
- ▶ Based on OSHA's Multi Employer Citation Policy.

Host Employers

- ▶ Provides information to contractors:
 - ▶ System characteristics
 - ▶ Known conditions
 - ▶ System design information needed for assessments
 - ▶ Other known system information related to safety and requested by contractor

Contract Employers

- ▶ Requires Contract Employers to provide needed information to field personnel concerning known conditions.



Contract Employer

- ▶ Added requirement for Contract Employer to provide information to Host Employer within 2 days after discovering a hazardous condition.

Responsibilities

- ▶ Contract employer and host employer must coordinate their work rules.



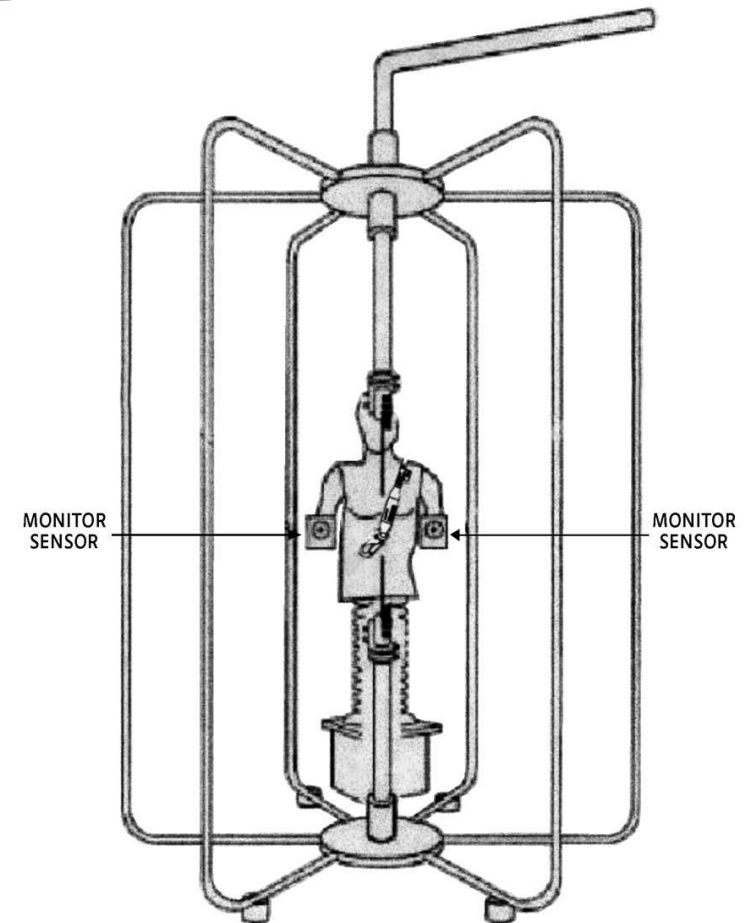
Personal Protective Equipment 1910.269(g)

PPE Payment

- ▶ Employer is required to pay for PPE required by 1910.269, including:
 - ▶ Fall protection equipment,
 - ▶ Electrical protective equipment and flame resistant and arc-rated clothing and
 - ▶ Other PPE required as identified.

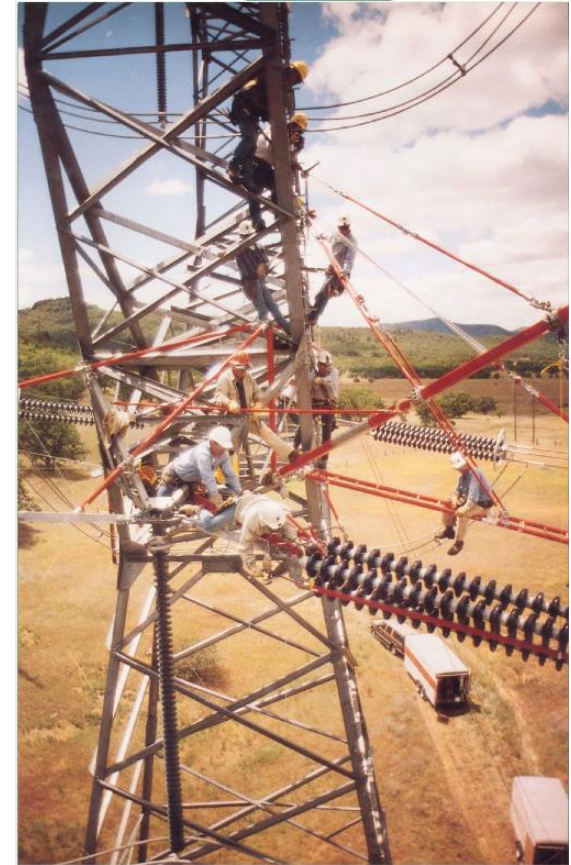
Electric Arc Requirements

- ▶ ASTM 887-04 and greater
 - ▶ **Electric Arc Performance**
 - ▶ *Electric Arc Test—
Harnesses and shock
absorbing lanyards shall be
electric arc tested using the
Test Method F1958/F1958M
mannequin test set up.*





Fall Protection

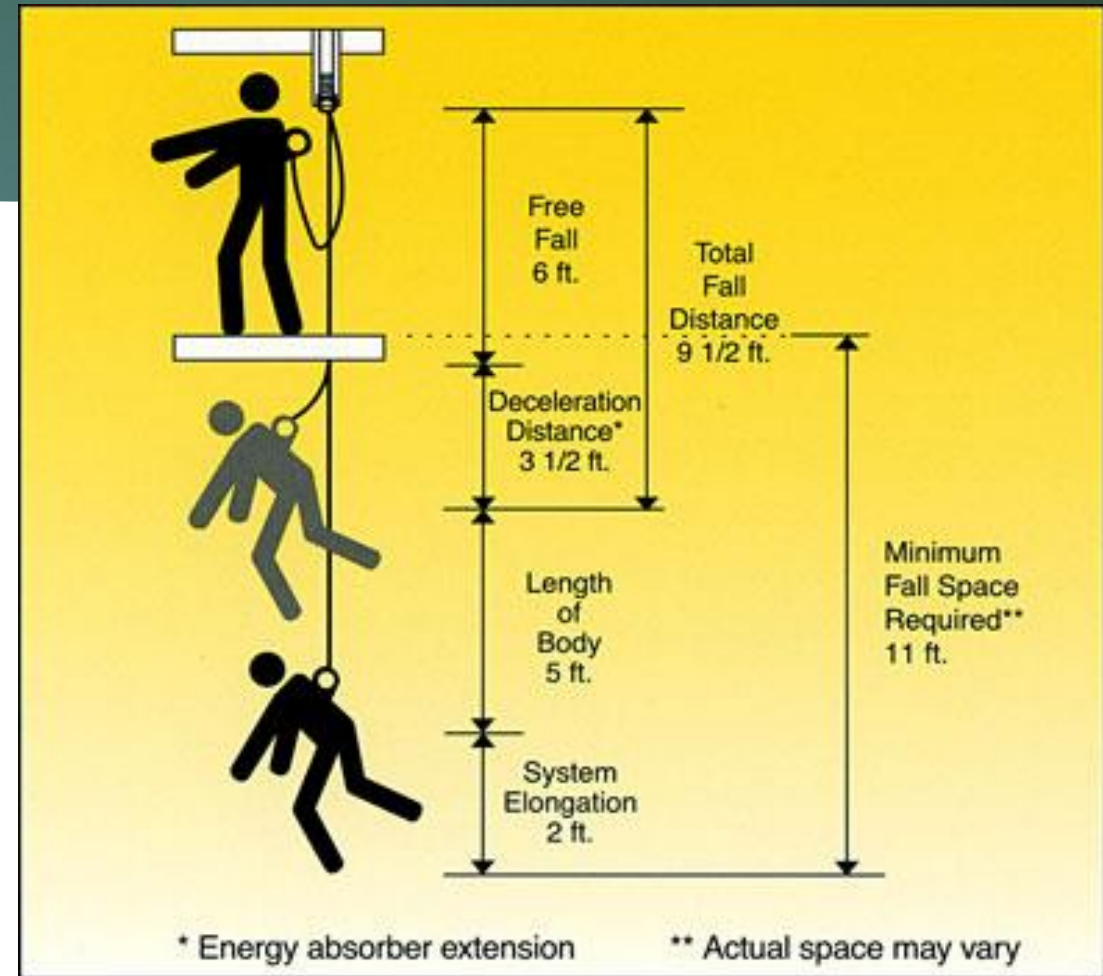


Types of Fall Protection

- ▶ Fall restraint system
 - ▶ A system that prevents the user from falling any distance
- ▶ Work positioning equipment
 - ▶ A system rigged to allow an employee to be supported on an elevated vertical surface and work with both hands free while leaning
- ▶ Personal fall arrest equipment
 - ▶ A system used to arrest an employee in a fall from a working level

Fall Arrest

- ▶ A system used to arrest an employee in a fall from a working level.
 - ▶ No more than 6' freefall
 - ▶ Cannot hit a lower level at any distance



Fall Arrest



Aerial Lifts

- ▶ Fall restraint system, or
- ▶ Personal fall arrest system



Work Positioning

- ▶ A system rigged to allow an employee to be supported on an elevated vertical surface and work with both hands free while leaning
 - ▶ *Cannot free fall more than 2'*



Anchorage

- ▶ Anchorages for work positioning shall be capable of supporting at least twice the potential impact load of the employees fall or 3,000 lbs. whichever is greater.
 - ▶ *Note: Wood-pole fall-restriction devices meeting ASTM F887–12e1 are deemed to meet the anchorage-strength requirement when they are used in accordance with manufacturers' instructions.*

Fall Protection

- ▶ Poles, towers, and similar structures, more than 4 above the ground.
 - ▶ Fall restraint system,
 - ▶ Work positioning equipment, or
 - ▶ Personal fall arrest system
 - ▶ As appropriate

Fall Protection

► Appropriate for Work



Fall Protection

- ▶ All workers are covered
 - ▶ 100% fall protection is required by April 1, 2015
- ▶ Limited exceptions
 - ▶ If employer can demonstrate fall protection is infeasible or creates greater hazard
 - ▶ Congested pole (only while in the congested area)



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