Objectives

- Review “big four” OSHA Electric Power Standards.
- Review compliance dates.
General Industry OSHA Rules

Revised

- 29 CRF 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?
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
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.
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.
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.
### Table V-5—Alternative Minimum Approach Distances (in Meters or Feet and Inches) for Voltages of 72.5 kV and Less

<table>
<thead>
<tr>
<th>Nominal Voltage (kV) Phase-to-Phase</th>
<th>Distance</th>
<th>Phase-to-ground exposure</th>
<th>Phase-to-phase exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>m</td>
<td>ft</td>
</tr>
<tr>
<td>0.50 to 0.300^2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.301 to 0.750^2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.751 to 5.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1 to 15.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.1 to 36.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36.1 to 46.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46.1 to 72.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Voltage range phase to phase (kV)</th>
<th>Phase-to-ground exposure</th>
<th>Phase-to-phase exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>m</td>
<td>ft</td>
</tr>
<tr>
<td>72.6 to 121.0</td>
<td>1.13</td>
<td>3.71</td>
</tr>
<tr>
<td>121.1 to 145.0</td>
<td>1.30</td>
<td>4.27</td>
</tr>
<tr>
<td>145.1 to 169.0</td>
<td>1.46</td>
<td>4.79</td>
</tr>
<tr>
<td>169.1 to 242.0</td>
<td>2.01</td>
<td>6.59</td>
</tr>
<tr>
<td>242.1 to 362.0</td>
<td>3.41</td>
<td>11.19</td>
</tr>
<tr>
<td>362.1 to 420.0</td>
<td>4.25</td>
<td>13.94</td>
</tr>
<tr>
<td>420.1 to 550.0</td>
<td>5.07</td>
<td>16.63</td>
</tr>
<tr>
<td>550.1 to 800.0</td>
<td>6.88</td>
<td>22.57</td>
</tr>
</tbody>
</table>

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 Method

<table>
<thead>
<tr>
<th>Incident-Energy Calculation Method</th>
<th>600 V and Less&lt;sup&gt;2&lt;/sup&gt;</th>
<th>601 V to 15 kV&lt;sup&gt;2&lt;/sup&gt;</th>
<th>More than 15 kV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1Φ</td>
<td>3Φ&lt;sub&gt;a&lt;/sub&gt;</td>
<td>3Φ&lt;sub&gt;b&lt;/sub&gt;</td>
</tr>
<tr>
<td>NFPA 70E-2012 Annex D (Lee equation)</td>
<td>Y-C</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Doughty, Neal, and Floyd</td>
<td>Y-C</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>IEEE Std 1584b-2011</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>ARCPRO</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Voltage Range (kV)**</th>
<th>Fault Current (kA)</th>
<th>Maximum Clearing Time (cycles)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4 cal/cm²</td>
</tr>
<tr>
<td>4.0 to 15.0</td>
<td>5</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>6</td>
</tr>
<tr>
<td>15.1 to 25.0</td>
<td>5</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>25.1 to 36.0</td>
<td>5</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>36.1 to 46.0</td>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>3</td>
</tr>
</tbody>
</table>
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/cm²
  - Required to have an Arc Rating
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/cm².
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

<table>
<thead>
<tr>
<th>Exposure</th>
<th>None* (min. arc rating)</th>
<th>Arc-rated faceshield with a minimum rating of 8 cal/cm²*</th>
<th>Arc-rated hood or faceshield with balaclava</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-phase, open air</td>
<td>2–8 cal/cm²</td>
<td>9–12 cal/cm²</td>
<td>13 cal² or higher.¹</td>
</tr>
<tr>
<td>Three-phase</td>
<td>2–4 cal/cm²</td>
<td>5–8 cal/cm²</td>
<td>9 cal/cm² or higher.²</td>
</tr>
</tbody>
</table>

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

¹ 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.

² 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.
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’*
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)
Pamela (Pam) T. Tompkins, CSP, CUSP, CUSA
President

710 East Main Street
Lexington, SC  29072
Toll Free (866) 782-4089
(803) 407-4707
Mobile (803) 917-1537
ptomkins@setsolutionsllc.com
www.setsolutionsllc.com