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LAST REVISION: August 8 th , 2016	REVIEWED BY: L. Kirk Berglund, Safety Director	FORM REF No: SP-ARCFLASH
SUBJ: Arc Flash		

1. POLICY

It is the policy of Meiners Electric that we as a company protect ourselves and surrounding personnel from the hazards of arc-flash. We must evaluate, plan and review any and all arc-flash hazards we encounter while performing our jobs.

2. PROCEDURES

All personnel must be protected from the hazards associated with electricity. For non-qualified personnel they must be protected by enclosures, insulation, barricades and safety signs, or attendants.

3. HAZARD IDENTIFICATION

Prior to any electrical work an Arc-Flash Hazard review must be performed. This review will address the hazards associated with the work to be performed and the safety measures that need to be put in place to protect personnel directly working with or near the exposure hazard.

Arc-Flash hazards shall be identified using a combination of the following determining factors:

1. NFPA 70E (Current Edition)
2. The manufacturer's recommendations
3. Age of equipment to be serviced
4. Environmental conditions
5. Knowledge of equipment

4. HAZARD CONTROL

Authorized Workers must not allow unqualified personnel to enter the flash protection boundary (as listed in the following tables, unless posted otherwise on the equipment) when equipment is being operated or live parts are exposed. Barricades and proper signage shall be used to identify and control the arc-flash boundaries.

Note: The calculated arc-flash boundary is the distance within which a person could receive a maximum of a curable second degree burn if an arc flash were to occur. In most cases the calculated distance will be smaller than listed in the table. The calculated values of distance and Hazard/Risk Category are the minimum required.



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Work Distance Table AC Voltage (Control Zones)

Training Requirements	Qualified level training required		Qualified Authorized Personnel ONLY	
	Limited Approach Boundary		Restricted Approach Boundary	Prohibited Approach Boundary
Nominal System Voltage Range Phase-to-Phase -greater than 10 joules	Exposed Movable Conductor(s) (Overhead lines)	Exposed Fixed Circuit Part(s)		
Less than 50 V	Not specified	Not specified	Not specified	Not specified
50 V to 300 V	10'-0"	3'-6"	Avoid contact	Avoid contact
301 V to 750 V	10'-0"	3'-6"	1'-0"	0'-1"
751 V to 15 kV	10'-0"	5'-0"	2'-2"	0'-7"
15.1 kV to 36 kV	10'-0"	6'-0"	2'-7"	0'-10"
36.1 kV to 46 kV	10'-0"	8'-0"	2'-9"	1'-5"
46.1 kV to 72.5 kV	10'-0"	8'-0"	3'-2"	2'-2"
72.6 Kv to 121kV	10'-0"	8'-0"	3'-4"	2'-9"
138 Kv to 145kV	11'-0"	10'-0"	3'-10"	3'-4"
161 Kv to 169kV	11'-8"	11'-9"	4'-3"	3'-9"
230 Kv to 242kV	13'-8"	13'-0"	5'-8"	5'-2"
345 Kv to 362kV	15'-4"	15'-4"	9'-2"	8'-8"
500 Kv to 550kV	19'-0"	19'-0"	11'-10"	11'-4"
765 Kv to 800kV	23'-9"	23'-9"	15'-11"	15'-5"

Clearances required by OSHA for construction projects may be greater than stated above, as per 29 CFR 1926.416



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Work Distance Table DC Voltage (Control Zones)

Training Requirements	Qualified level training required		Qualified Authorized Personnel ONLY	
	Limited Approach Boundary		Restricted Approach Boundary	Prohibited Approach Boundary
Nominal Potential Difference	Exposed Movable Conductor(s) (Overhead lines)	Exposed Fixed Circuit Part(s)		
Less than 100 V	Not specified	Not specified	Not specified	Not specified
100 V to 300 V	10'-0"	3'-6"	Avoid contact	Avoid contact
301 V to 1 kV	10'-0"	3'-6"	1'-0"	0'-1"
1.1 kV to 5 kV	10'-0"	5'-0"	1'-5"	0'-4"
5 kV to 15 kV	10'-0"	5'-0"	2'-2"	0'-7"
15.1 kV to 45 kV	10'-0"	8'-0"	2'-9"	1'-5"
45.1 kV to 75 kV	10'-0"	8'-0"	3'-2"	2'-1"
75.1 Kv to 150 kV	10'-8"	10'-0"	4'-0"	3'-2"
150.1 Kv to 250 kV	11'-8"	11'-8"	3'-10"	3'-4"
161 Kv to 169 kV	11'-8"	11'-9"	5'-3"	5'-0"
250 Kv to 500 kV	20'-0"	20'-0"	11'-6"	10'-10"
500.1 Kv to 800 kV	26'-0"	26'-0"	16'-5"	16'-5"

Clearances required by OSHA for construction projects may be greater than stated above, as per 29 CFR 1926.416

Keep all mechanical equipment a minimum of 10 feet away from overhead power lines. If voltage exceeds 50,000 volts, the clearance should be increased by 4 inches for each 10,000 volts

1. Prior to operating equipment, the Authorized Worker must warn personnel of the arc-flash hazard. All personnel must wear the proper PPE within the Flash Protection Boundary
2. Prior to working on or near live parts, the Authorized Worker must warn personnel of the arc-flash hazard.
3. All personnel within the arc-flash boundary must wear the required PPE.



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PPE is primarily intended to protect a worker from burns due to exposure to heat from electric arcs. Levels of PPE selected by methods contained in NFPA 70E and IEEE 1584 are intended to reduce Arc-Flash burns to the just curable level for 95% of incidents. PPE may not prevent injury due to arc blast, as mentioned above, and some flash burns may be incurable. Workers and others that may be exposed to arc-flash must be trained in the proper selection and use of PPE and tools. Such protection will include as a minimum: a hard hat, leather gauntlet gloves, safety glasses, and approved flame retardant clothing. In addition, for more severe exposure it could include head covering and full face shields, Nomex coveralls, rubber insulated gloves with leather protectors, leather boots or shoes, hearing protection (ear canal inserts), etc. Specific requirements for PPE are described in NFPA 70E.

Note: Arc-Rated clothing shall be selected to meet or exceed the minimum required arc flash rating.

Minimum PPE Requirements

Hazard / Risk category	Clothing description – (Layers are indicated in parentheses)	Minimum required arc flash rating of PPE. (cm/ca)
1	Arc-rated long-sleeve shirt and pants or arc-rated coverall Arc-rated face shield or arc flash suit hood Arc-rated jacket, parka, rainwear, or hard hat liner (AN) Protective Equipment Hard hat Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts) Heavy duty leather gloves (see Note 3) Leather footwear (AN)	(4)
2	Arc-rated long-sleeve shirt and pants or arc-rated coverall Arc-rated flash suit hood or arc-rated face shield and arc-rated balaclava Arc-rated jacket, parka, rainwear, or hard hat liner (AN) Protective Equipment Hard hat Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts) Heavy duty leather gloves (see Note 3) Leather footwear (AN)	(8)
3	Arc-rated long-sleeve shirt (AR) Arc-rated pants (AR) Arc-rated coverall (AR) Arc-rated arc flash suit jacket (AR) Arc-rated arc flash suit pants (AR) Arc-rated arc flash suit hood Arc-rated gloves (see Note 1) Arc-rated jacket, parka, rainwear, or hard hat liner (AN)	(25)



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	Protective Equipment Hard hat Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts) Leather footwear	
4	Arc-rated long-sleeve shirt (AR) Arc-rated pants (AR) Arc-rated coverall (AR) Arc-rated arc flash suit jacket (AR) Arc-rated arc flash suit pants (AR) Arc-rated arc flash suit hood Arc-rated gloves (see Note 1) Arc-rated jacket, parka, rainwear, or hard hat liner (AN) Protective Equipment Hard hat Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts) Leather footwear	(40)
Great than 4	While PPE is available in ATPV values of 100 cal/cm ² or more, values above 40 are considered prohibited due to the sound, pressure and concussive forces present. Above this level these forces are more significant than the thermal values.	N/A

No work shall be permitted on equipment with incident energy levels exceed 40 cal/cm².

4. As a minimum, Authorized Workers must wear long sleeve shirt and pants made of non-flammable/non-melting fabric, hardhats, safety glasses and leather gloves while operating or working on equipment which has been identified as having no arc-flash hazard.
5. Personnel who are required to wear long-sleeve shirts must ensure the wrists and neck are buttoned. Outer layer clothing must cover as much exposed area as possible.
6. Supervisors must ensure that personnel inspect arc-rated apparel before each use. Personnel must not use work clothing or flash suits that are contaminated, or damaged to the extent their protective qualities are impaired. Do not use protective items that become contaminated with grease, oil, or flammable liquids or combustible materials. Do not apply DEET insect repellent (K70766) to Arc-Rated Clothing. Use Permethrin Clothing Spray (K70764) if needed.
7. Personnel must verify that the insulating capability of the following equipment is retained by appropriate tests and visual inspection:
 - Grounding equipment;
 - Hot sticks;
 - Rubber gloves, sleeves, and leather protectors;
 - Voltage test indicators;



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- Blanket and similar insulating equipment;
- Protective barriers;
- External circuit breaker rack-out devices;
- Portable lighting units;
- Safety grounding equipment;
- Dielectric footwear;
- Protective clothing;
- Insulated tools.

These tests or inspections must be performed prior to use or, as a minimum, at intervals as required by the manufacturer. Rubber goods such as gloves, mats, blankets, etc must undergo dielectric testing every 6 months.

Authorized Workers must inspect protective ground cable sets for cuts in the protective sheath and damage to the conductors and check clamps and connector strain relief devices for tightness. These inspections must be made at intervals as required by service conditions.