

## LIVE LINE MAINTENANCE



Fiberglass reinforced plastic tools are manufactured by a few companies and are available to perform any live line maintenance work - and their safety record is great!



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## LIVE LINE MAINTENANCE



Tools designed for live line work can be utilized for live work off poles or structures, for use doing barehand work, or a combination of the two. Tools are available or can be made for just about everything!



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## BARE HAND WORK METHODS

A lack of parallel systems demanded increased usage and preferred live maintenance on circuits to reduce outages

Conductors, fittings and hardware getting bigger, heavier becoming cumbersome with conventional tooling

Rapidly increasing voltages necessitating extended minimum working clearance distances



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## BARE HAND WORK METHODS

1937 – Michael Faraday developed theory on FARADAY CAGE

Can a worker be protected from hazardous electrical charges and electrostatic fields when shielded by the FARADAY CAGE concept?

1960 – AEP and Ohio Brass Companies instituted a testing program to evaluate a FARADAY CAGE concept for energized line work

The live line technique was found to be safe and practical and today the FARADAY CAGE is replaced by a metal lined fiberglass bucket, a conductive work platform, and the use of conductive clothing



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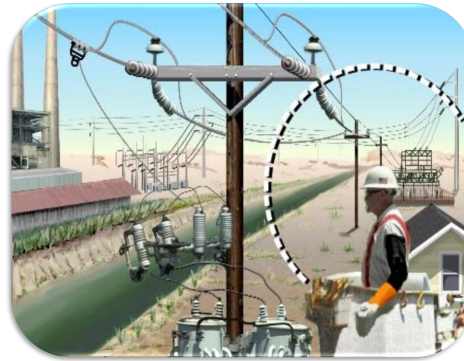
**DIFFERENT  
STRUCTURES**

**DIFFERENT  
EXPOSURES**



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## LIVE LINE MAINTENANCE



**MINIMUM APPROACH DISTANCE  
MAD**

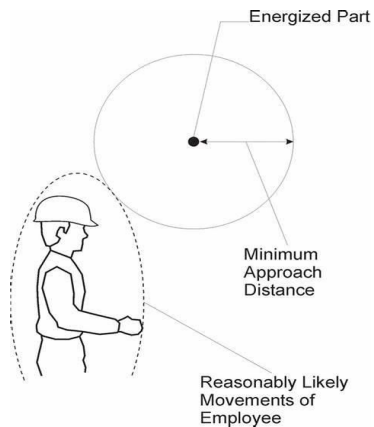


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## MINIMUM APPROACH DISTANCE

**MAD**

THE CLOSEST DISTANCE  
A WORKER MAY APPROACH  
AN ENERGIZED OR  
GROUNDED OBJECT



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## MINIMUM APPROACH DISTANCE

OSHA 29 CFR 1910.269 & OSHA 29 CFR 1926.960

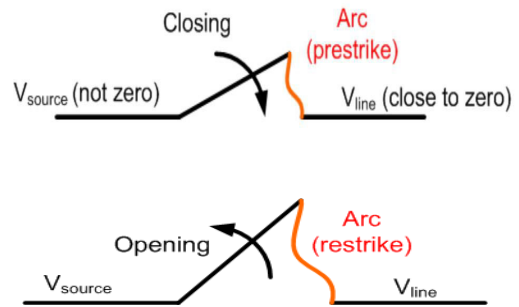
MINIMUM APPROACH DISTANCES TABLE

Phase-to Phase Voltage kV	Phase-to-Ground		Phase-to-Phase	
	Decimal Feet	Feet & Inches	Decimal Feet	Feet & Inches
46.1 to 72.5	3.29	3' - 4"	3.94	4' - 0"
72.6 to 121.0	3.71	3' - 9"	4.66	4' - 8"
121.1 to 145.0	4.27	4' - 4"	5.38	5' - 5"
145.1 to 169.0	4.79	4' - 10"	6.36	6' - 5"
169.1 to 242.0	6.59	6' - 8"	10.10	10' - 2"
242.1 to 362.0	11.19	11' - 3"	18.11	18' - 2"
420.1 to 550.0	16.63	16' - 8"	27.03	27' - 1"



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## MINIMUM APPROACH DISTANCE



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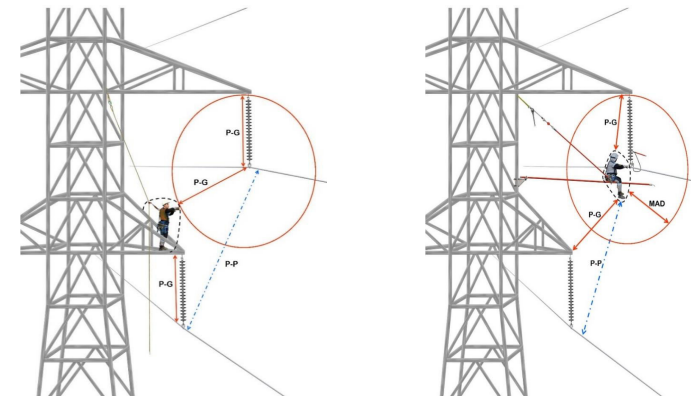
Default Values of TOV	
AC Line-to-Line Voltage	TOV for Live-Line Work
72.6 to 420 kV	3.5 p.u.
420.1 to 550 kV	3.0 p.u.
550.1 to 800 kV	2.5 p.u.

## MINIMUM APPROACH DISTANCE

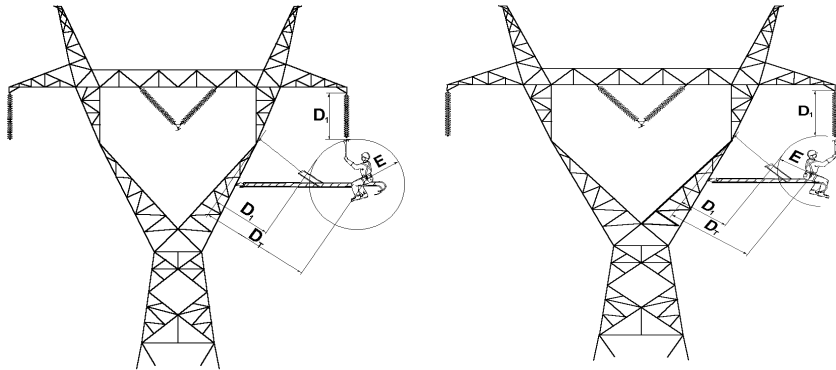
MAID MTID MHID

INADVERTENT MOVEMENT FACTOR

## MAD IS MAD – RIGHT?



## MAD IS MAD – RIGHT?

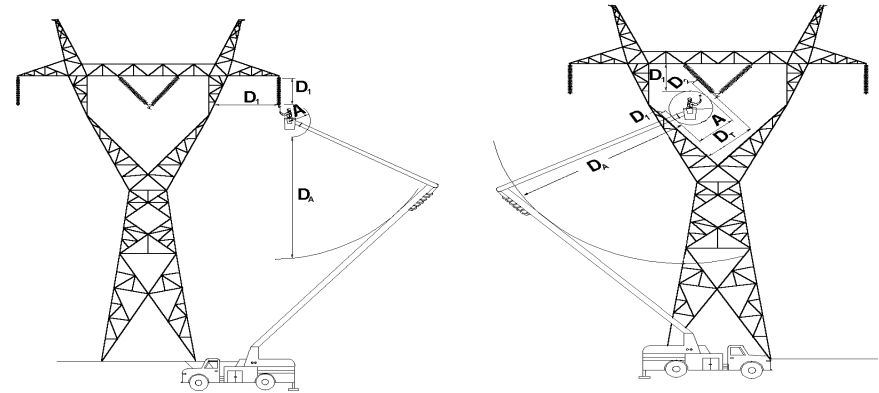


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NATIONAL SOCIETY OF PROFESSIONAL CONTRACTORS



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## MAD IS MAD – RIGHT?

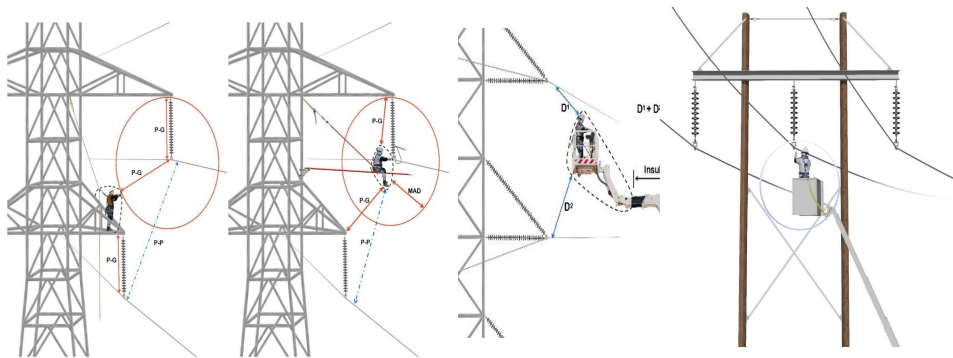


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## LIVE LINE MAINTENANCE



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## LIVE LINE MAINTENANCE

A worker's access to the conductor whether positioned on the structure, using an aerial lift, a ladder or a helicopter must account for all variables involved

The creation of this "WORKER ENVELOPE" takes into consideration the work activity being performed, the movement of the worker, the movement of any tooling/equipment, and any movement of the conductor

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## THE PROGRAM

What resources does the contractor need?

What resources does the contractor have?

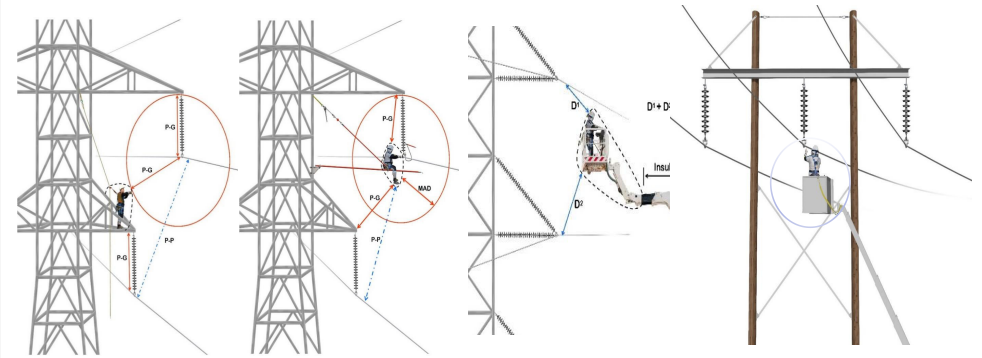
Are supervisory / training employees knowledgeable/qualified to lead?

Is there a process in place/or available for guidance?



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## THE PROGRAM

HOW GOOD IS YOUR HEALTH AND SAFETY PLAN?

HOW GOOD ARE YOUR HAZARD ASSESSMENTS?

HOW GOOD ARE YOUR TAILBOARDS?

HOW GOOD IS YOUR CONTINUOUS IMPROVEMENT PROCESS?



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## THE PROGRAM

### MANAGEMENT RESPONSIBILITY

- SENIOR LEADERSHIP COMMITMENT
- ALL LEADERSHIP LEVELS COMMITMENT
- ALL WORKERS COMMITMENT



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## MANAGEMENT RESPONSIBILITY

### SENIOR LEADERSHIP OWNS THIS

SUPPORT AND PARTICIPATE IN A COMMITTEE OF

- SENIOR MANAGEMENT
- OPERATIONS MANAGEMENT
- FIELD MANAGEMENT
- FIELD WORKERS
- SAFETY
- FLEET / TOOLS



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## THE PROGRAM

SPECIFIC ATTENTION IS NECESSARY

1. A written program
2. Training and testing to qualify workers
3. Process to certify training and qualification
4. On-going refresher training
5. Specific work procedures and tooling
6. Monitor regulatory compliance
7. Continuous program improvement initiatives
8. Ensure adequate proficient incident analysis



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## MANAGEMENT RESPONSIBILITY



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