MESAU™
FIELD TRAINING

AC Mitigation

Materials & Construction

Presented By:

Wes Avey is an accomplished leader in the cathodic protection industry. With more than a decade of experience he carries a wealth of knowledge and experience in cathodic protection and integrity solutions. His technical experience and designs, range from simple projects to complex facility design solutions. Wes is a dedicated AMPP instructor and maintains a NACE CP4 and PMP certification.

Wesley Avey, PMP
NACE CP Specialist #39155
Director of Projects
Bass Engineering a MESA Company

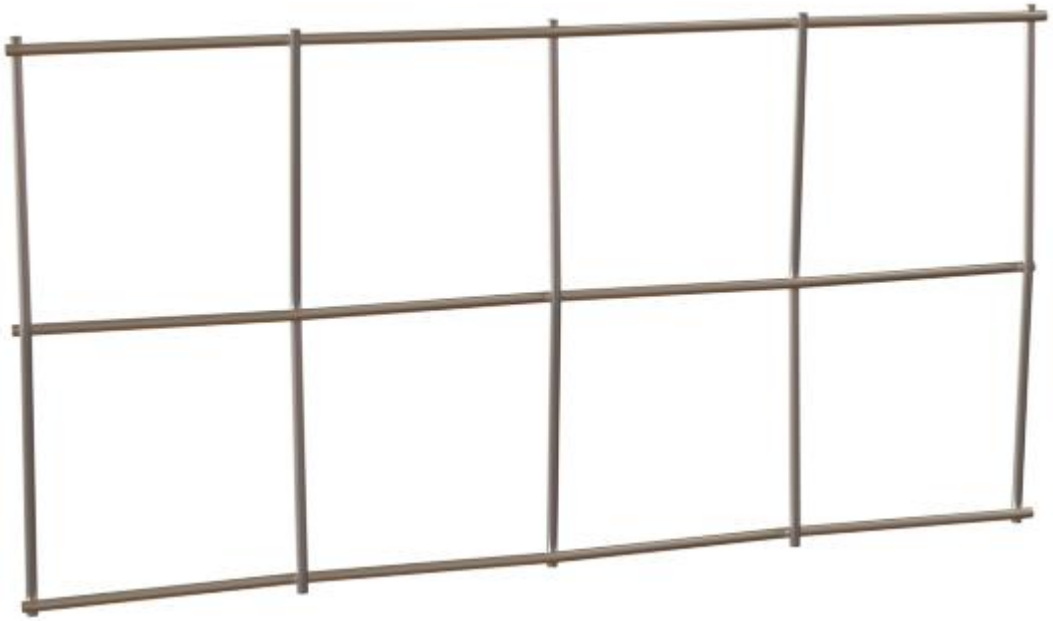
MESA U
FIELD TRAINING

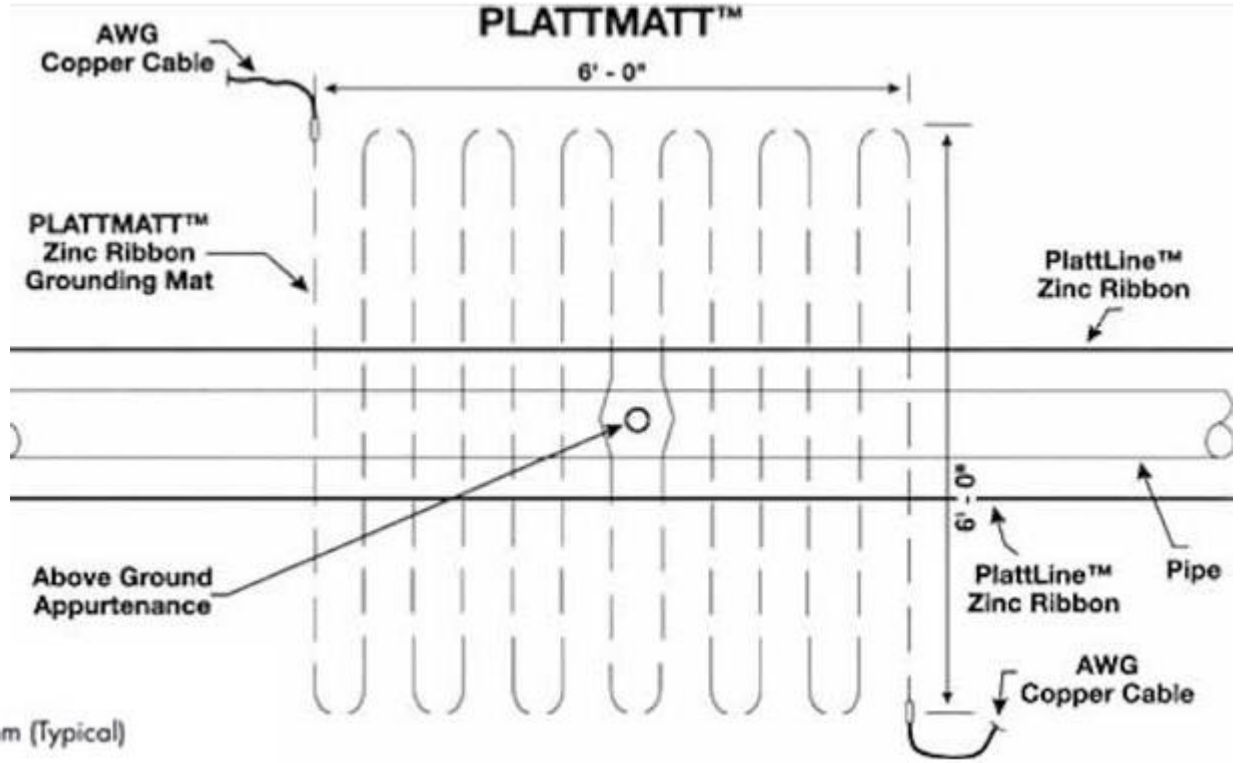
Training Objectives

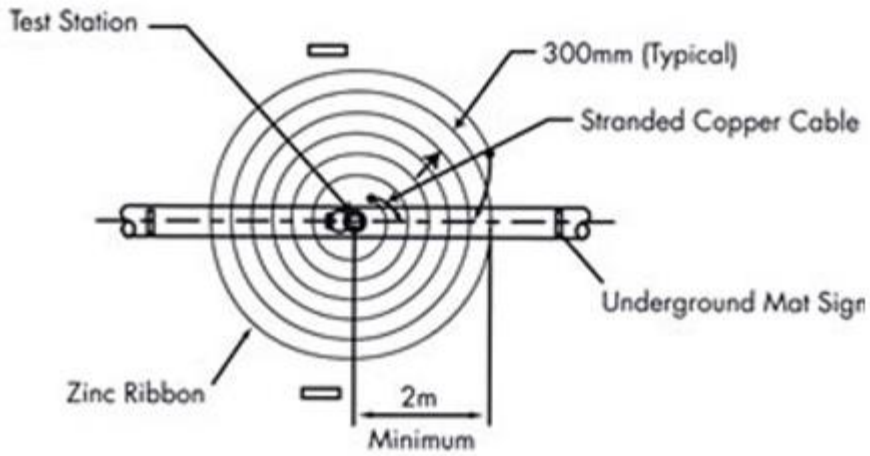
- Understand available AC mitigation materials and the advantages/disadvantages.
- Understand construction methods for installation.
- Understand installation steps.
- Discuss advantages and disadvantages of pipeline / mitigation configuration.

MESAU
FIELD TRAINING

Grounding Mats







Decouplers

PCR

- 3.7kA-15kA at 30 cycles
- 45A-80A Steady State
- 100kA Lightning
- Class 1, Div 2

SSD

- 1.2kA-5kA at 30 cycles
- 45A Steady State
- 100kA Lightning
- Class 1, Div 2

PCRH

- 3.7kA-15kA at 30 cycles
- 45A Steady State
- 100kA Lightning
- Class 1, Div 1 & 2

Decouplers

PCRX

- 5kA-15kA at 30 cycles
- 100kA Lightning
- Class 1, Div 2
- Stainless steel enclosure
- Camouflage technology, invisible to interrupted survey testing

ISP

- 35kA-118kA at 1 cycle
- 90A-120A Steady State
- 75kA – 100kA Lightning
- No class location
- Highest fault protection rating

Connections

Exothermic

- Extremely low resistance
- Requires special equipment. Not always easy to come by.
- Could melt in a high heat conditions (fault/lightning).
- Direct pin-braze / stingers have similar characteristics.

Mechanical (crimp / bolts)

- Only requires typical CP tech hand tools.
- Higher resistance compared to exothermic.
- Can become higher resistance if not properly coated (heating/cooling/moisture).
- Stud pin braze are still mechanical connections.

MESAU
FIELD TRAINING

Connections

Exothermic

Mechanical

Linear Material Options

Zinc Plattline

- 4 sizes
- Most common is Plus (5/8” x 7/8”)
- Will act as an anode for the pipeline if there is a closed failure.
- Must expose core
- Heavy

Bare Copper Cable

- Stranded
- 2/0 or 4/0 most common
- Readily available
- No special handling
- Higher consumption rate

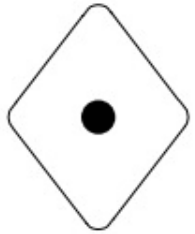
Copper Clad Steel Cable

- Made specifically for grounding applications
- Cheaper option
- Higher resistance/ft
- Heavy
- Harder to cut
- Less likely to get stollen
- Cheaper!?

MESAU FIELD TRAINING

Plattline Size Options

Specification Chart

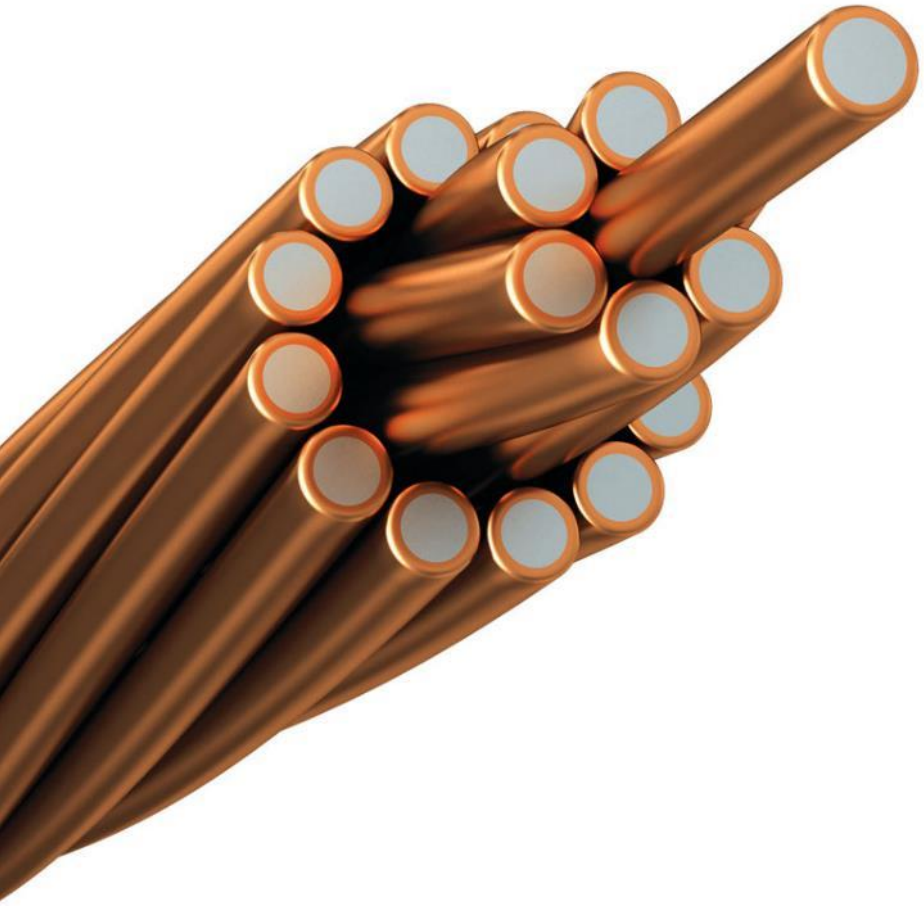


Product Size	Super
Cross Sectional Dimensions: Inches Millimeters	1 x 1¼ 25.4 x 31.75
Weight/Unit Length Pounds/Foot Kilogram/Meter	2.4 3.570
Diameter of Core Wire Inches Millimeters	0.185 4.70
Package Size *** Special Order Size**	100 ft Coil *500 ft Reel

MESAU
FIELD TRAINING

Copper Cable

Copper Clad Steel Cable



Isolation Steady State & Surge Protection

Touch/Step SAFETY Hazzard Mitigation

Design Considerations

- Everything must be the same AC electrical potential.
- If you can touch it… it MUST be common to the ground, you are standing on.
- Are there isolation flanges?
- Are there items that move such as gates?

MESAU
FIELD TRAINING

Gradient Control Mat Installation

- Design
- Pull back any existing rock/gravel to expose soil.
- Install gradient matting per design
  - Some will install a geotextile barrier below the mat.
  - May install magnesium anodes to protect mats.
- Connect all gradient mats together
- Install necessary isolation decouplers. (Don’t forget about pipeline casings!)
- Install gradient control decoupler.
  - Consider installing a switch?
  - Consider class location?
- Install crushed stone (clean washed limestone little to no fines).
- Commission

Gradient Control Mat Installation

Gradient Control Mat Installation

Gradient Control Mat Installation

Pipeline Steady State Mitigation

Options

- Linear
  - Single
  - Double
  - Multiple
- Linear with shallow verticals
- Deep Vertical Point Grounds (DVPG)
- Combination

Steady State Installation Options

Linear / Horizontal

- Best to control current
- Easy to achieve low resistance installation
- Requires significant right-of-way disturbance
- The only option for fault/conductive threat mitigation

Vertical

- Best when space is limited
- Mitigation affects may be smaller per foot of mitigation compared to linear
- Minimal right-of-way disturbance

MESAU
FIELD TRAINING

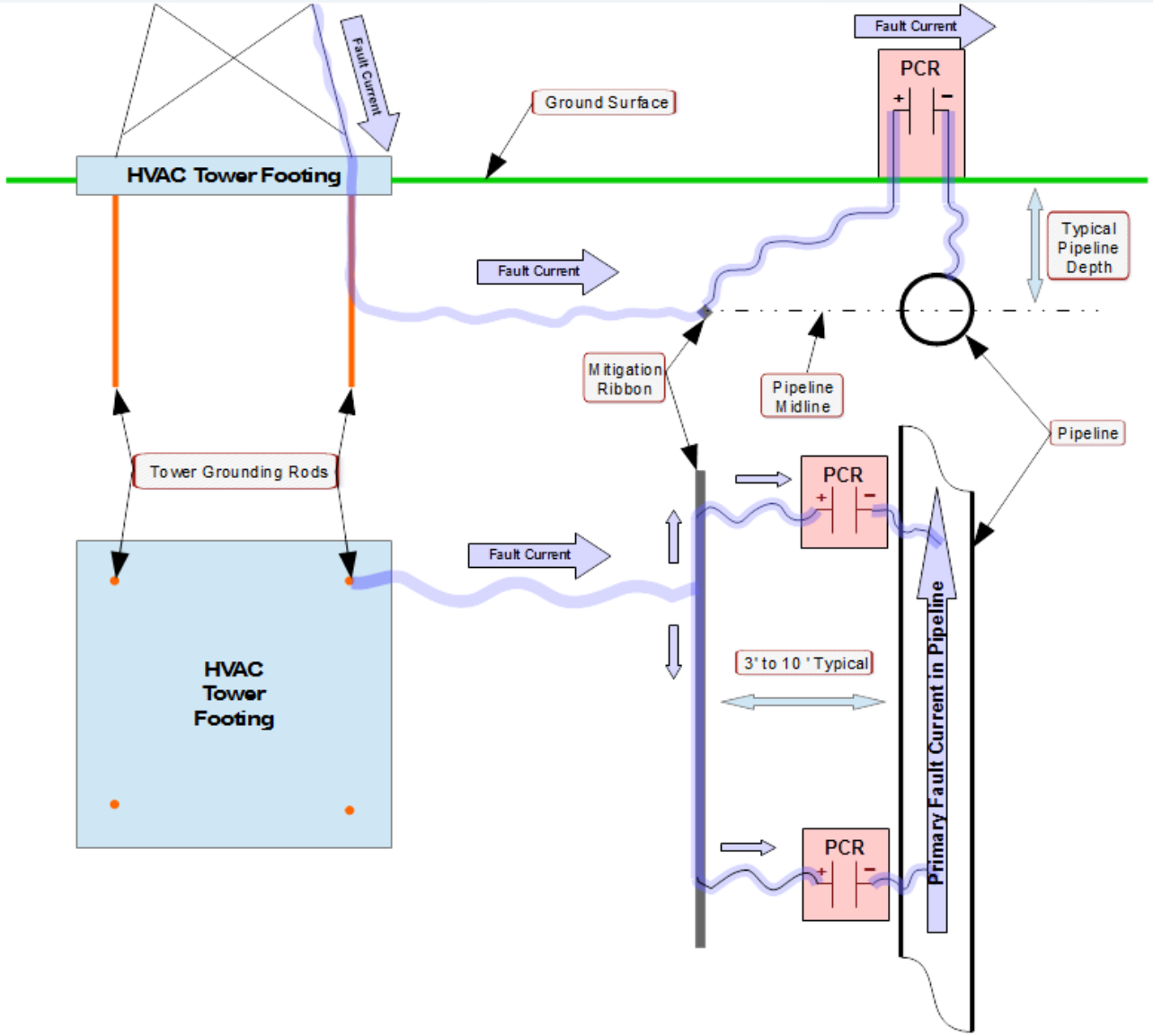
Linear Steady State Installation

- Excavated
- Trenched
- Plowed
- Rock saw (then plow)
- Horizontal directional drill

Horizontal Mitigation Configurations

Recommended

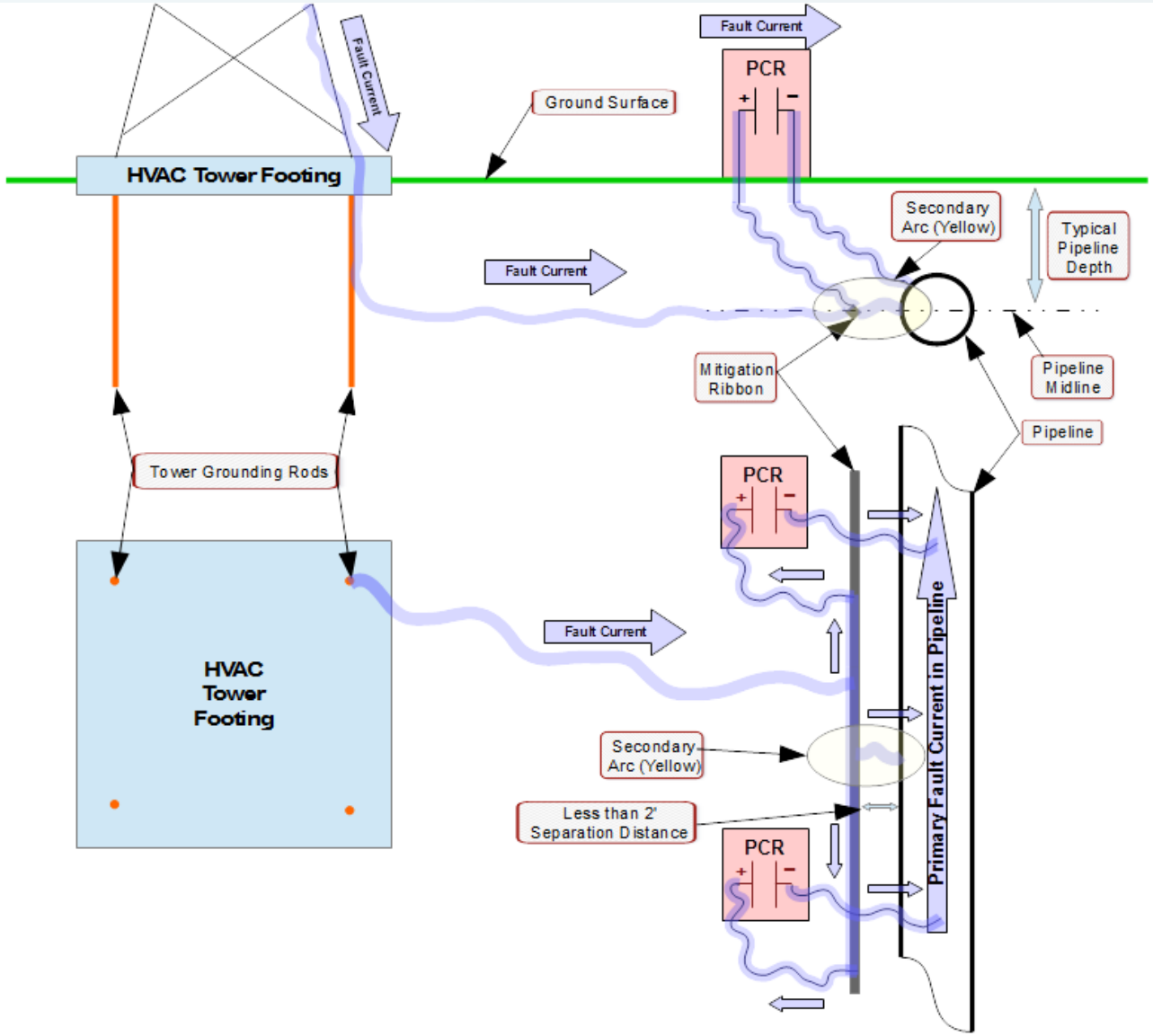
- Same side as powerlines
- 3’ – 10’ separation
- In-line with pipe centerline
- Good for steady state and AC voltage
- Best for fault control



Horizontal Mitigation Configurations

Closely Spaced

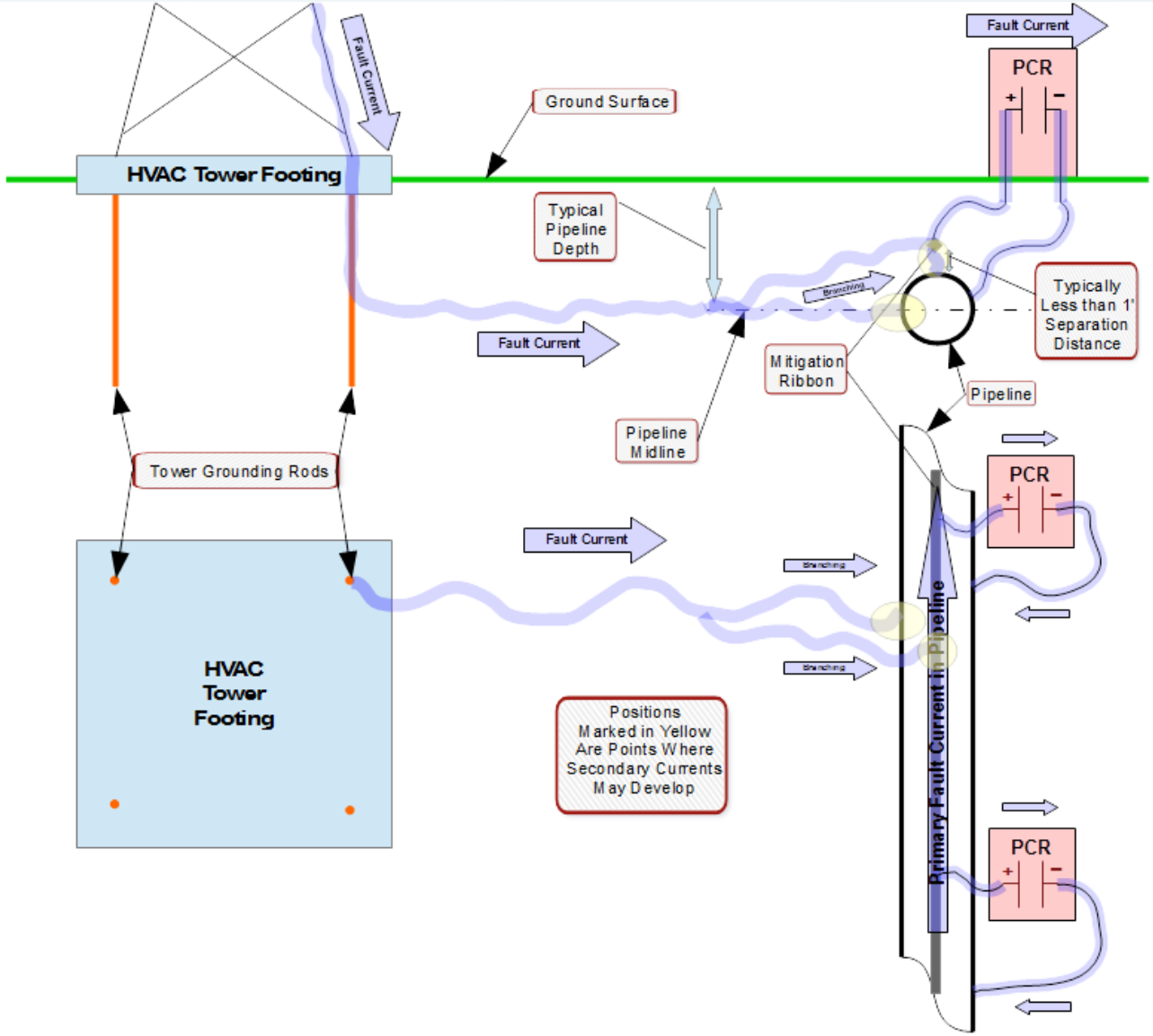
- Typical during pipeline construction
- Good for steady state and AC voltage
- Possible flashover during a fault and coating flaw



Horizontal Mitigation Configurations

Closely Spaced / Above

- Typical during pipeline construction
- Good for steady state and AC voltage
- Possible flashover during a fault and coating flaw



Horizontal Mitigation Configurations

To recap, optimal mitigation strategies employing ribbon should have the following attributes to protect the pipeline asset:

- The mitigation ribbon should be installed at the midline of the pipeline asset.
- The mitigation ribbon should be installed at least three feet away from the pipeline.
- The mitigation should begin and end with a decoupling device of appropriate size.
- DC De-couplers should be spaced apart for adequate fault current load sharing.
- Mitigation should be installed between the HVAC tower footings and the pipeline asset being protected.

Linear Steady State Installation

Linear Steady State Installation

DVPG Steady State Installation

DVPG Steady State Installation

Materials:

- Linear mitigation
  - Typically copper
- Weight
- Centralizers
- Conductive backfill
  - Loresco Powerfill
  - Conducrete
- Decoupler

POWERMET
YOUR SOLUTION DISTRIBUTION

MESAU
FIELD TRAINING

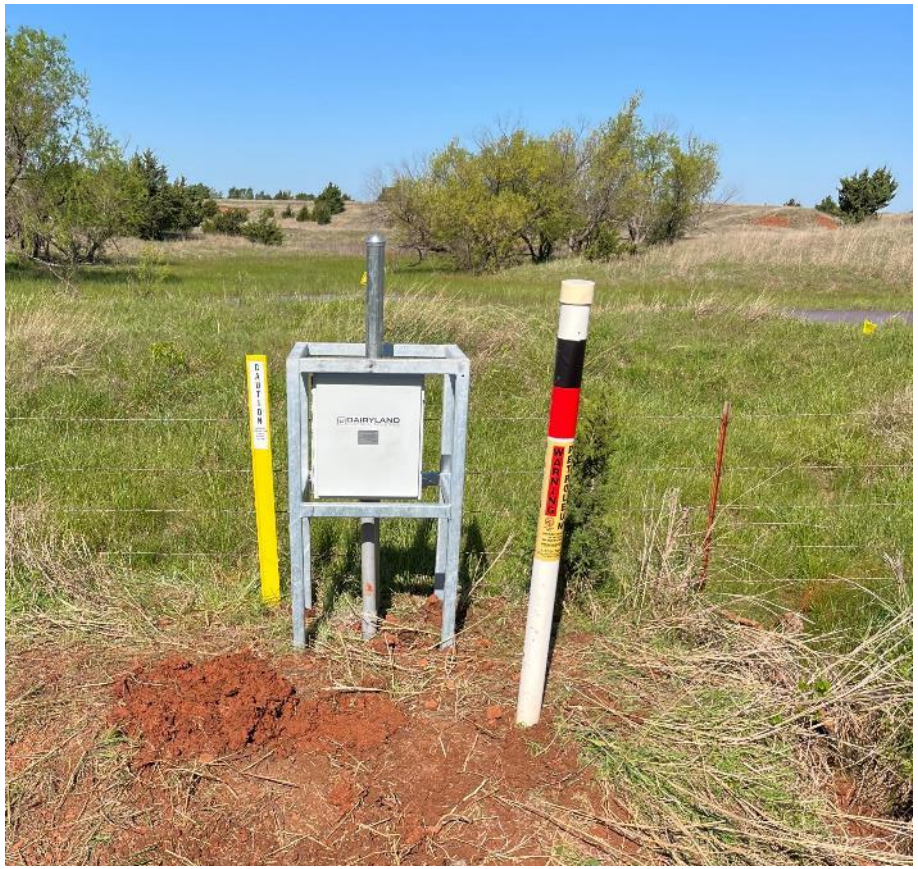
Constructability Concerns

- Road Crossings / Easements
- Foreign lines
- Waterways
- Environmental areas
- Steep terrain
- Rock

The Final Product

MESAU
FIELD TRAINING

The Final Product



The Final Product

Questions / Comments

Wesley Avey

Director of Projects

wesley.avey@bass-eng.com

918-891-5654