Tips, Tricks and Techniques

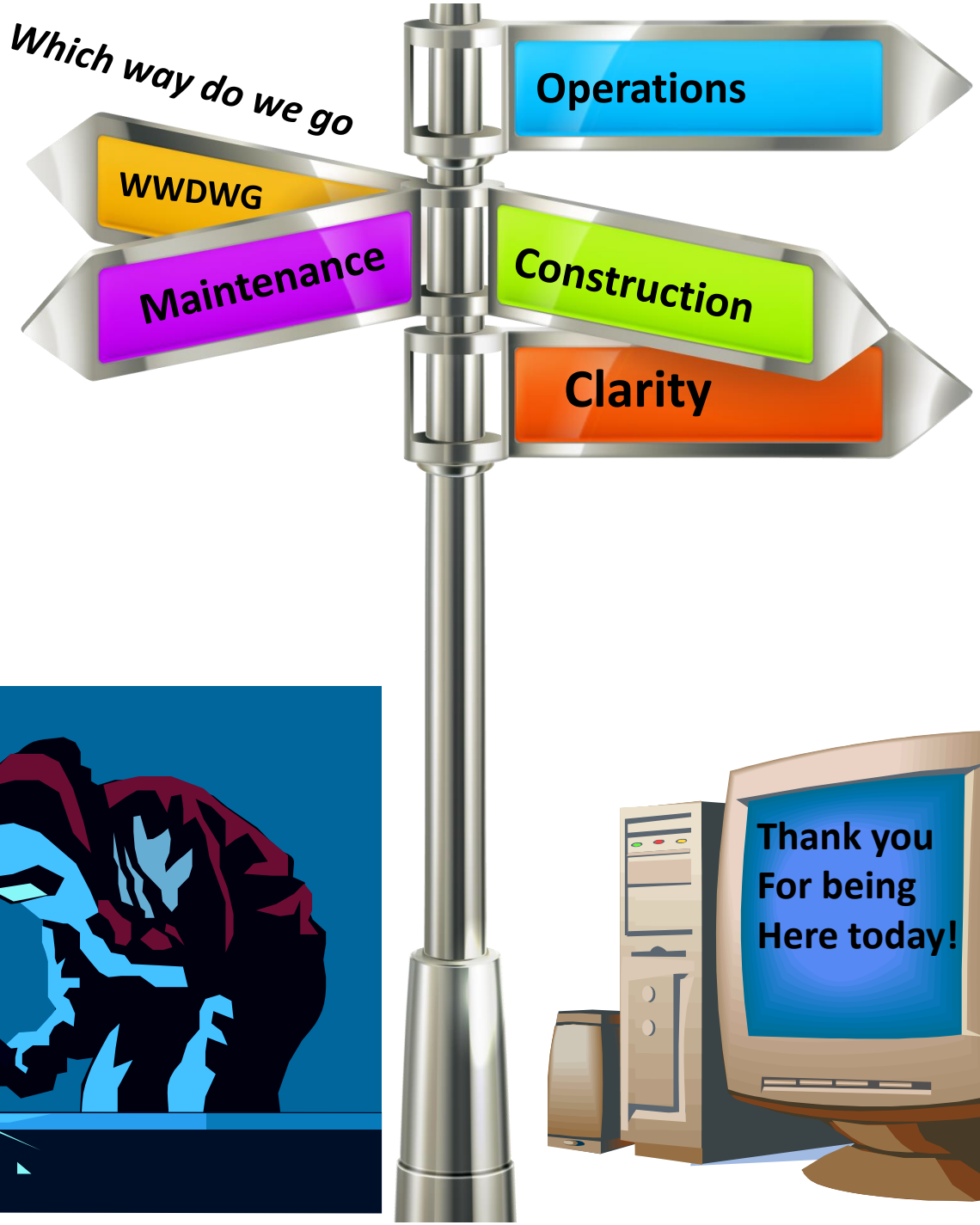
Tom Conner

Tip – Know what pyrophoric materials are

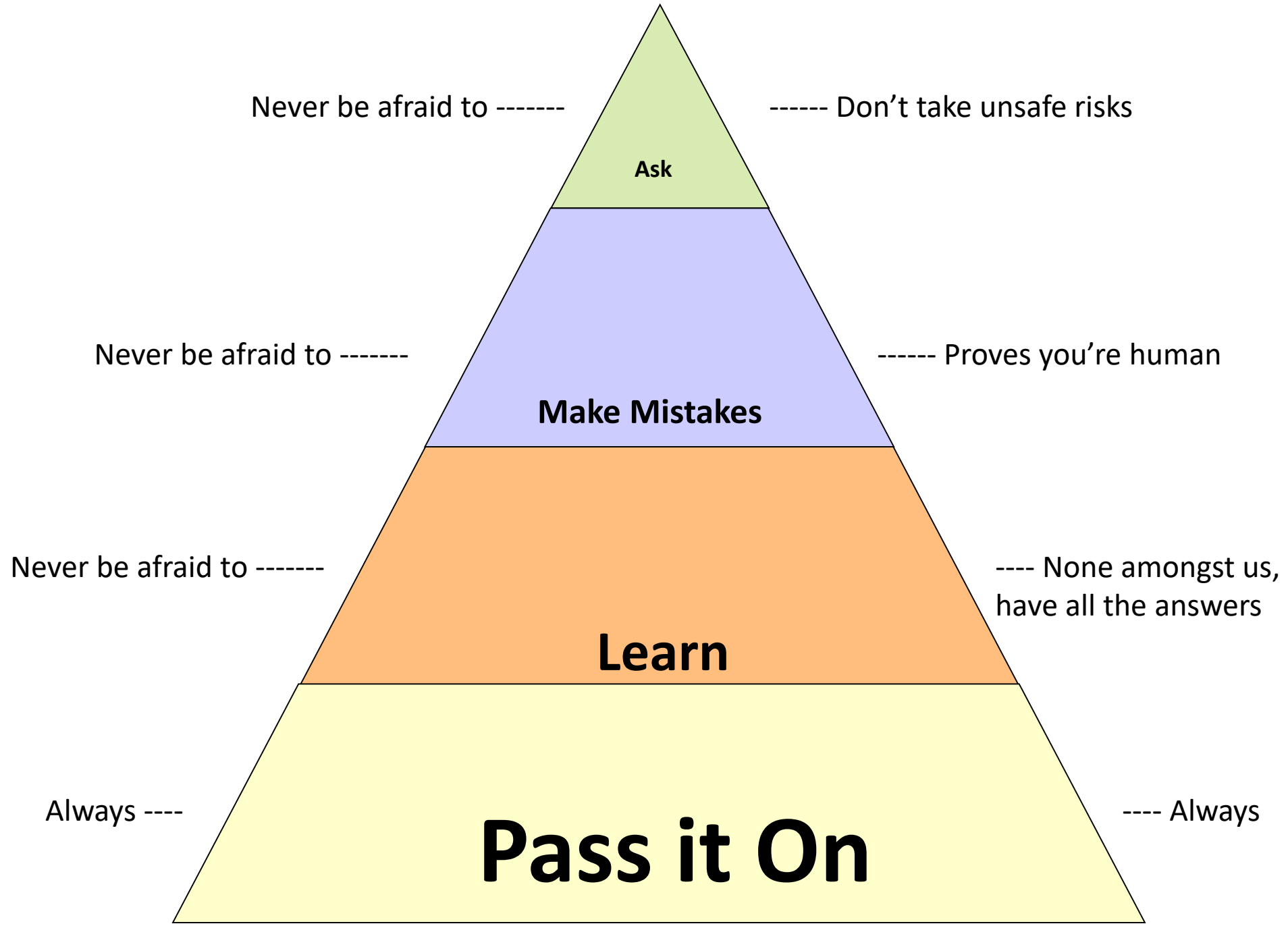
Iron Sulfides react with air & water

Safety Item

We are all as good as our training and experience permits; With this presentation, I'd like to share some of mine with you.


Which way do we go
Operations
WWDWG
Maintenance
Construction
Clarity


Thank you
For being
Here today!


Never be afraid to -------
------ Don't take unsafe risks
Ask
Never be afraid to -------
------ Proves you're human
Make Mistakes
Never be afraid to -------
---- None amongst us, have all the answers
Learn
Always ----
---- Always
Pass it On

Safety  First


68+26

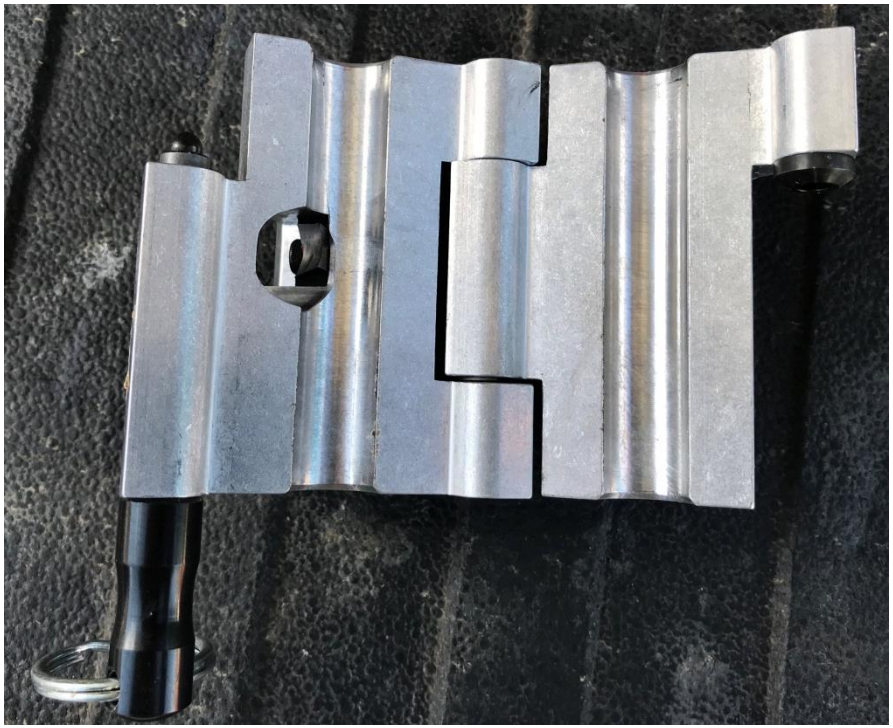

65 7-161

Safety Tip - What do you see here?

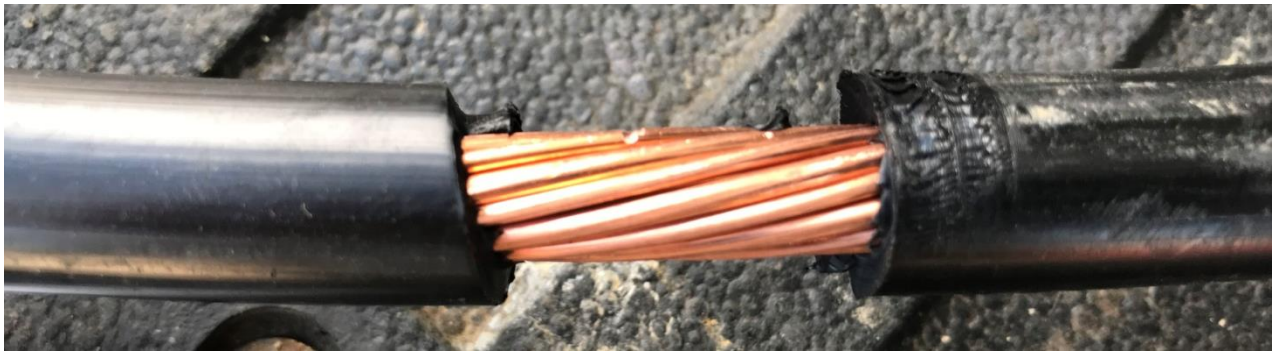
This TS was under this tower

Tip-Safety on HMWPE Cable work

Cable work safety



The end result is quite clean



Eliminates, torches, cable cutters, knives & potential hand and finger cuts
Using the right tool for the job is most important!

Tips for your corrosion career

- Reporting and remembering – clarity in communication
- Accessing your available tools
- Taking stock in your network of support
- Communicate effectively through your words and data
- Be that “go-to” person in your organization
- Never hesitate to ask questions

An example in Reporting

“Pre-Job communications and testing”

In the laydown yard – blast a section of pipe to ensure the QA

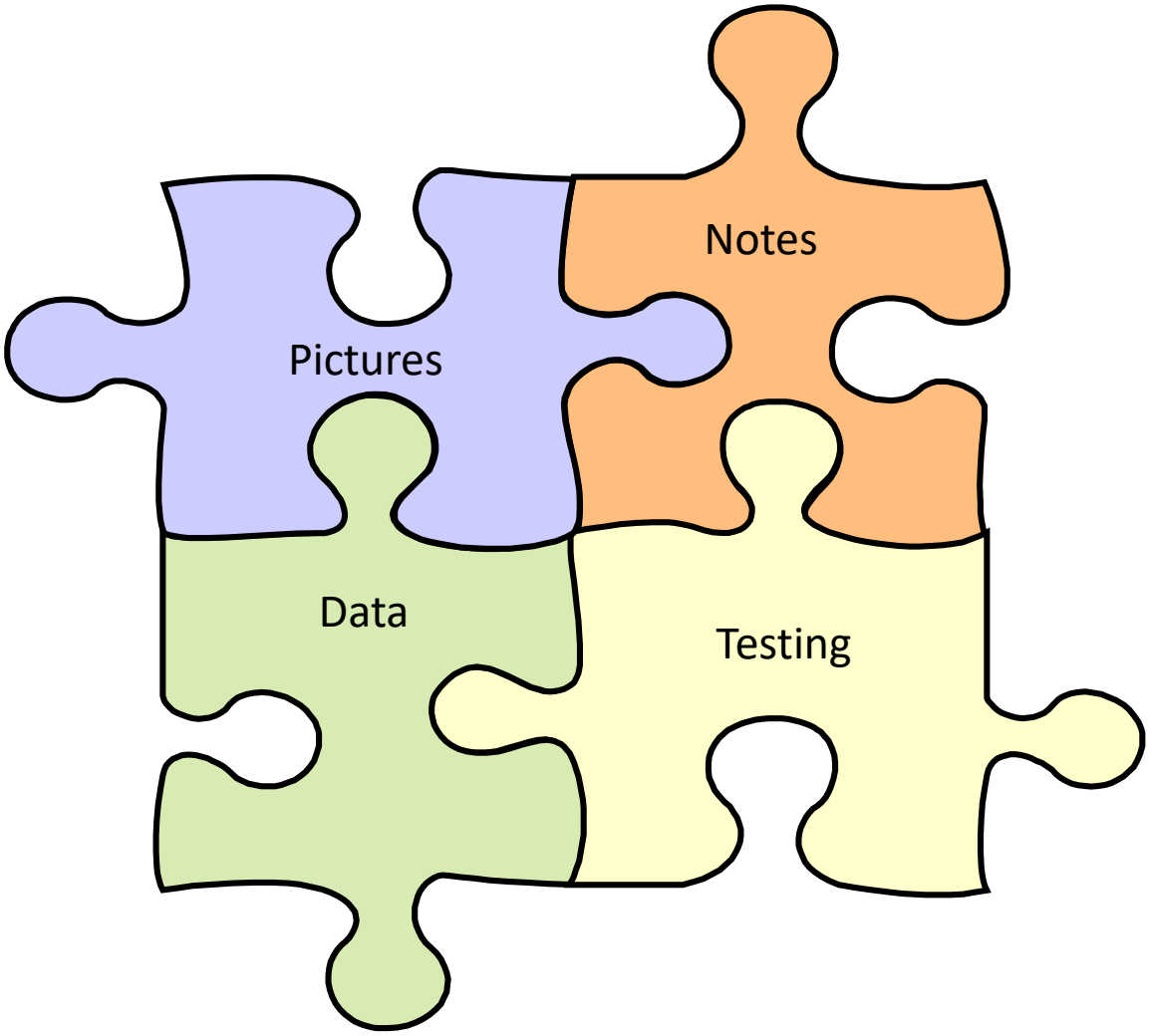
Inspect the result

Check the anchor pattern

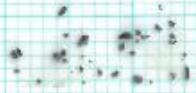
Second spot and test

Perform a “Blotter Test”
This one was great, no oils, mist or debris from compressor

Now put it all together in a report



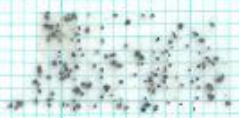
Medium Spent



3.5 mil

From Fine Grit

3.5 mil



Fine

New Medium

New Fine

From Medium Grit

4.25 mil

4.375 mil

10-22-12
Lay down Yard Test

Tom Conner
Tom Conner

The preceding page indicates the appearance of new Fine and Medium Grits tested 10-22-12 at the lay down yard.
New Grit is pictured as well as after it has been utilized and indicates their diminished size and fractured shape. Also are two Press-O-films of each blasted to White Metal as the Coating specs require, this test measures the anchor profile of the blasted area.
Powercrete R-95 has a requirement of a 2.5 to 4 mil profile and Denso Protal 7200 & Protal 7125 both require 2.5 to 5 mil profile.
Also as guidance from Harsco, the manufacture of the blasting media; Black Beauty, that we tested are as follows: Medium grit an expected range of 3.5 to 5 mil, should be achieved. Fine grit, an expected range of 2 to 3.8 mil, should be achieved.
The tests on the Fine grit measures a surface profile of 3.5 mil. The Medium grit measured a 4.25 & a 4.375 mil profile depth.

Considering the maximum by spec on the Powercrete R-95 is exceeded by using the medium grit and still though within the profile range of the Denso products, my recommendation is to utilize the Fine grit as a 3.5 mil profile surface preparation depth is acceptable to both manufacturer specs.

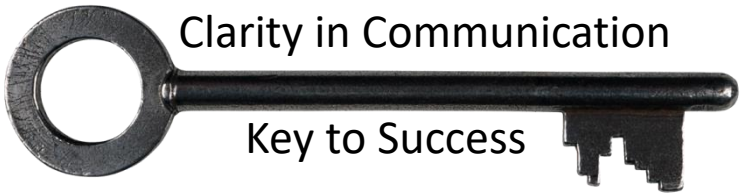
Recommend throughout the job at selected by random choice girth weld prepared areas be spot checked to ensure the consistency of the 3.5 mil surface profile be the expected and maintained depth during this projects coating needs.
Also tested was the blaster and compressor itself with a “Blotter” test on a white rag, to verify no oils or lubricants were being emitted onto the pipes surface via the blasting head. This test was negative. Acceptable, clean and oil free air leaving no stain on the bright white rag was noted. Contractor should continue as they have to check the built in trap and vent/ clean as necessary to maintain this good working condition of the blasting unit in harmony with the air compressor.

Picture of the first area tested using the Fine grit, a 3.5 mil profile measured here:

Picture of the second area tested using the Medium grit, a 4.25 mil profile measured here:

Note also on the Medium grit here, there are several visual inclusions of “Black Spots” where the media although crushed by its impact were imbedded loosely into the surface profile.

Blotter testing white rag indicates no staining whatsoever.



This test was conducted by Tom Conner / Sr. Corrosion Technologist / NACE #6461 on 10-22-12 between 10:00 am and 11:30 am at the Laydown yard. Temps were in the upper 60's and a clear blue sky day with very low relative humidity in the air.

This is also clarity in communication

- Contractor now knows, you know what you're looking at and expecting throughout the job.
- Saves your inspectors having to have this discussion daily.
- You also now have a permanent record of mutual understanding to ensure proper checks and balances from day one.

Company style reporting

- Follow your company guidelines.
- Propose new ideas if it is a global benefit.
- The time to be prepared is before you need it, have examples ready.
- Never let rejection upset you, just think positive on a better way to present your ideas.
- Detail & Timeliness is a must while its all fresh in your mind.

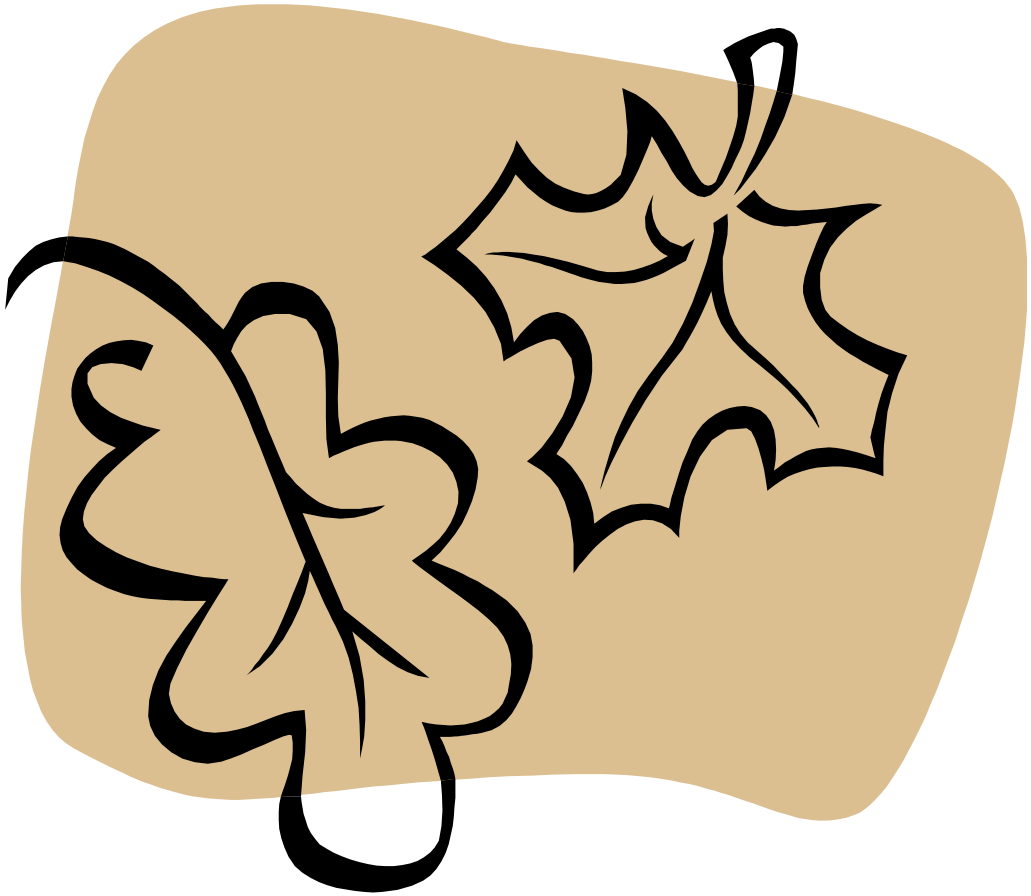
Tips on Communication

- Say what you mean, mean what you say; just don’t be mean when you say it.
- Listen to understand, not to just hear.
- Eye contact is a must.
- Facts are a must to have available, not feels.
- Always have Plan A & Plan B ready for your higher level discussions.
- Always be an active listener.

Tip- Pad everything and use a “deadman” on hill side construction

Pad your skids too

Ethane Molecule



Tip – check for it in stray gas concerns

THE 24 HOUR RULE

If you have an issue and do not address it within 24 hours, it will fester & we do not want that for you, or your work group. This is one of the single, biggest destroyers to your health, well being & productivity. Don't carry a burden, voice it, deal with it, seek help if necessary and release it. We are all brothers and sisters in this thing we do together, that's the bottom line.

Attitudes are Contagious, Make Yours Worth Catching

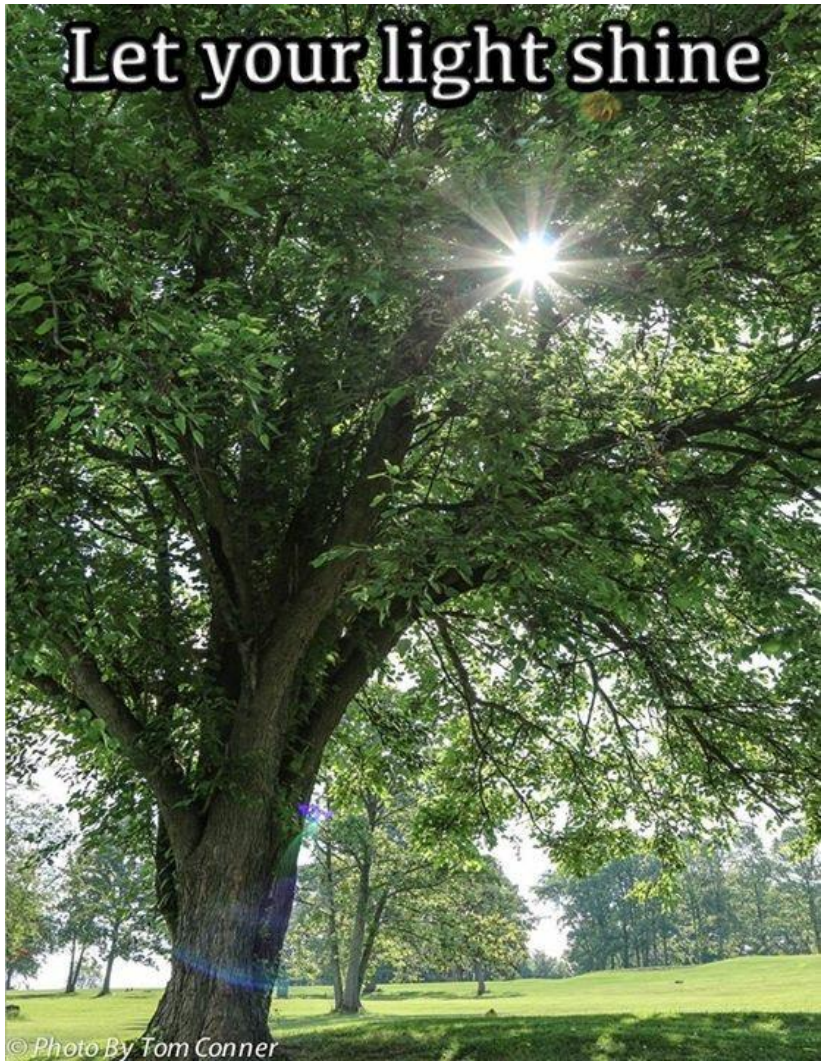
Tip on remedial painting – low cost but effective way to ensure you're good to go without lead abatement considerations being left out. Around 10 bucks.

Tip- Always read your manufacturer's spec on coating----These guys didn't

Neither did these guys----------
What all do you see here?

Tip- Always set up proper grounding and have clean springs while jeeping

Both matter when you are a Corrosion Professional



Have a strong work ethic

Tips on making your connections Thermite, Exothermic, Cad Weld

- Remember .109 wall or more with a UT reading
- Clean your area
- Prepare your 15 gram shot
- Dry the area
- Make the shot
- Let cool to ambient
- Remove the slag
- Ensure connection is tight
- Clean the area
- Coat the area

This is not a hammer

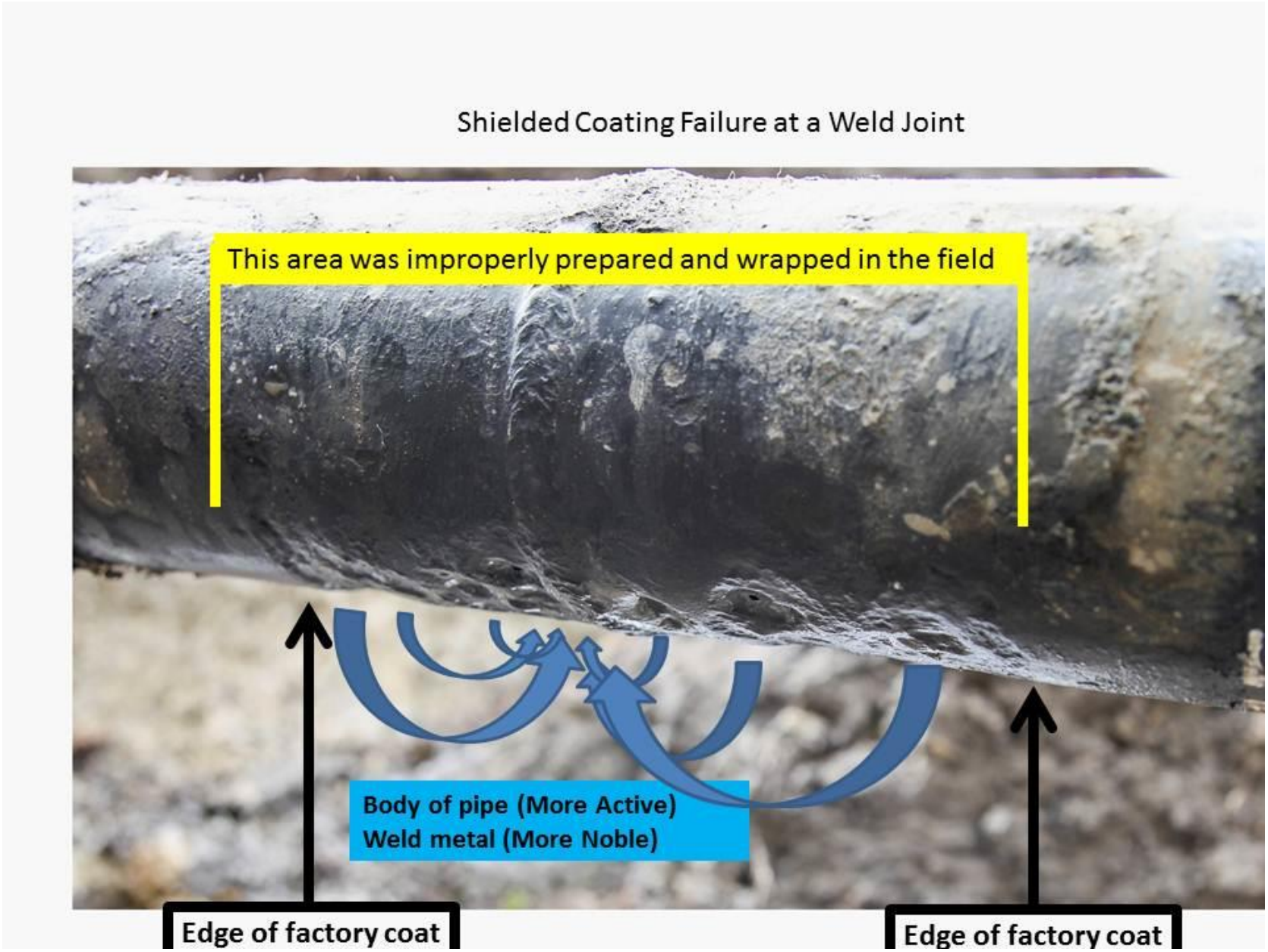
#8 THHN Wire

Tips – Always ensure a 15 gram shot
This is what happens with 32 grams^2

In a properly working DC circuit current flows from positive to negative

Remember this statement in all you do with your CP work

A pure galvanic reaction here:



Tip-Always isolate above/below ground interfaces

Points of **Isolation**

at all below ground to above ground risers

Protect below ground piping with impressed or galvanic systems

What happens if We do not?

Tip-Use a “soil-tube” in your lots.

- Ensures consistency of half cell placement one year to the next.
- Gets you below the fabric, gravel etc.
- Use native soils to fill it to surface level.
- If you cut a 7’ test station pole, use the waste end.
- Saves a great deal of time in your read day.
- Do have a jug of water ready if it’s dried out.

Quality Data Is A MUST

Operator/Contractor

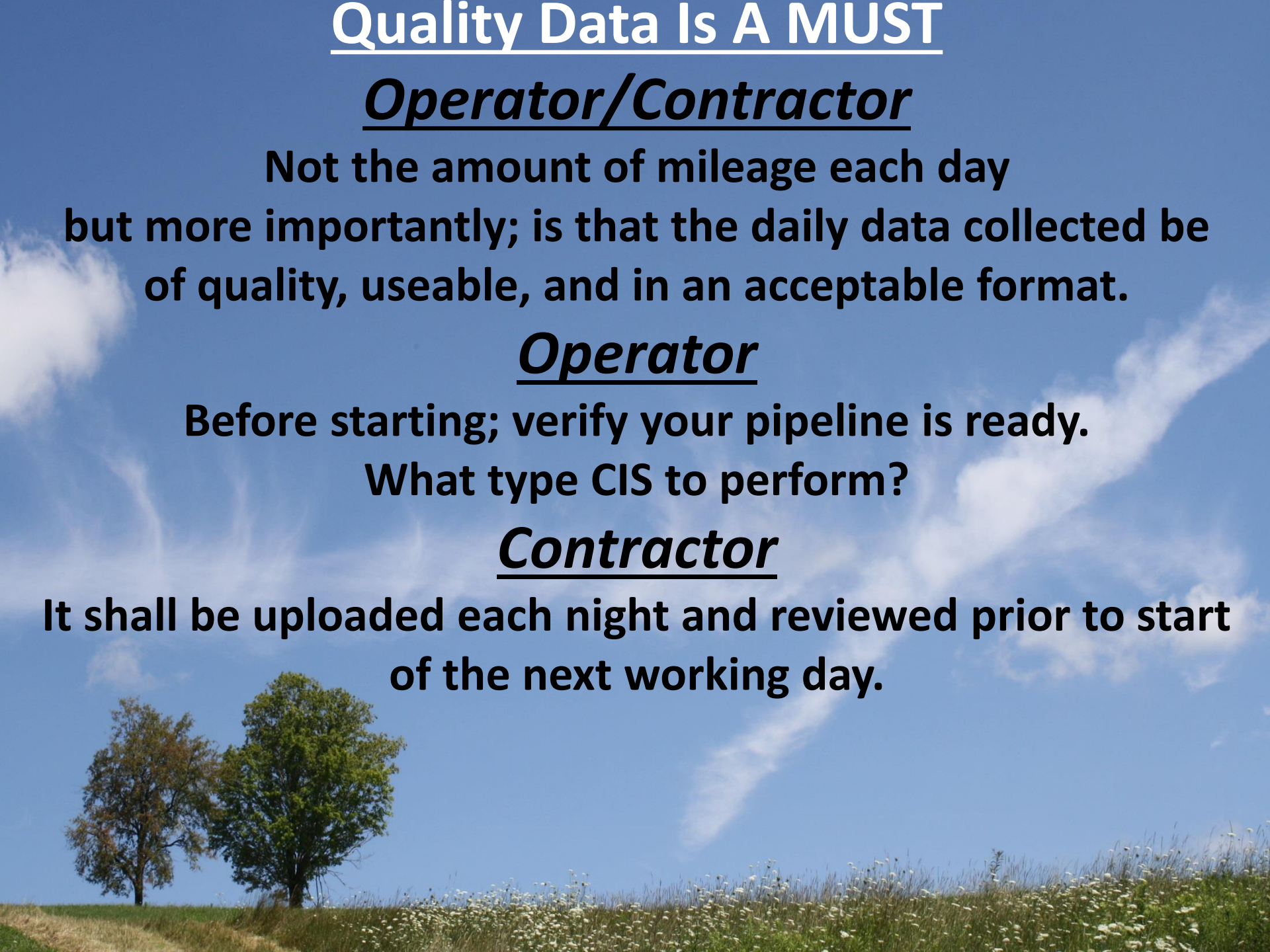
Not the amount of mileage each day
but more importantly; is that the daily data collected be of quality, useable, and in an acceptable format.

Operator

Before starting; verify your pipeline is ready.
What type CIS to perform?

Contractor

It shall be uploaded each night and reviewed prior to start of the next working day.



Best tips I can give you

Things change, the basic laws of what we do remain constant and consistent

- Remember the most very basic lessons you've received here at AUCSC. Those all add up in the formula and formation of your assessments, reviews and thoughts for what's next in your decisions in design and in your field work.

TYPICAL GALVANIC SERIES

METAL	VOLTS (CSE)
Commercially Pure Magnesium	-1.75
Magnesium Alloy	-1.60
Zinc	-1.10
Aluminum Alloy	-1.05
Commercially Pure Aluminum	-0.80
Mild Steel (Clean & Shiny)	-0.50 to -0.80
Mild Steel (Rusted)	-0.20 to -0.50
Cast Iron (Not Graphitized)	-0.50
Lead	-0.50
Mild Steel in Concrete	-0.20
Copper, Brass, Bronze	-0.20
High Silicon Cast Iron	-0.20
Carbon, Graphite, Coke	+0.30

Typical Potentials measured between metal (when immersed in neutral soils or waters) and a copper-copper sulfate reference cell contacting the adjacent soil or water.

Soil Resistivity Environments

Classification	Electrolyte Resistivity Ω cm	Corrosivity
Low Resistance	0 to 2,000	Severe
Medium	2,000 to 10,000	Moderate
High	10,000 to 30,000	Mild
Very High	30,000 and Above	Increasingly Less

How metals are affected by these type soil classifications


Tip-It's not scary, it's just
Ohms Law

E=IxR

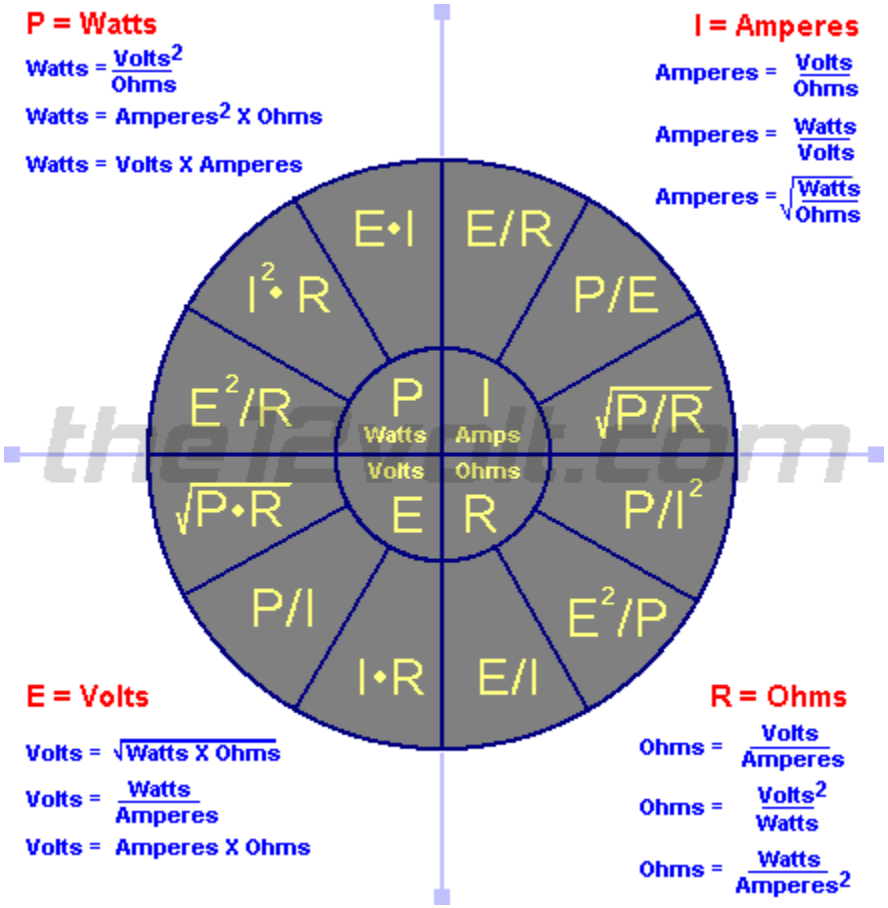
V, I, and R, the parameters of Ohm's law.

Ohm's law states that the current through a conductor between two points is directly proportional to the potential difference across the two points. Introducing the constant of proportionality, the resistance, one arrives at the usual mathematical equation that describes this relationship:

where *I* is the current through the conductor in units of amperes, *V* is the potential difference measured *across* the conductor in units of volts, and *R* is the resistance of the conductor in units of ohms. More specifically, Ohm's law states that the *R* in this relation is constant, independent of the current.

The law was named after the German physicist Georg Ohm, who, in a treatise published in 1827, described measurements of applied voltage and current through simple electrical circuits containing various lengths of wire.

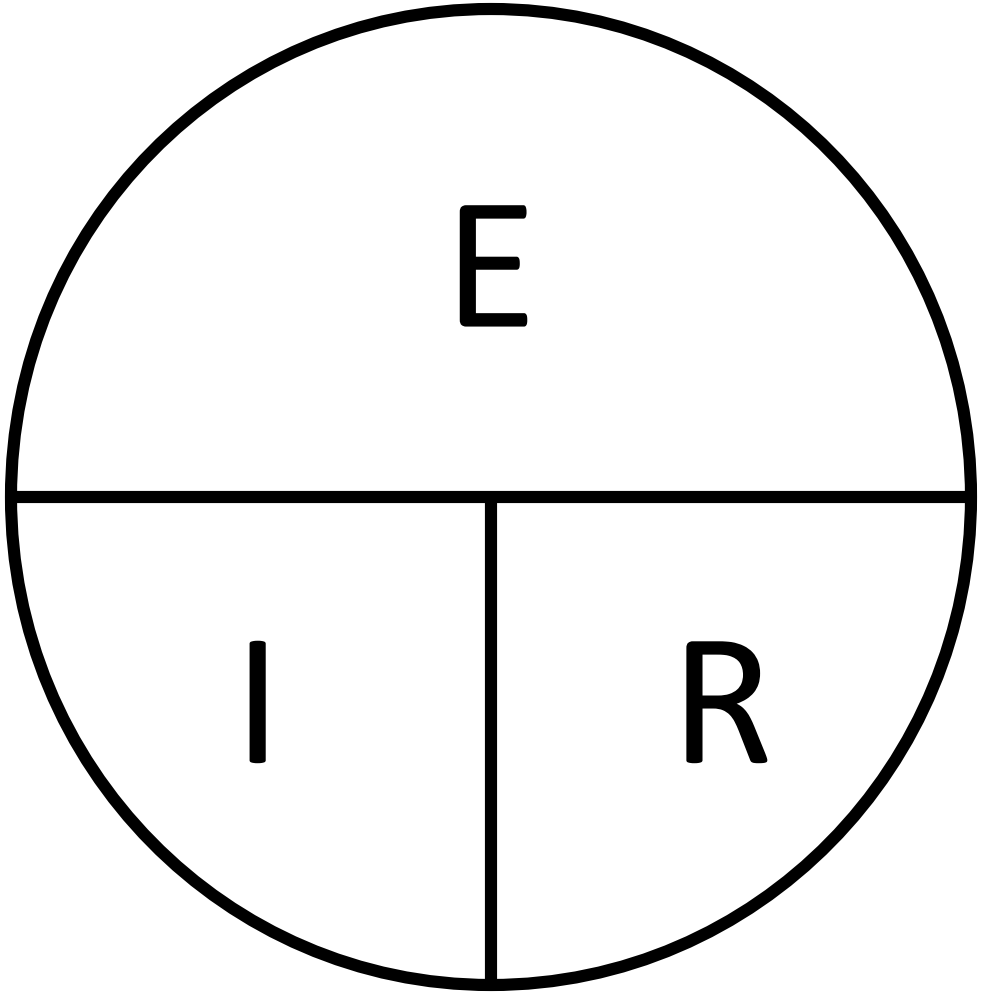
The Complex Version



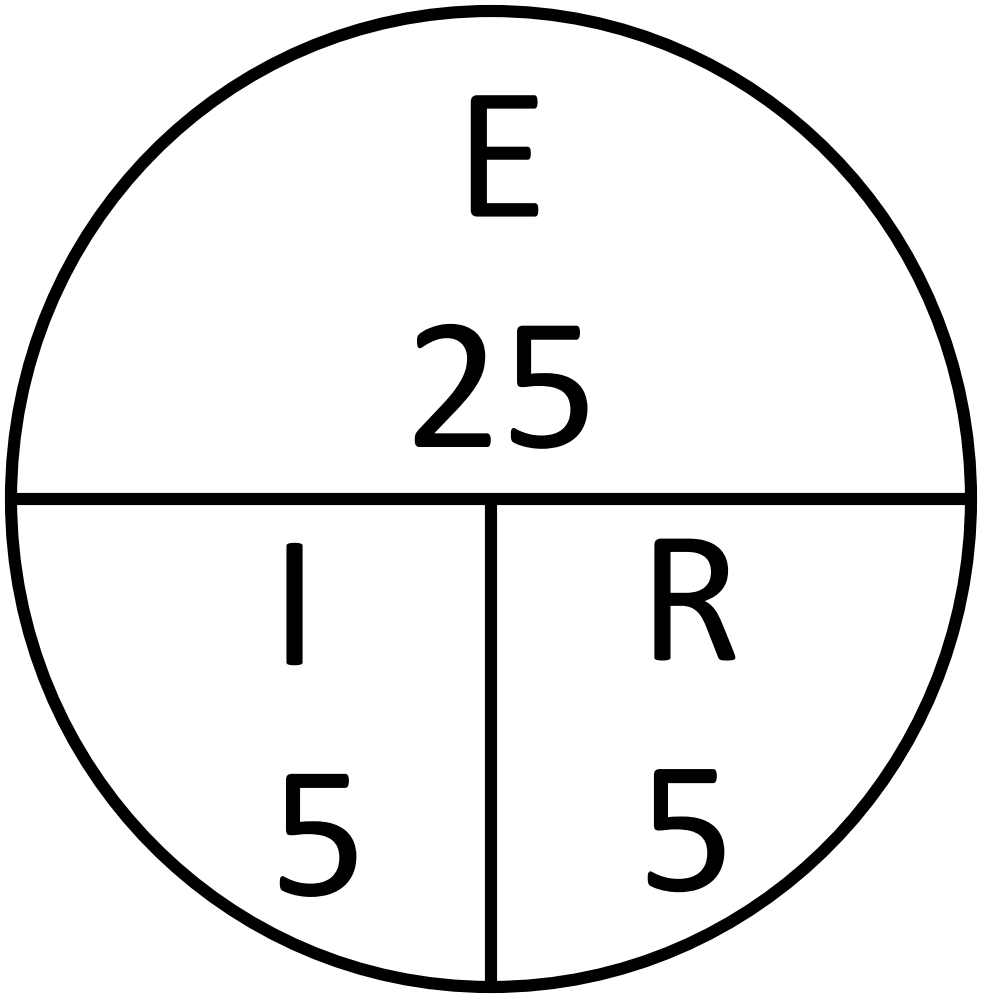
Watts up?
Why this is also important in a DC Circuit

AMPS=	**WATTS÷VOLTS**	**I = P ÷ E**	**A = W ÷ V**
WATTS=	**VOLTS x AMPS**	**P = E x I**	**W = V x A**
VOLTS=	**WATTS ÷ AMPS**	**E = P ÷ I**	**V = W ÷ A**

The version we will use



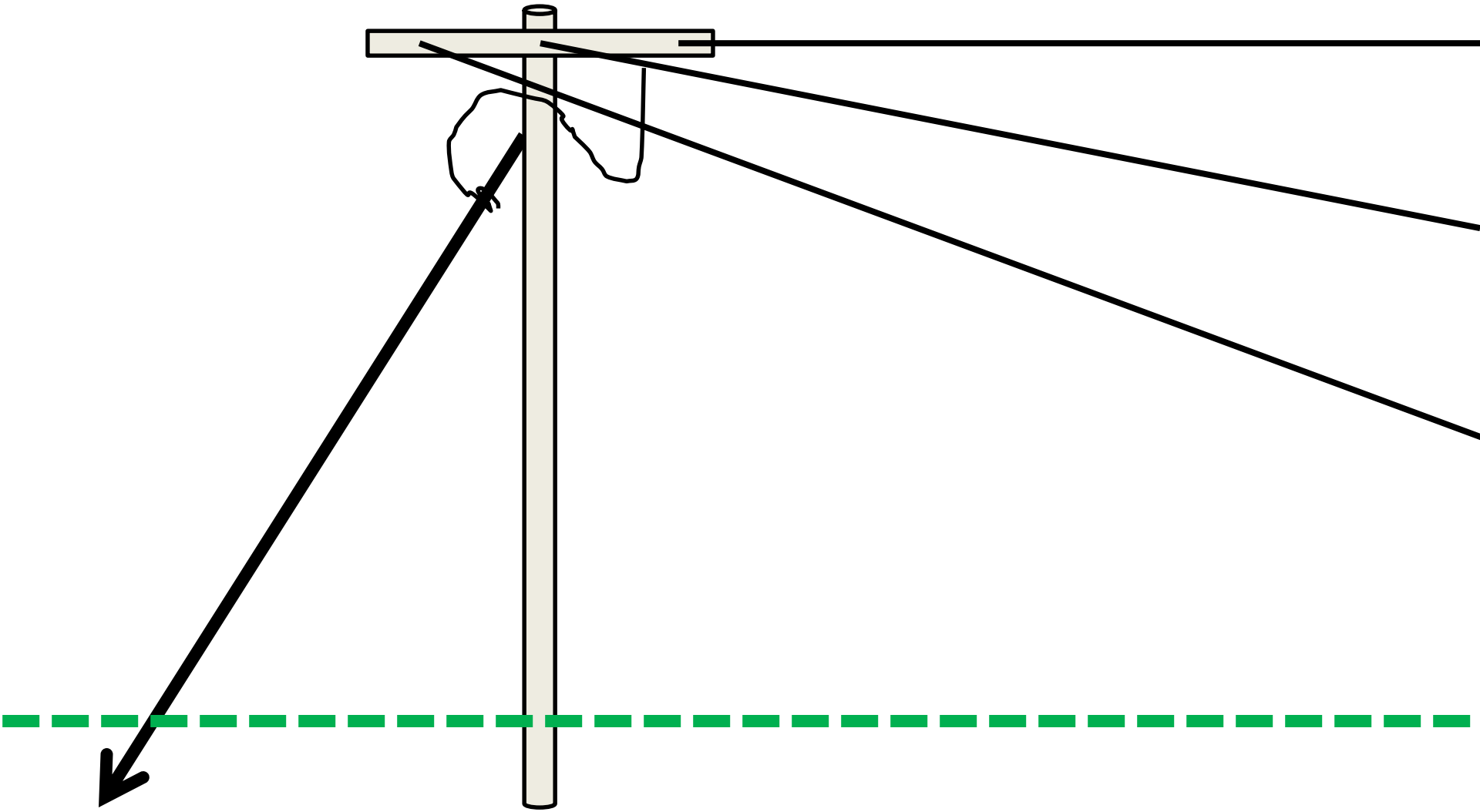
Example of its use



OK, Why do we use it?

- Trending numbers from baseline data.
- Troubleshooting the circuit.
- Understanding the capacity of supplied current; in relation to existing facilities plus future additions / expansions.
- Sizing metallic bonds and current drains.
- Sizing resistance within a circuit.

Look Up – If neutral and guide anchor are bugged together this can cause you circuitry issues

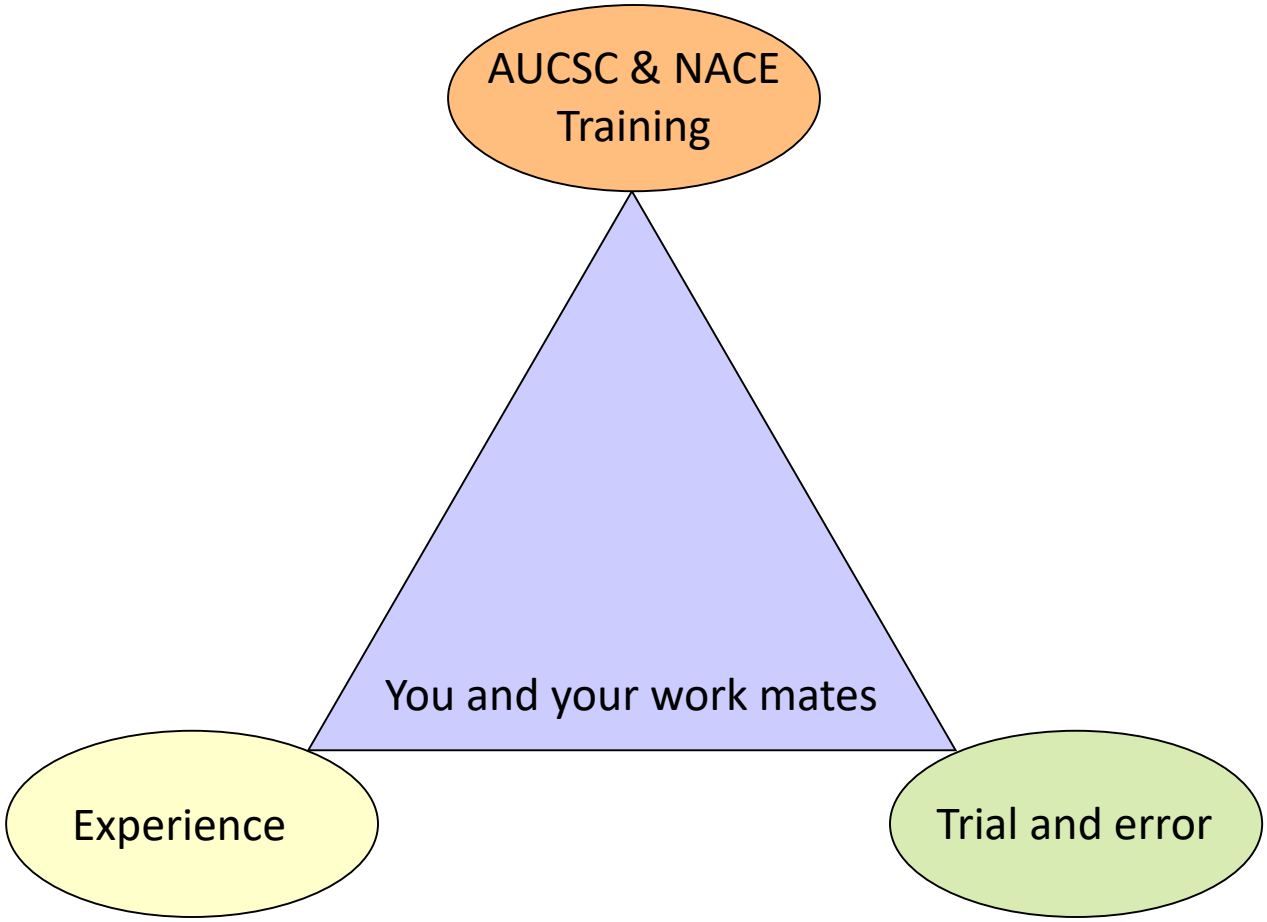


Tip-Site selection for rectifiers is most important

Good today, maybe not tomorrow; Think long term and seasonal conditions

Questions on these Tips??

Tricks



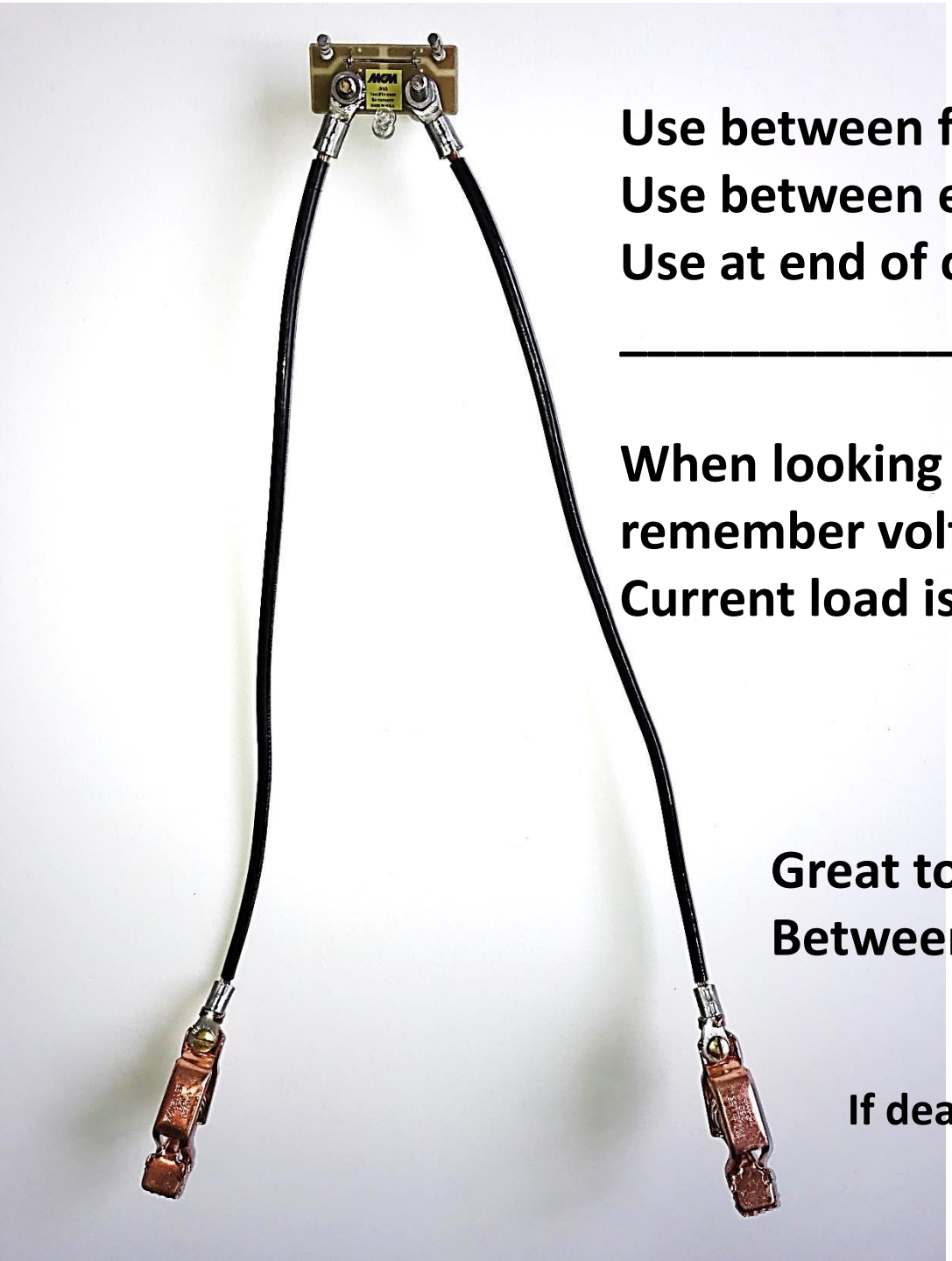
All are born from necessity

Tricks that may help you in the field

- “Poor mans Amp clamp”
- Simulated anodes or load
- Finding Anodes + Pinpointing the splice
- Recognizing a problem
- Never assume
- Verify your equipment is in good working order
- Trust the data you collect

Poor Mans Amp Clamp

- Two alligator clips
- Two nuts
- Two bolts
- Four ring terminals
- Two pieces of #8 wire
- One shunt



Use between flanges
Use between ends of cable
Use at end of cable with a simulated anode

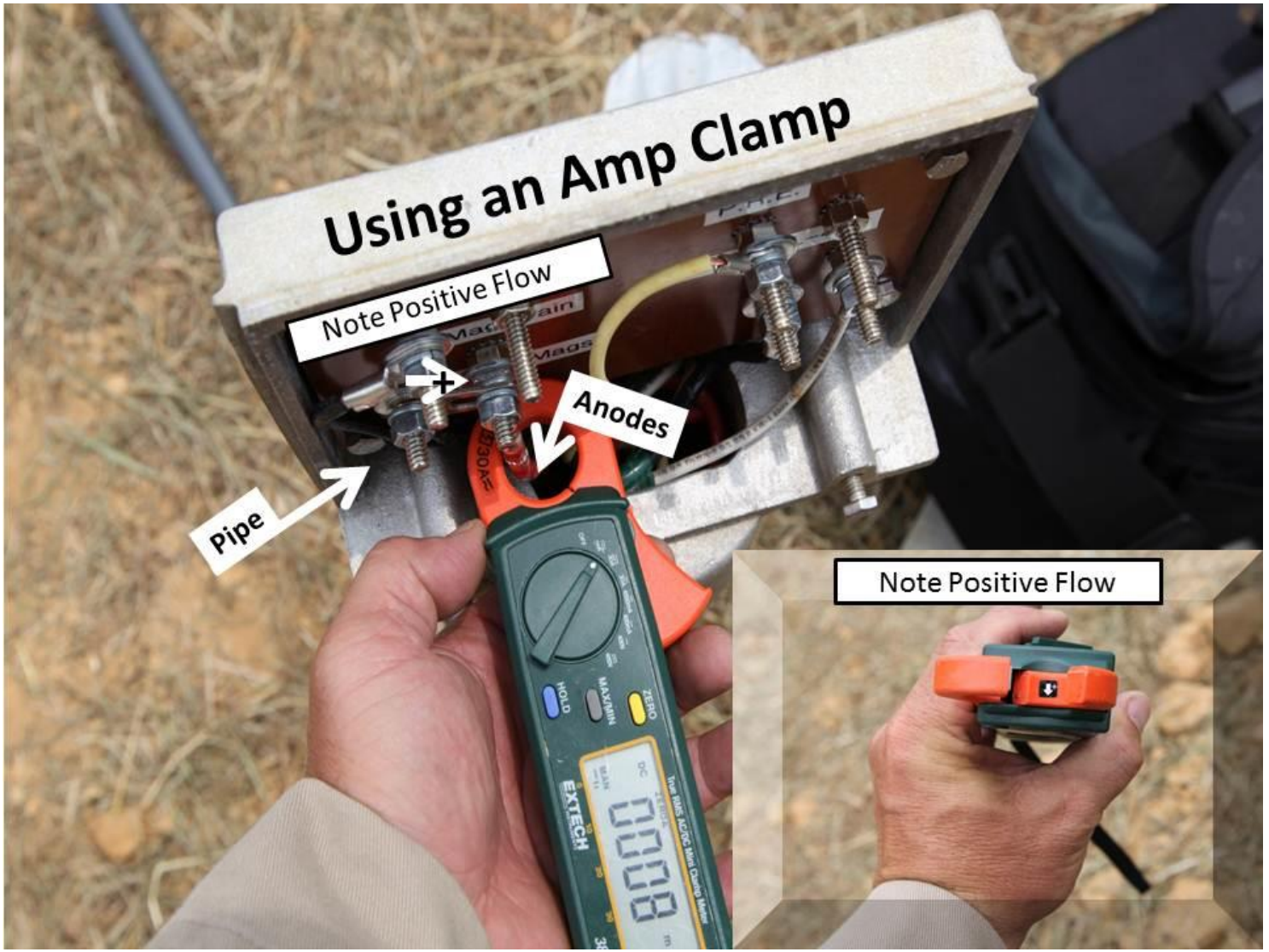
When looking for problems in a CP system, remember voltage can be misleading.
Current load is what you should be verifying.

Great too for quick checks in the field
Between structures

Safety Item
If dealing with high DC voltages/amps
Use insulated alligator clips

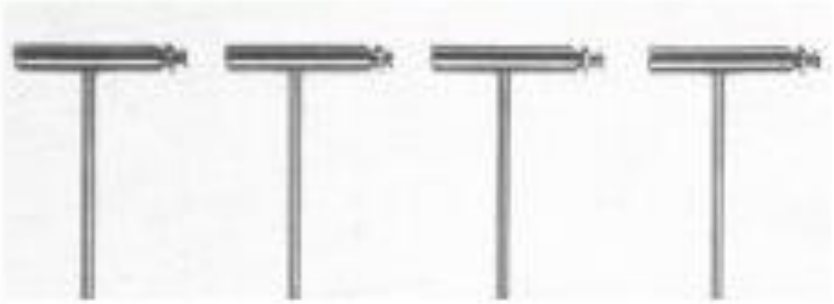
Rich mans amp clamp, shows the positive direction of flow

Positive flow



Negative flow

Hey what's a simulated anode?



These work too

Great for new pipeline spot checks

This is a “Spike” anode for Clamping on to a customer Service line. Great though for quick tests in the field

You can pass current through almost anything you have in your truck

- Probe bars
- Screwdrivers
- Anything metal that you have and need in a pinch can be used as a simulated anode.
- Especially helpful when verifying current to and through the end of your existing cable and anode system, or while repairing a cable break.

Leads

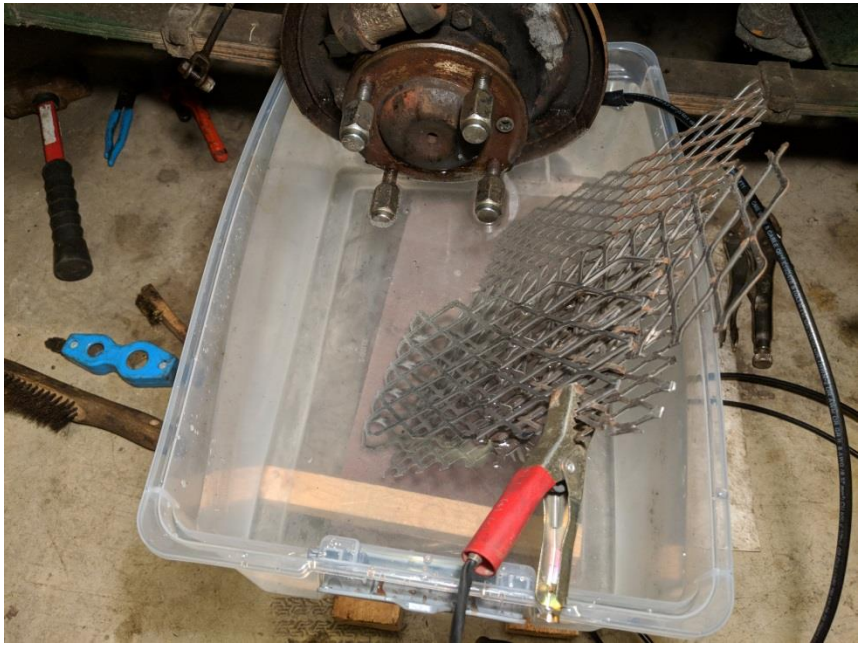
Don’t be afraid to make your own custom sets.

Weld finder for very thick coatings

Using a compass

- To minimize coating removal, somewhat make clean the coal tar or other types of very thick coatings where the weld is not visible. Simply slide easily the compass at the 12:00 position with the pipe, it will deflect over the weld. This can save you a lot of time and money in repairs.

Trick - You can use CP in creative ways

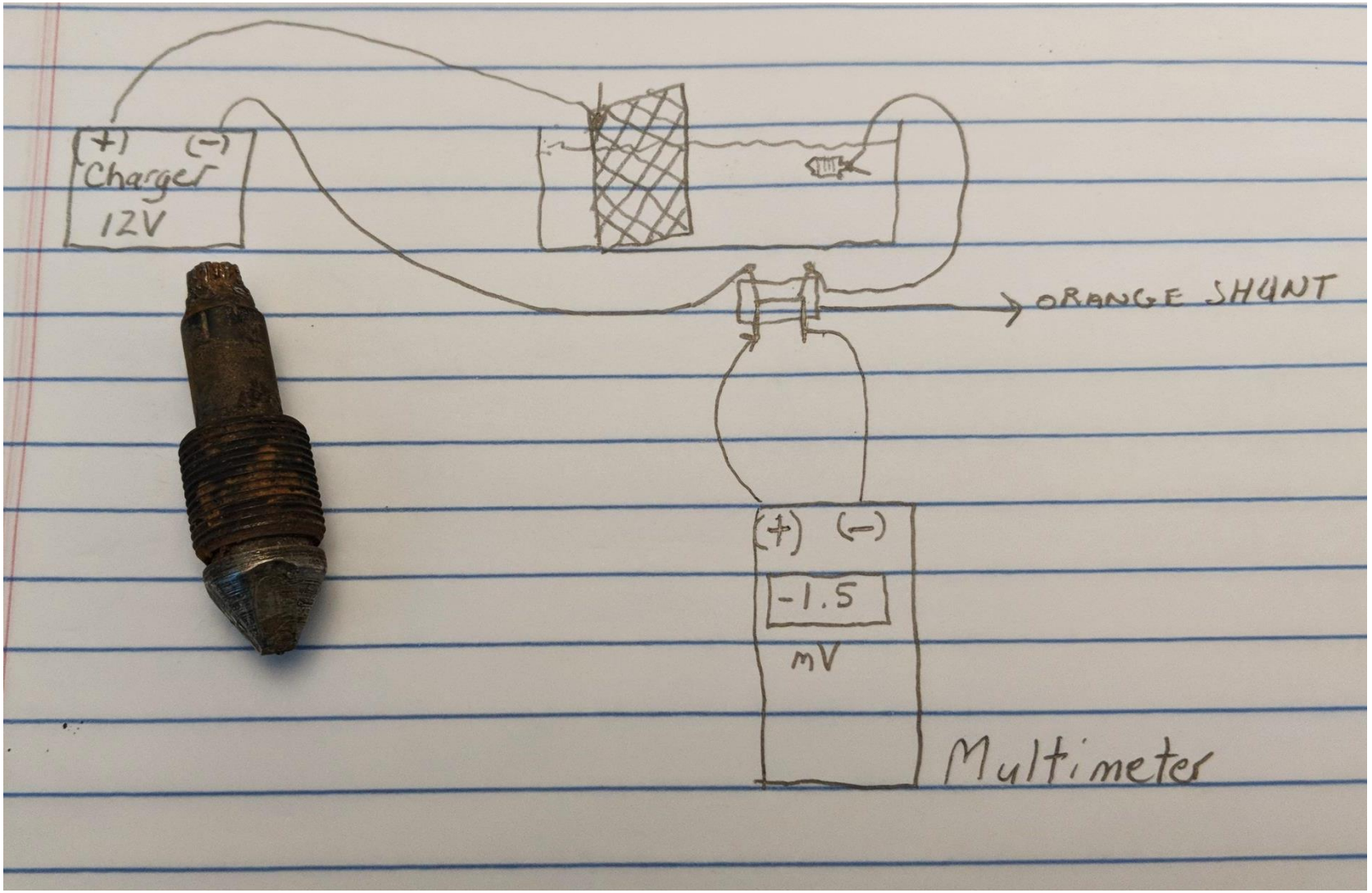


Solution consists of water and Baking soda

Passing a limited amount of voltage, freed the rusted bolt

Note the solution change, the ionic reaction is real

It worked



Techniques

- Make it easy to remember – Label everything
- Giving your pipe and groundbeds a lovely CP friendly environment.
- Finding Anodes + Pinpointing the splice.
- Making new splices.

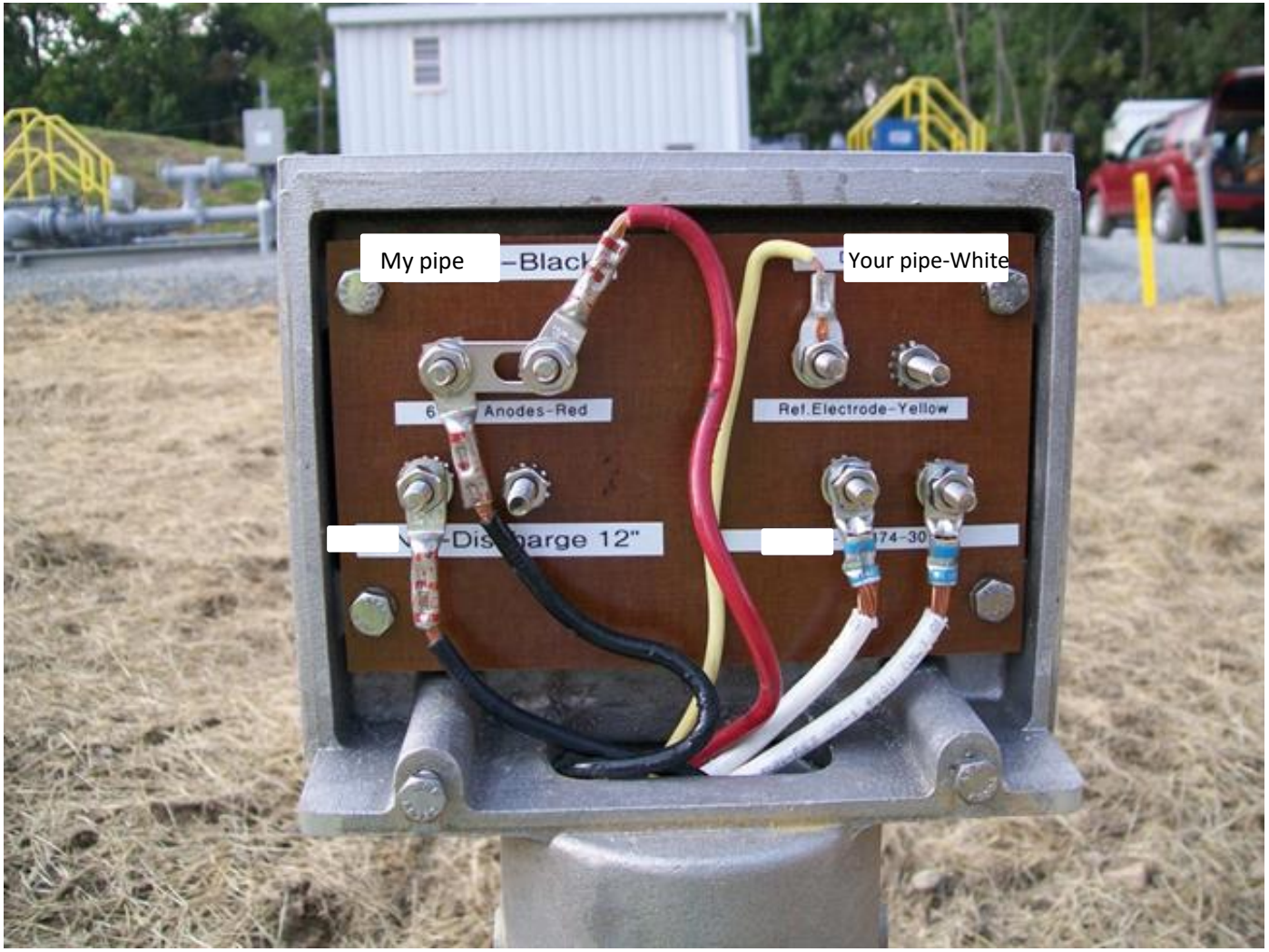
The best 40 bucks you'll ever spend

Again, clarity in communication without you being there.

- **What we do, we do for them that comes behind us.**
- **Think of your savings in elimination of the unknowns.**
- **Insist it as part of your new construction.**
- **Anytime you're out, make time to start.**
- **Take a photo also and make a TS book using your company form.**
- **Most helpful in survey activities, audits and turnover needs.**
- **Set the Standard, it's your field.**

Eliminate guess work and testing to verify what you are reading. Think also again of contractor savings.

Neatness and detail – Most important



What’s this?

Limestone fines for backfill

The goal of CP is to achieve an alkaline environment

$$Mg \rightarrow Mg^{2+} + 2e^-$$

$$2H_2O + 2e^- \rightarrow H_2 + 2OH^-$$

During Mg dissolution, the anodic and cathodic reactions are expressed by the above equations

Gives a very stable environment for current flow. Great pad material also.

Splicing and crimped connections

This is Called a Wye Splice

130C is great to make a couple of wraps at your splice interface with smaller cables

This is called an In-Line splice

130 C works great at filling in the gaps

#8 HMWPE
Header Cable

Ensure all components are well centered within the body of the splice kit

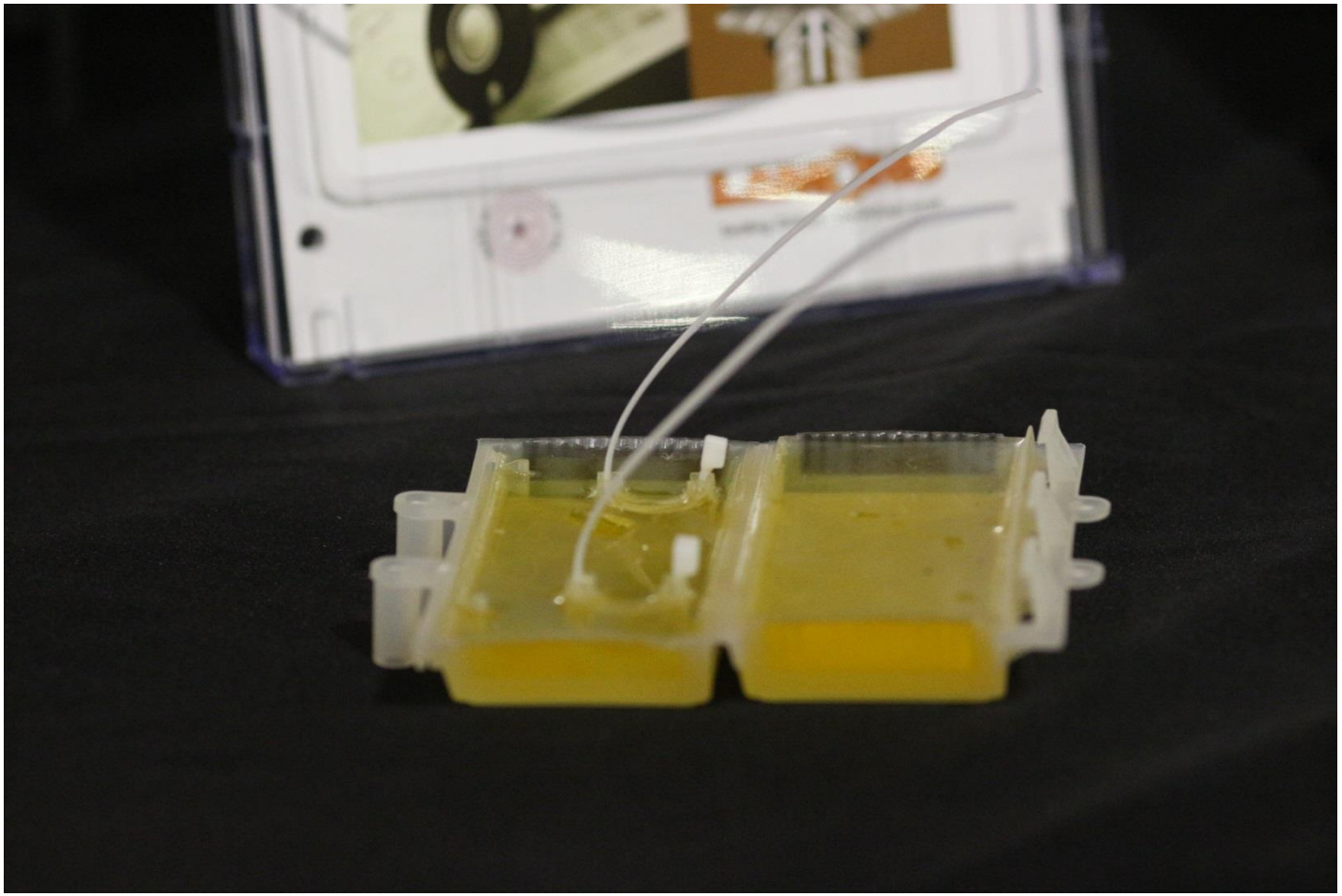
Just a partial pour of the resin here, so you can actually see the raceway

Shallow cable depths, go sideways.

Just a partial pour of the resin here, so you can actually see the raceway

Be neat, detailed, have clean tools and hands

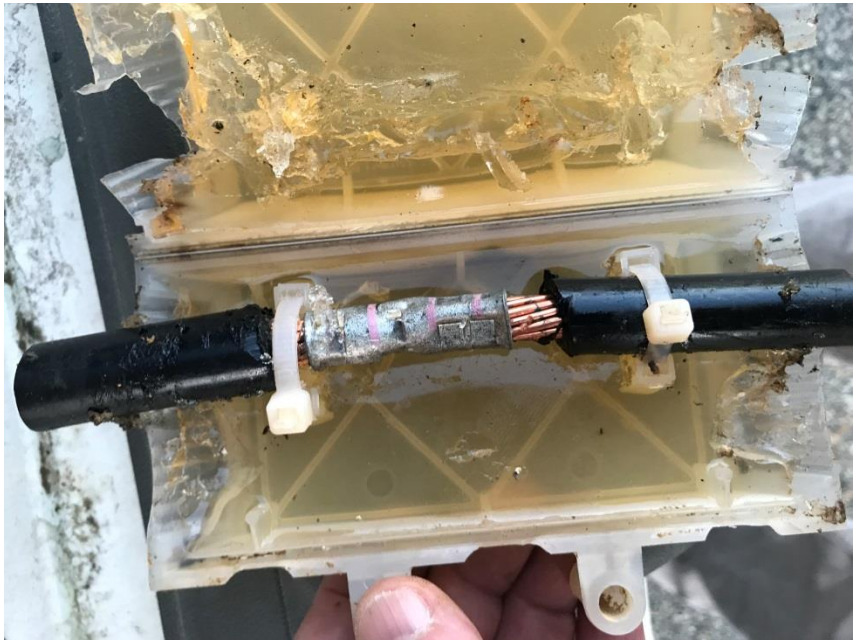
These work great too for splices.



Performance Examples

In the ground 5 years

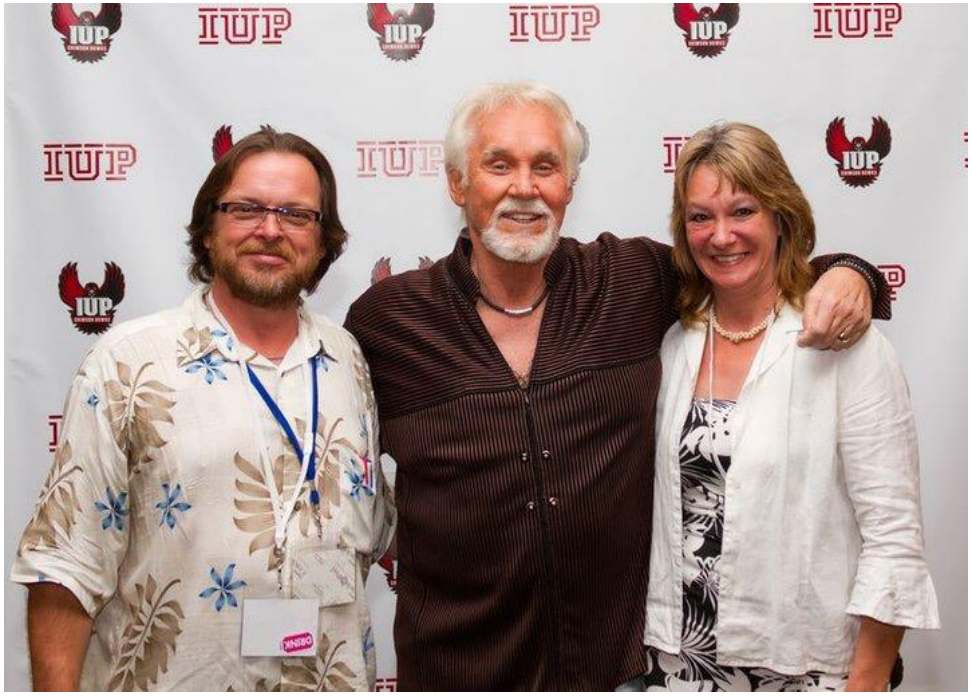
In the ground 7 years



Be Ready

Let’s let our brains cool off with a dose of fun viewing, and corrosion motivation.

<u>Find that thing you love to do, do it well</u>
<u>And you’ll never work a day in your life.</u>



As it goes in our corrosion work, dedication, drive and passion for the craft will take care of you and your family for a lifetime….Give it your all!
Live life to it's fullest!!!

Be involved with:

Your company

Your local committees

AUCSC

NACE

Volunteer & Mentor

And now for something completely different

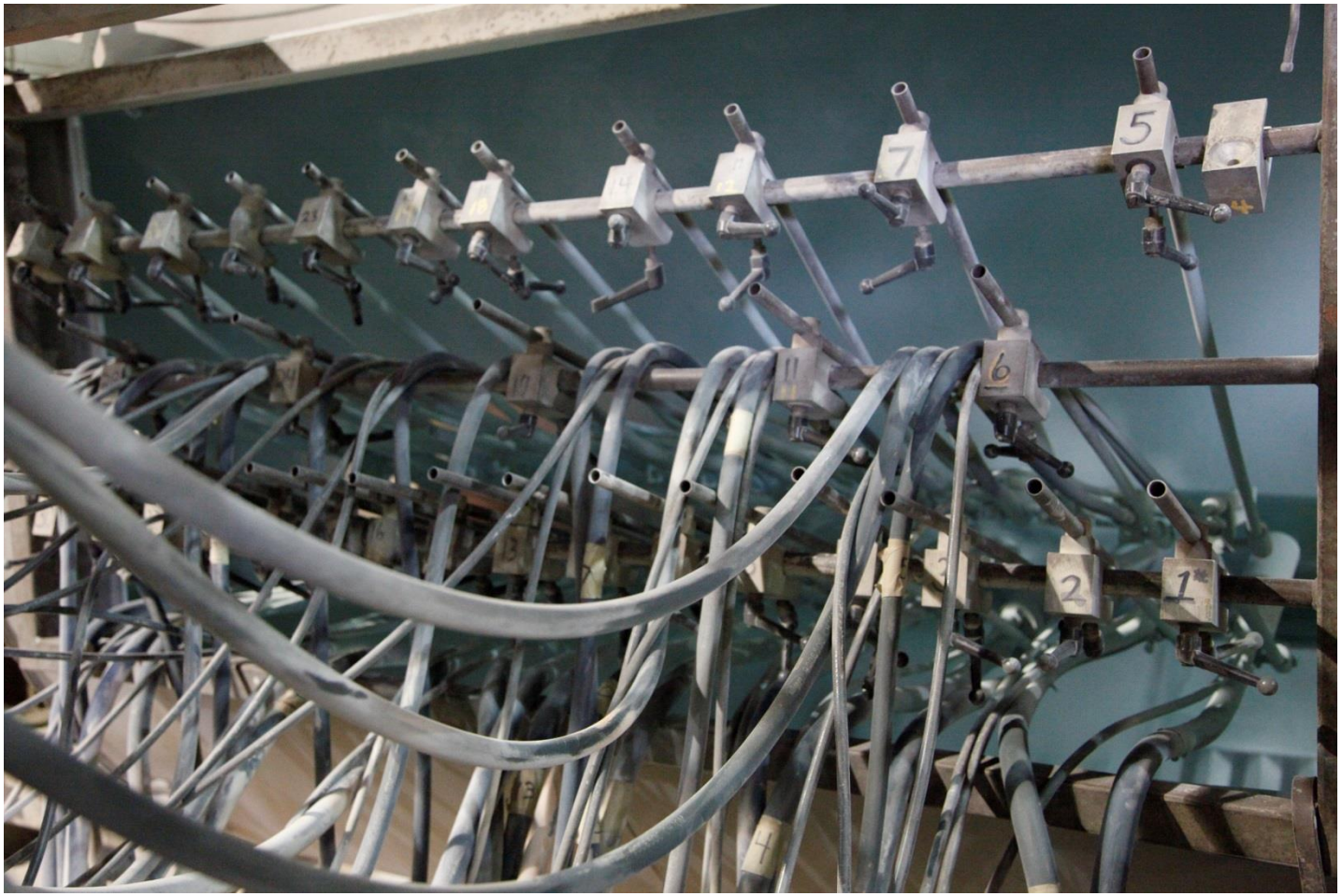
Who knows what this is in the palm?

FBE

This is how you get the bare ends on your FBE coated pipe

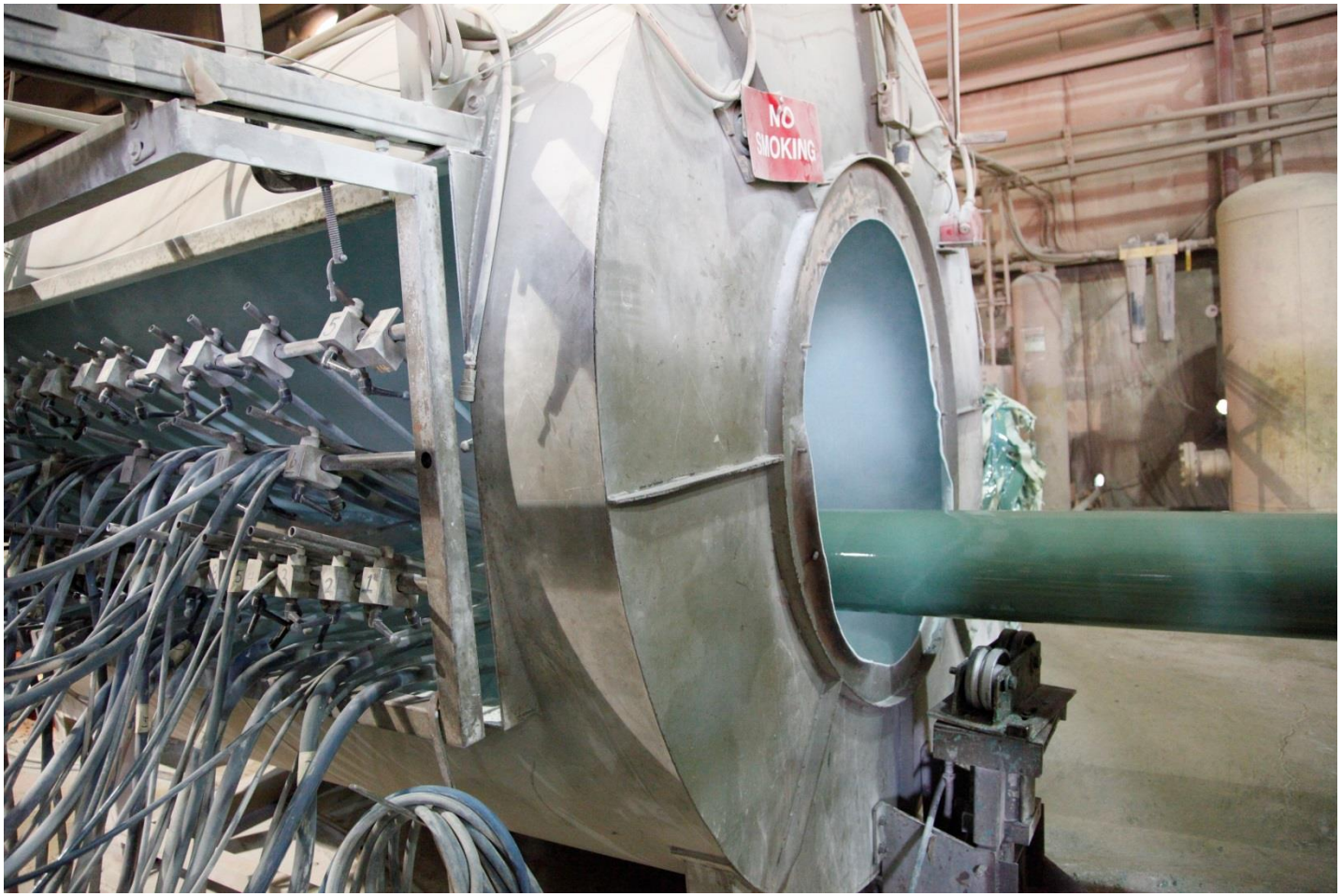
Masking Tape on

Coating spray booth



Being applied

Coming through




SMOKING

The mystery is now solved

Masking Tape off

ROW conditions are paramount to our next topics of discussion

Caning for Working Anodes

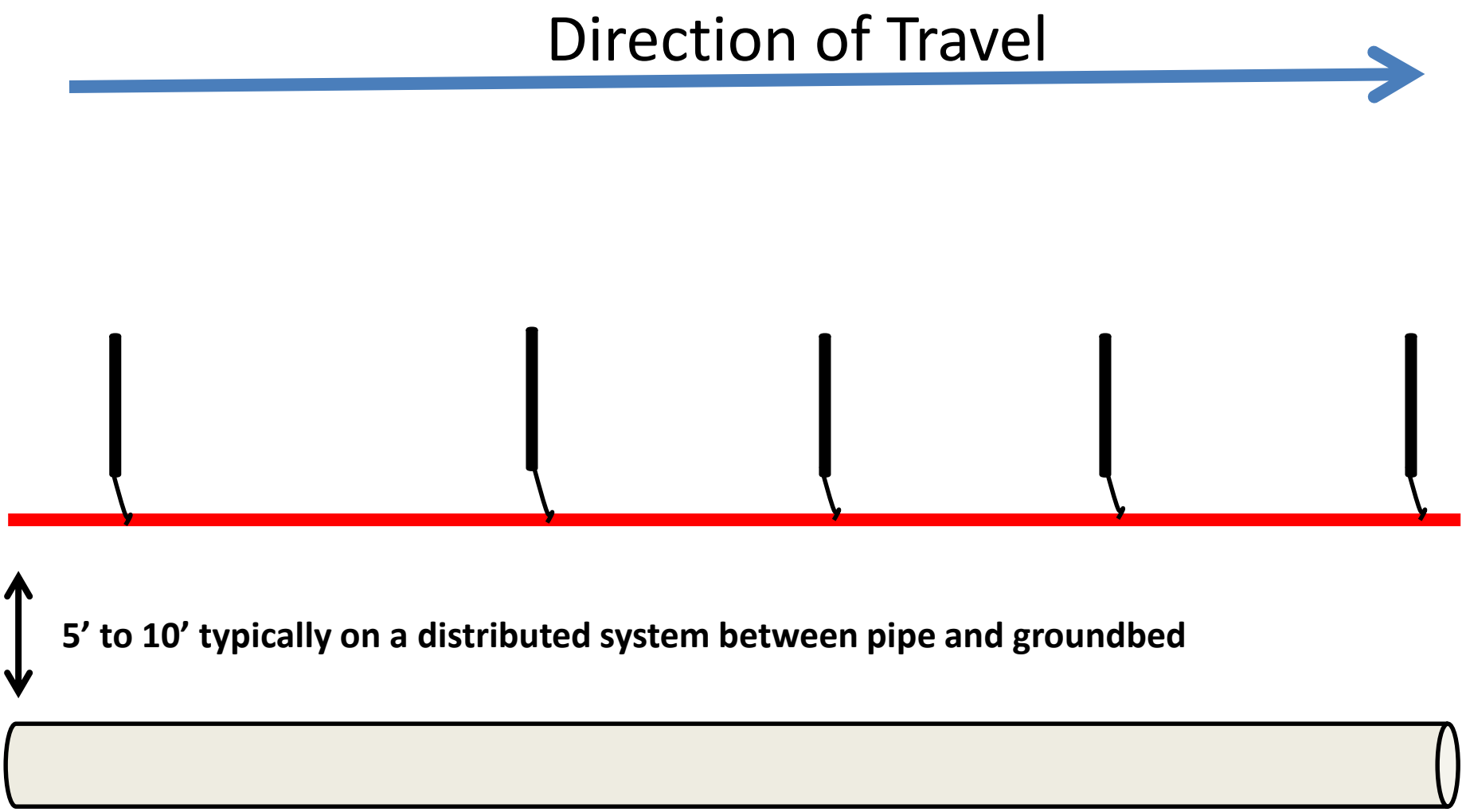
- You need 1 multi-meter, two half cells & a lead set to cover the distance between pipe and groundbed if it's a distributed system.

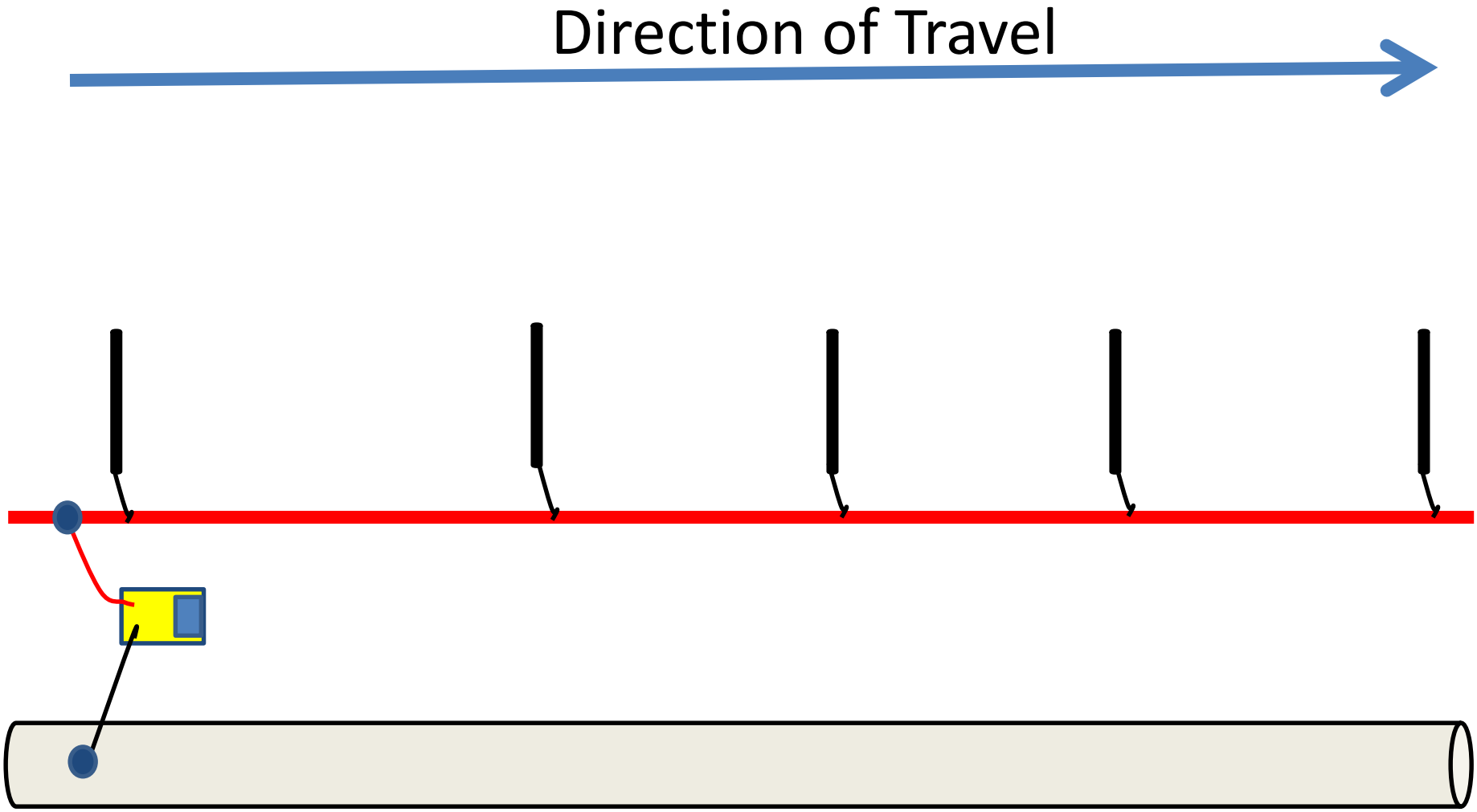
- If it's a remote bed, you need a reel lengthy enough to go from structure to anodes.

Distributed Anode System

- Two people are ideal, three is terrific. In this, two each hold and move a half cell, the third is in the middle with the meter (typical lead lengths work).
- If you've only two to work this, make a custom lead lengthy enough in distance.

Distributed Anode System




Direction of Travel

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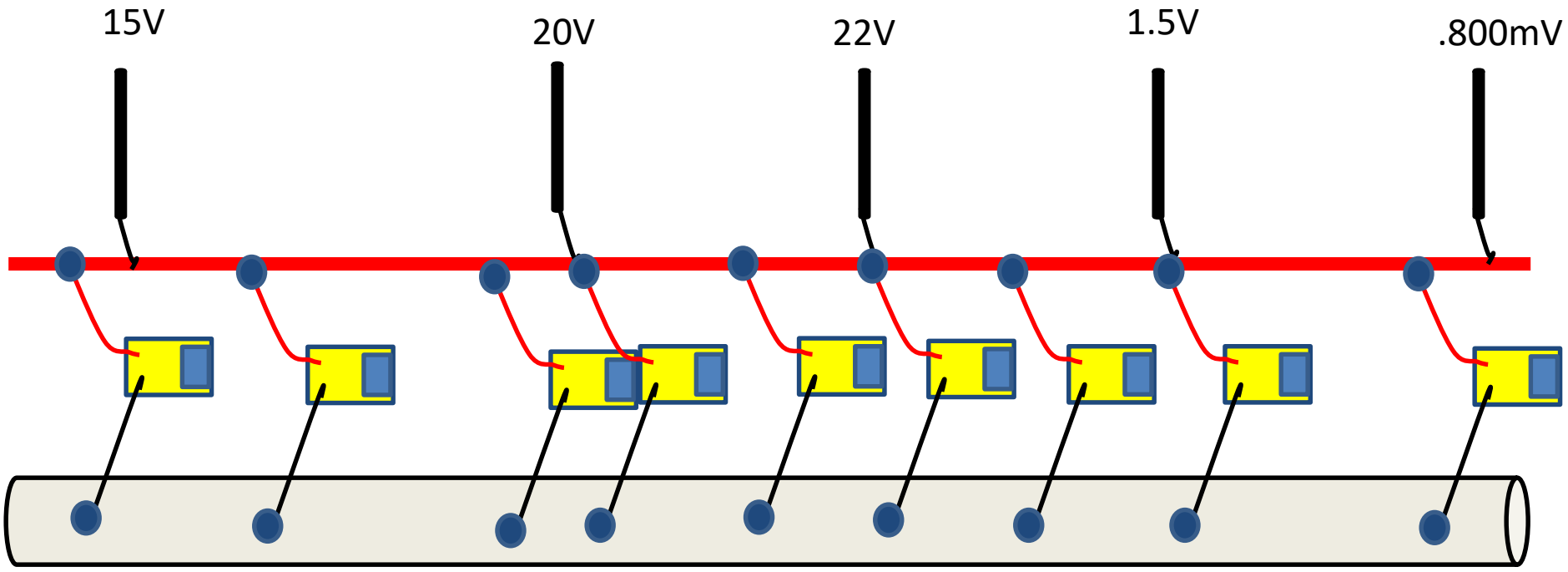
Lets say our rectifier is putting out 30V 10A



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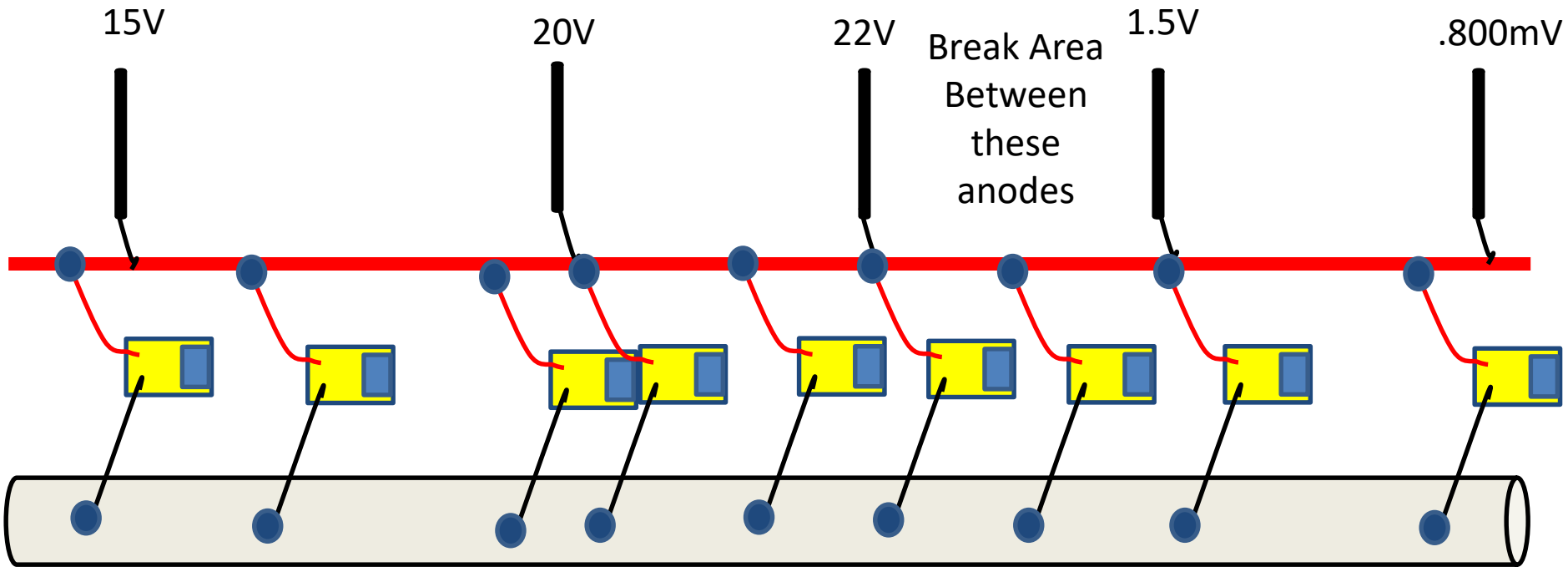
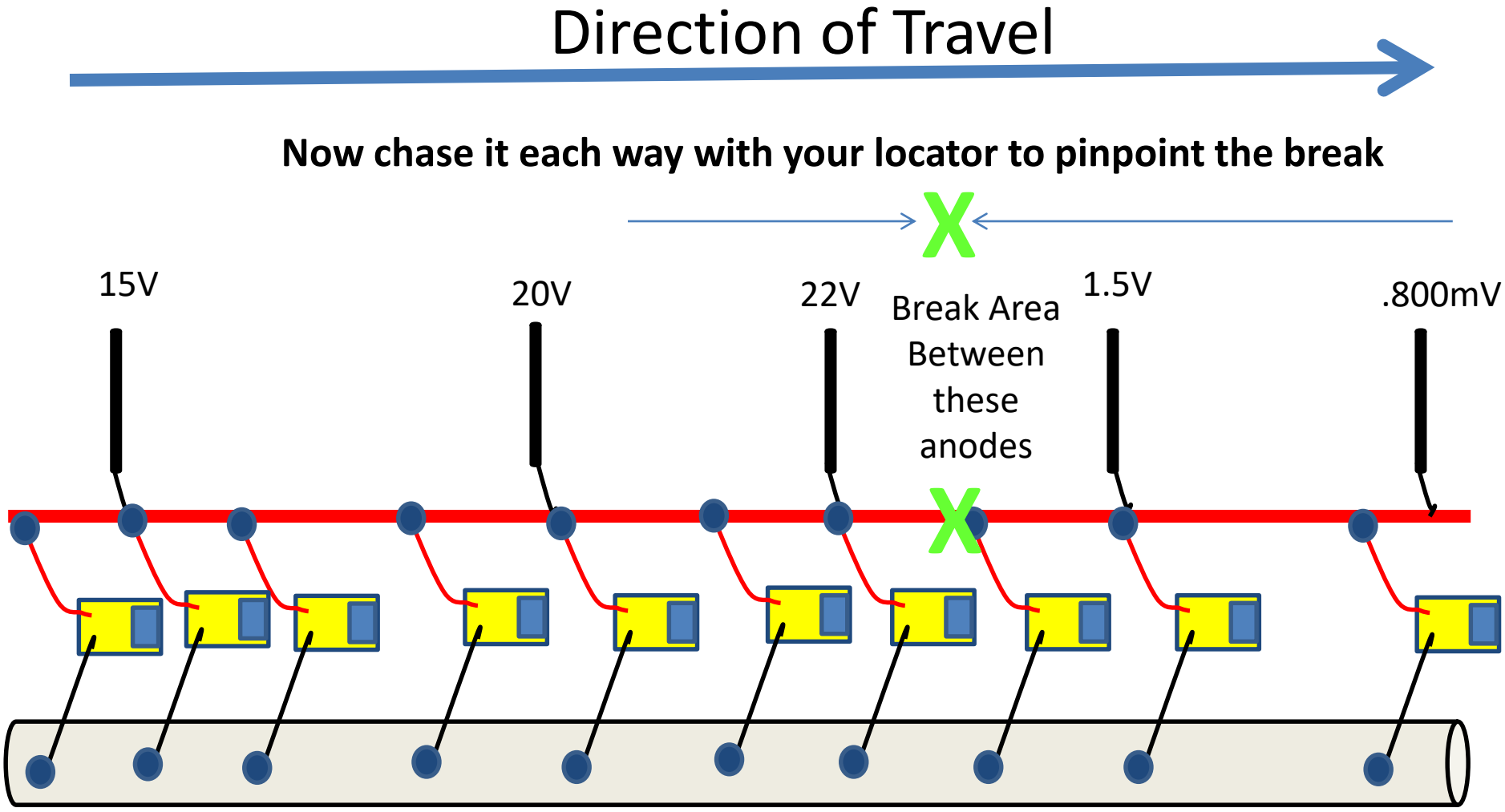


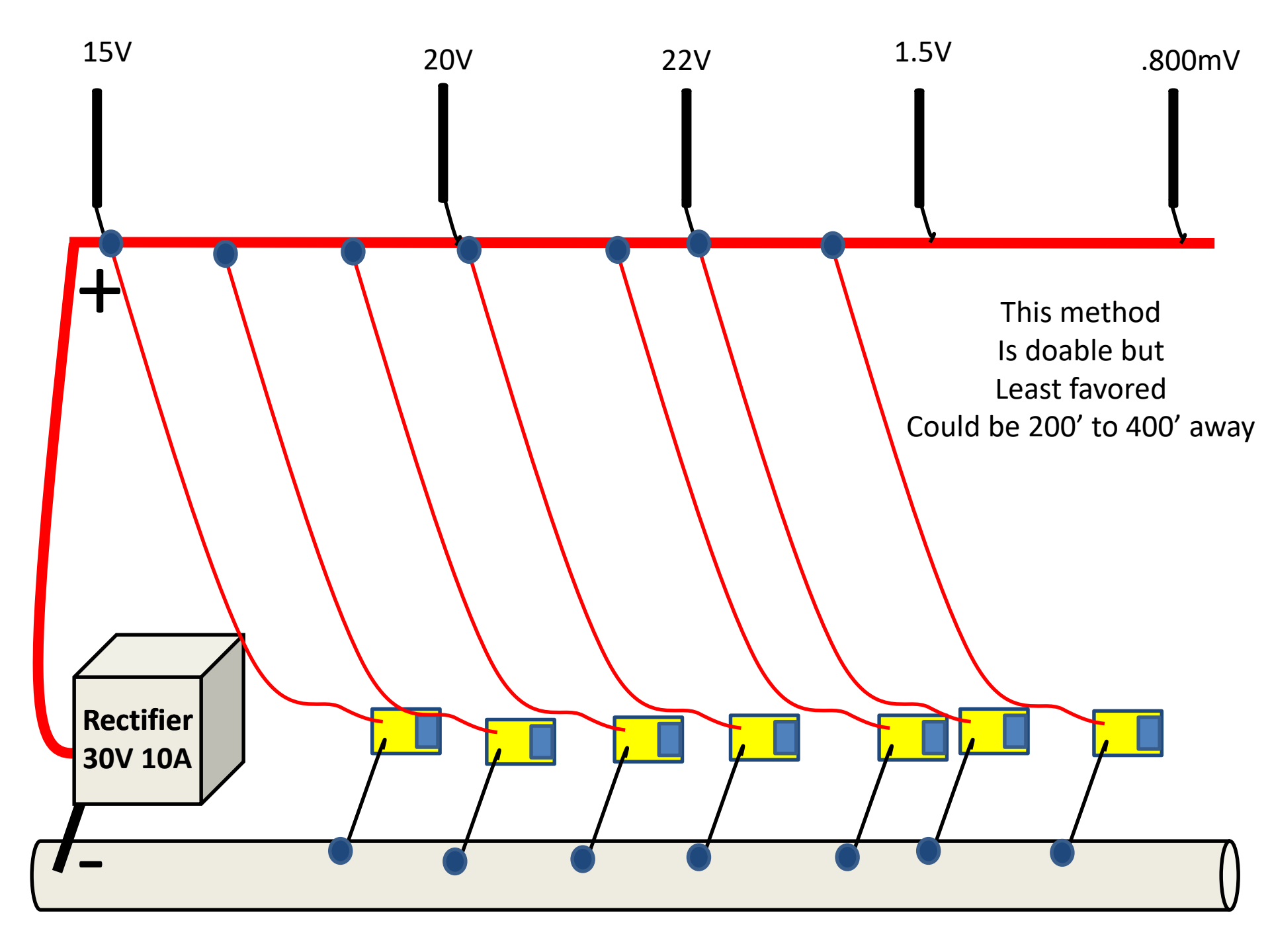


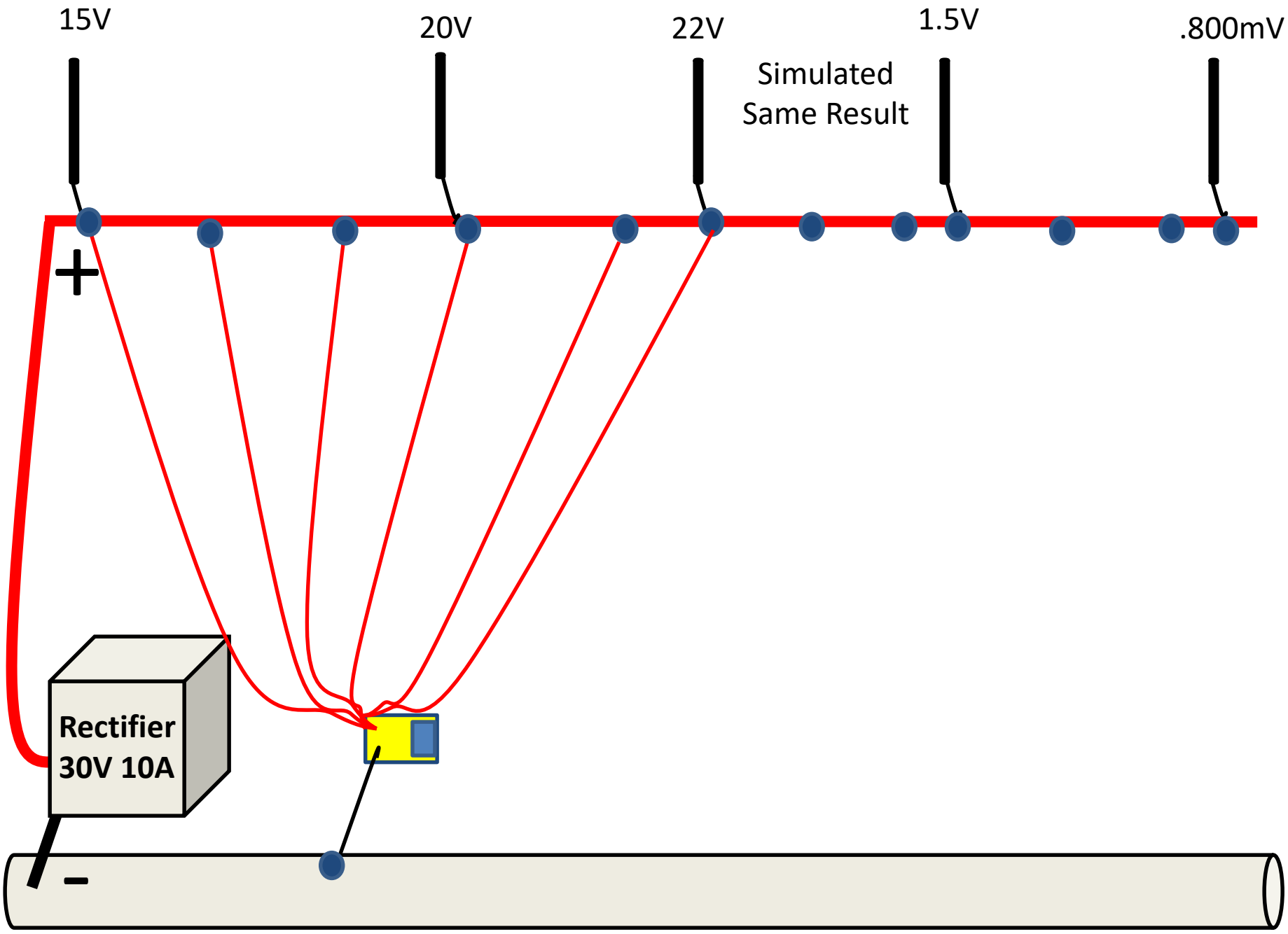
You can also find all of your anode leads with your locator, nulls over the splice kit; make a circle when you hear that and you'll pick up your lead. If not anodes are directly under The header cable

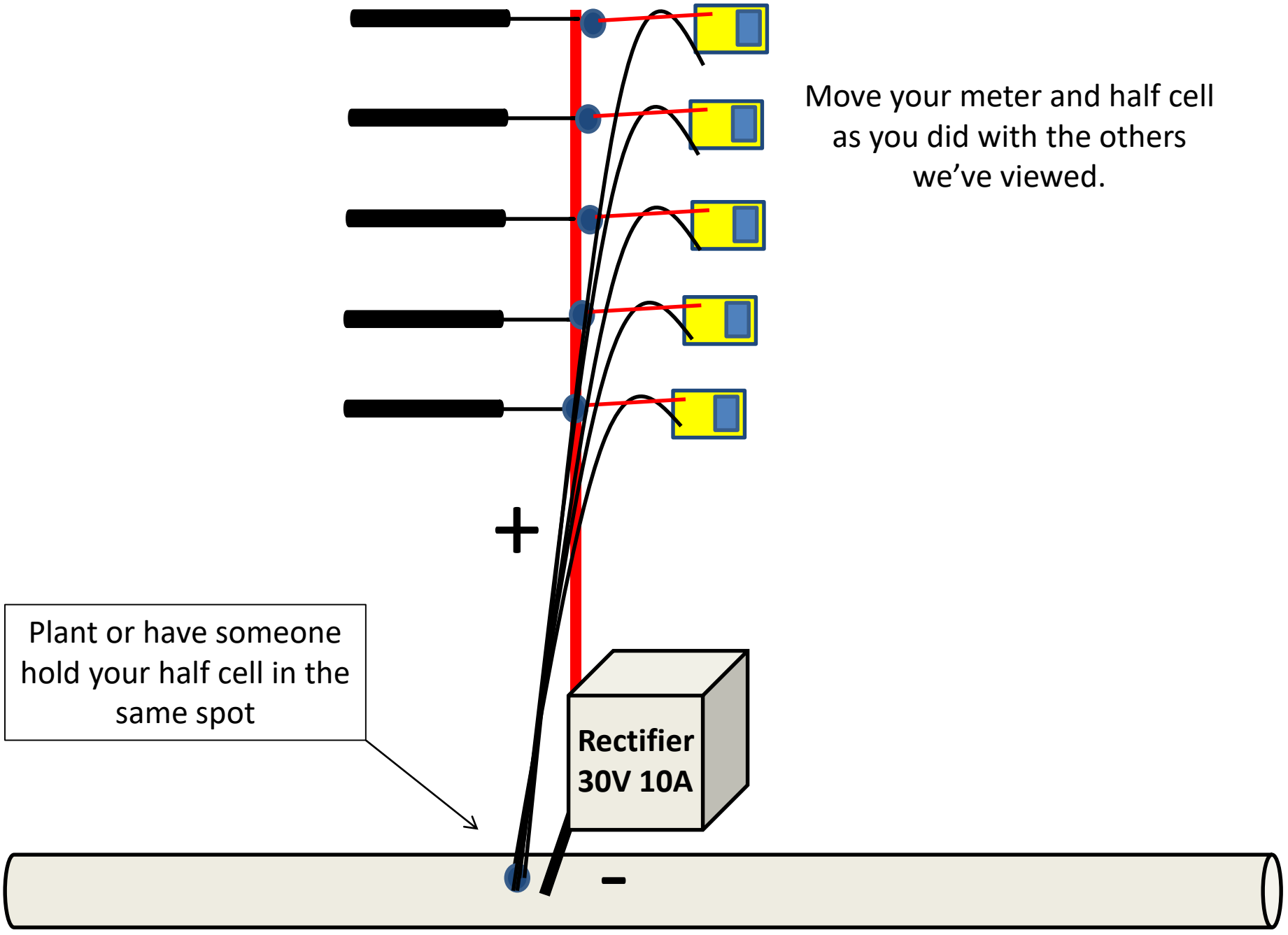
A cable break will be obvious. Depleted anodes in a groundbed can be trickier, so make sure you test the end of your cable with a simulated anode. If you have current at the end to the simulated anode, you do not have a full header cable break. It could have a strand hanging on or they've lived their service life. Check "as built" drawing if possible.

Remote Groundbeds

- You'll need a reel
- Two people are ideal, and again three is terrific.
- Have a stake ready too; if you need to plant a half cell temporarily.
- Duct tape to a marker or test station if it's in the proximity of where you're working.


15V
20V
22V
1.5V
.800mV
+
This method
Is doable but
Least favored
Could be 200’ to 400’ away
Rectifier
30V 10A
–


15V
20V
22V
1.5V
.800mV
Simulated
Same Result
+
Rectifier
30V 10A
–


Move your meter and half cell as you did with the others we've viewed.
Plant or have someone hold your half cell in the same spot
Rectifier
30V 10A
+
–

New Construction – Monitoring Test Station

- First joint installed – set it up with an anode in the test station and your two pipe wires.
- Have a read taken daily, morning is best to monitor the last days work.
- Advantages are the ability to immediately address any issues if there are any.
- There are no disadvantages to this practice.
- Could prove to be a huge money saver when you consider all required work after a newly constructed pipeline is completed.

Set up a trackable UT program

Make a book

Be consistent at your critical spots

Mark them out, don’t guess

Make a Photo Log as part of your book

Great for tracking and trending

What your eyes see is a great technique (collected & quality data over eyes though) What do you see in the next few slides??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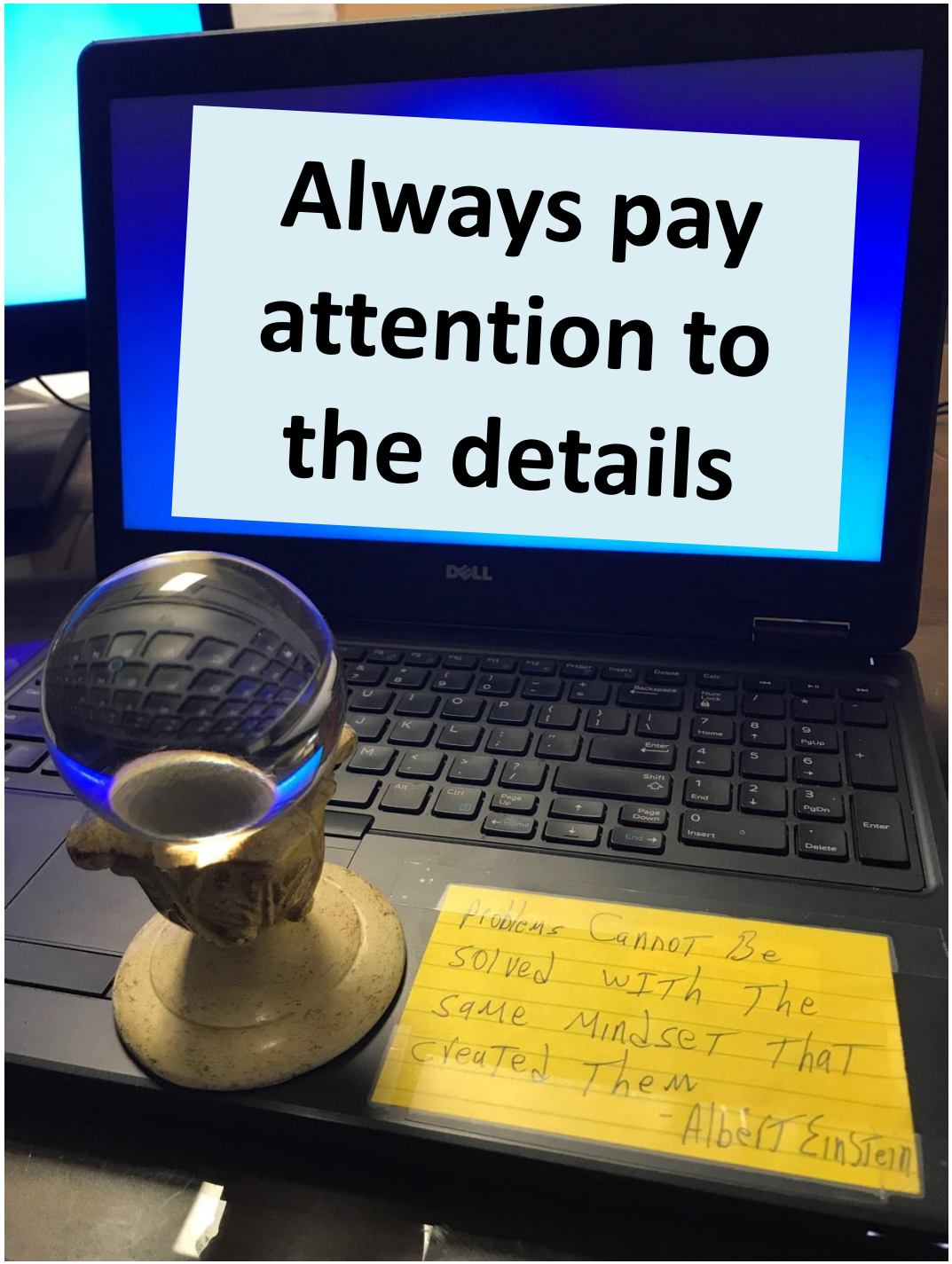
What would happen if you took a read with your board here?

The most unsafe act I’ve ever encountered

Here's why


Always pay attention to the details
Problems Cannot Be solved with The same Mindset That created Them
-Albert Einstein

Perfection & Care = Pride in Ownership

Questions????

From one corrosion friend to another

Thank you for your time and participation