

# Exothermic Welding Training

Andy McElroy – Harger Lightning & Grounding

Sponsored by:

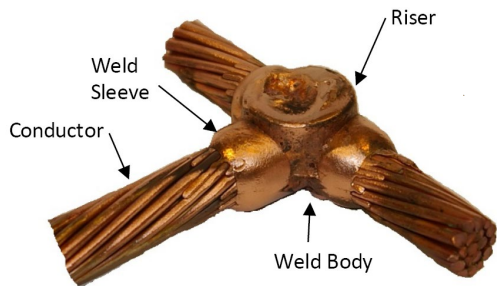


Session 1: *Practical Bonding Practices*  
March 16, 2022

## Agenda

- What is an exothermic weld
- Benefits of an exothermic weld
- Required tools
- Welding preparation
- Connection Process
- Inspection Process
- Common obstacles/best practices
- Tools/Accessories that improve productivity and quality
- No hands on, Sorry...

## What is an exothermic weld



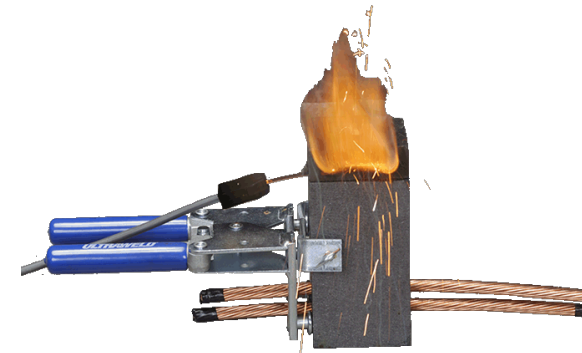
- Chemical reaction in which heat is liberated
- Reaction provides the heat necessary to make a molecular connection between to 2 or more metal objects.
  - Such as copper to copper or copper to steel

## What is an exothermic weld

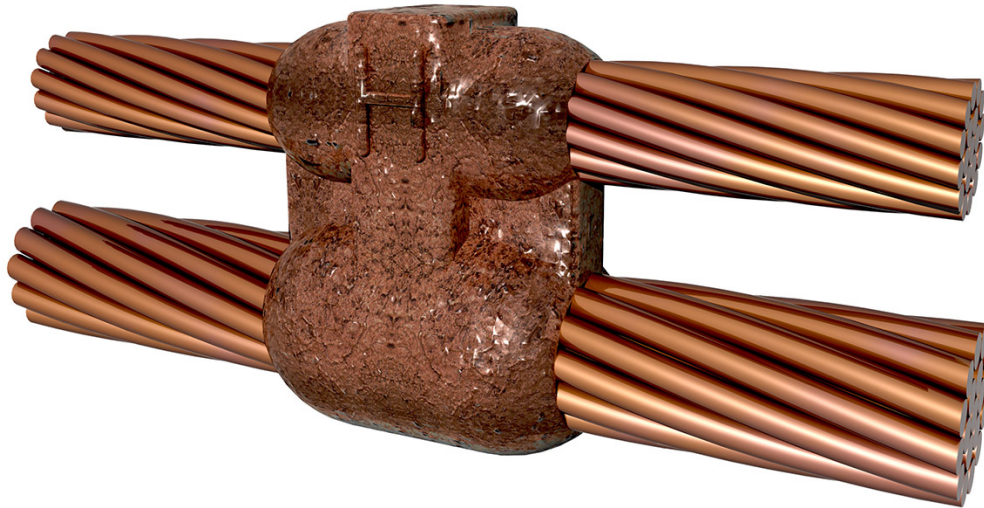
- Chemical reaction; copper oxide and aluminum



- Molten copper drops down in graphite mold to weld conductors together
- This reaction reaches approximately 4,600 degrees.



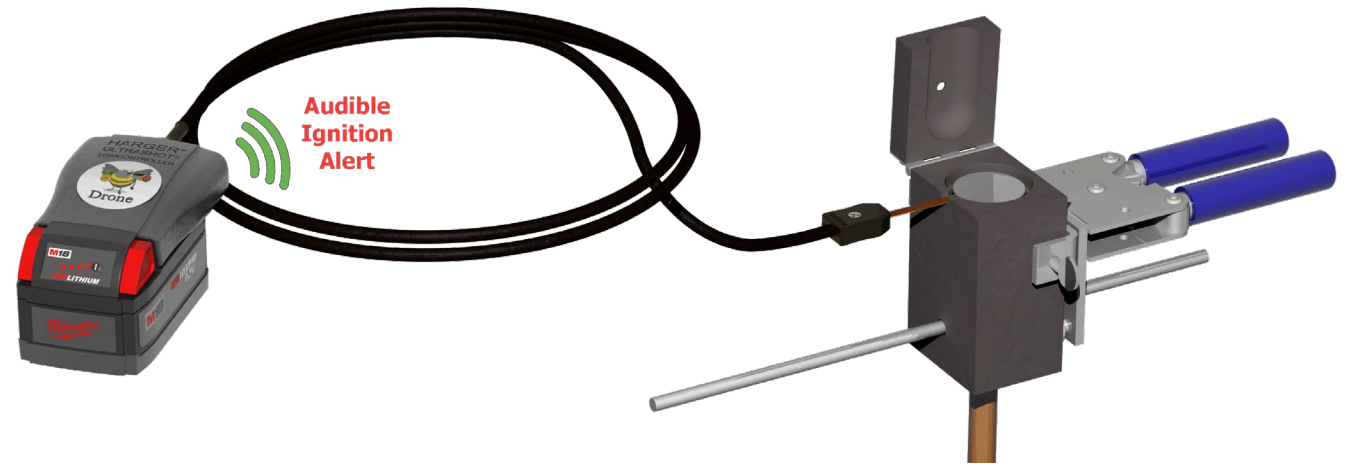
## Benefits



- Ampacity exceeds that of the conductors
- Lasts longer than the conductors it connects
- Permanent
- Will not loosen over time
- No maintenance
- No Increase in resistance over time

## Required tools

- 4 main components for making welds
  - Mold
  - Handle
  - Weld Metal
  - Igniter



## Required tools

- Molds
  - Made of graphite
  - Average 50-100 welds
  - Proper care and cleaning extends mold life
  - Ensure the mold is correct for the application



## Required tools

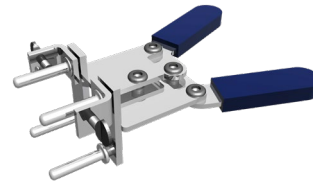
- Mold Proper Care
  - DO NOT use wire brush
  - DO NOT use screwdriver
  - DO NOT push conductor into a closed mold
  - Preheat mold





## Required tools

- Handles
  - Different molds can take different handle sizes or configurations



## Required tools

- Weld Metal
  - Different sizes
    - Connection determines amount needed
  - Ignition type
    - Traditional tubes & Electronic Ignition



## Welding Preparation

- **Safety First!**
  - Follow all procedures and warnings on instruction sheet
  - Glasses and gloves at all times
  - Follow job site/company PPE requirements.



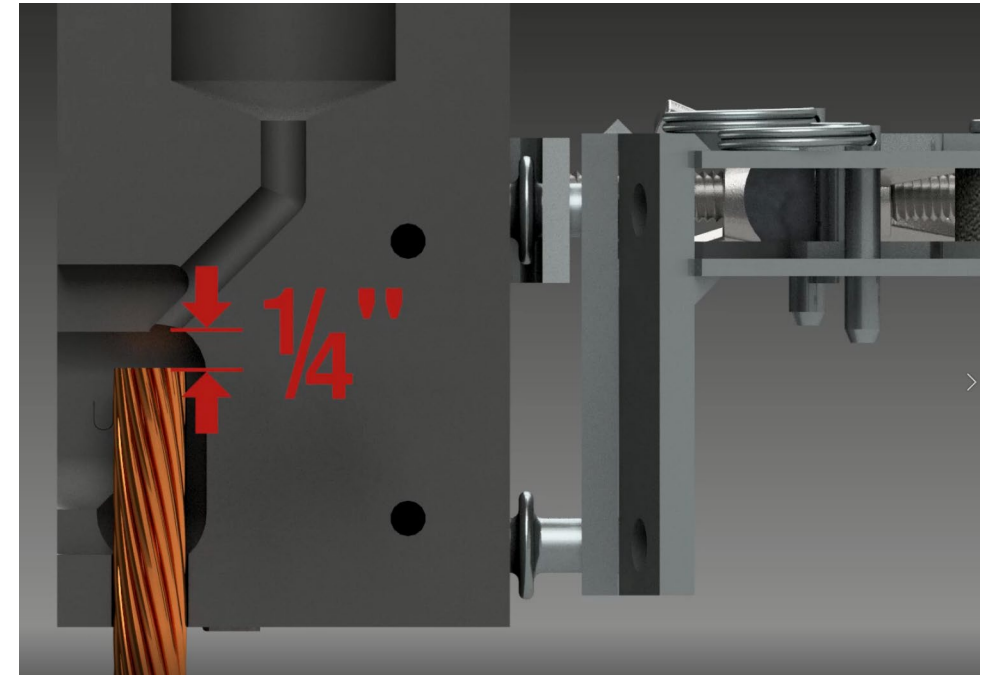
## Welding Preparation

- Prep and cleaning tools
  - Cable and surface cleaning brushes
  - Mold cleaning brush
    - Soft bristle brush
  - Torch for pre-heating mold



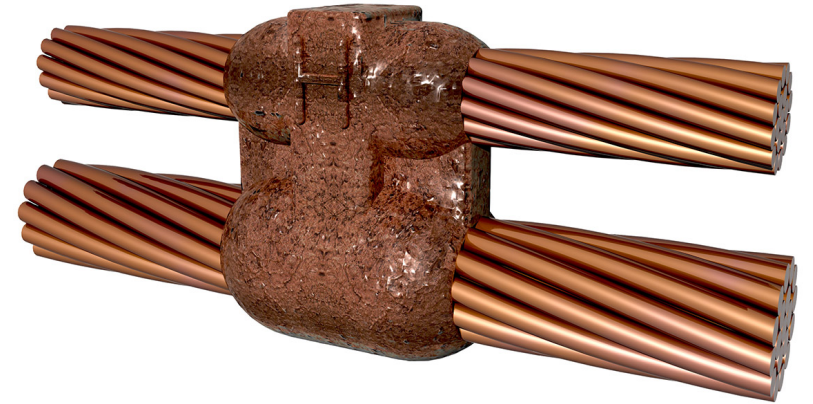
## Welding Preparation

- Read instructions
  - Conductor placement can be key to making a good weld.



## Connection Process

- 5 steps to making a successful weld
  - Will cover electronic ignition method
    - Safer
    - Efficient
    - Higher Quality



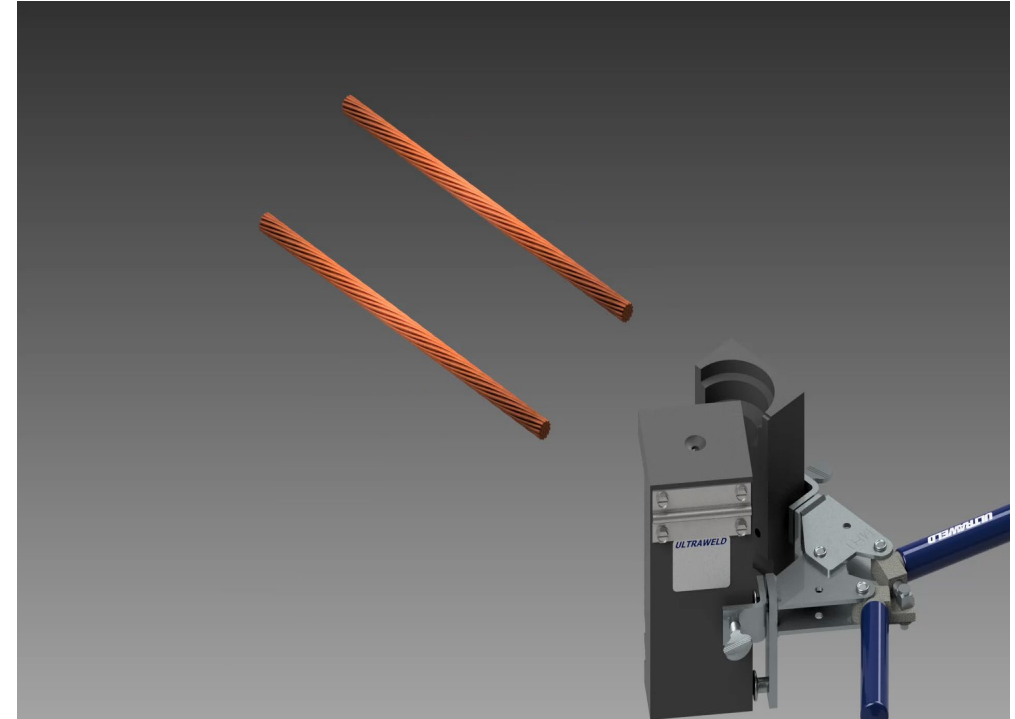
## Connection Process

- STEP 1 – Dry and clean the mold and conductor to eliminate moisture



## Connection Process

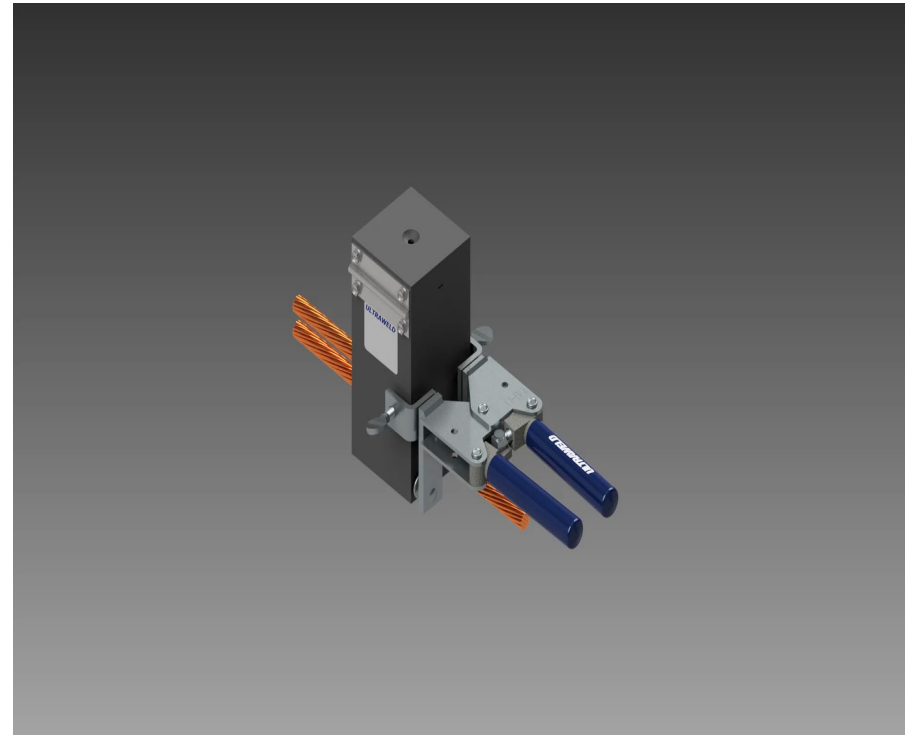
- STEP 2 – Place conductors into the mold and then close
  - Verify mold closes
  - Support everything





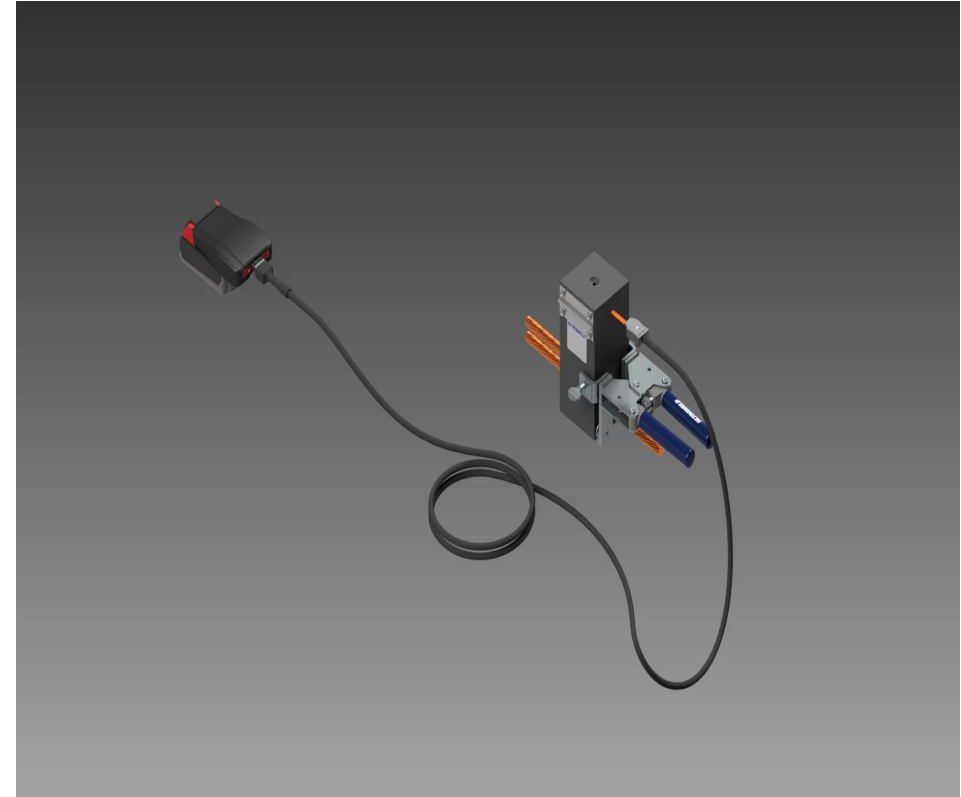
## Connection Process

- STEP 3 – Insert weld metal into the mold, close lid, and attach igniter to cartridge
  - Tubes require additional steps



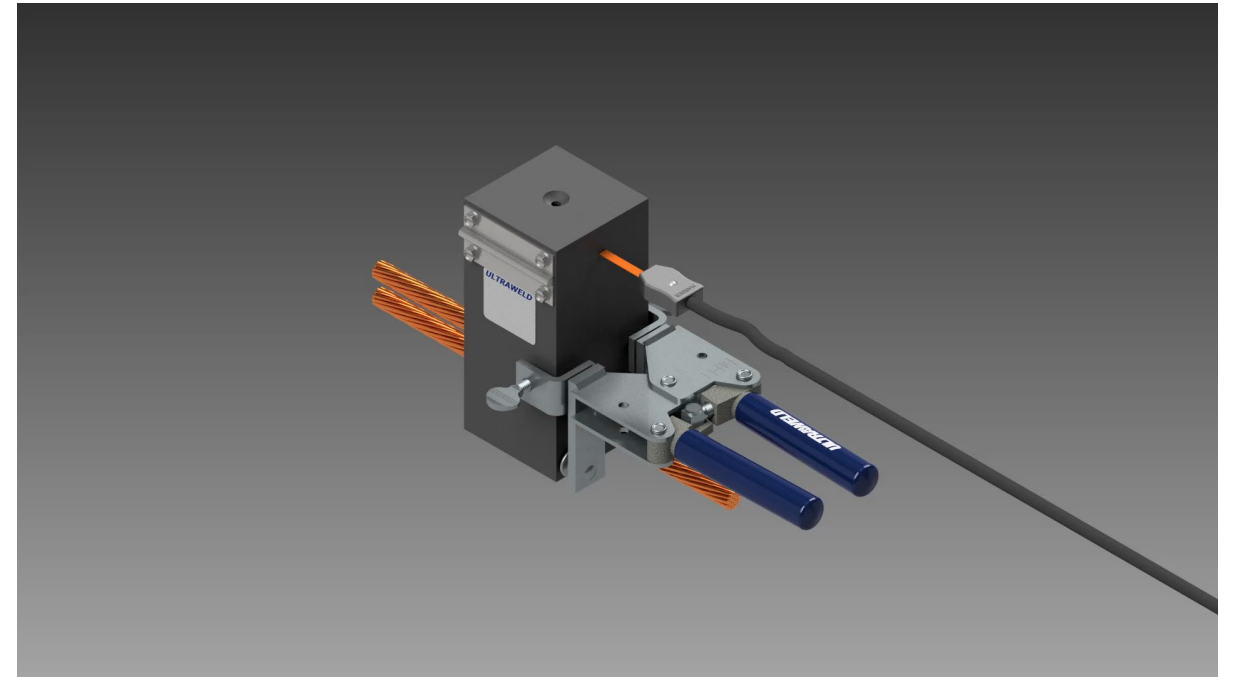
## Connection Process

- STEP 4 – Initiate reaction



## Connection Process

- STEP 5 – Allow 15-20 seconds for the reaction to complete.
  - Remove connection and clean the mold



## Inspection Process

- Mold inspection



## Inspection Process

- Weld Inspection



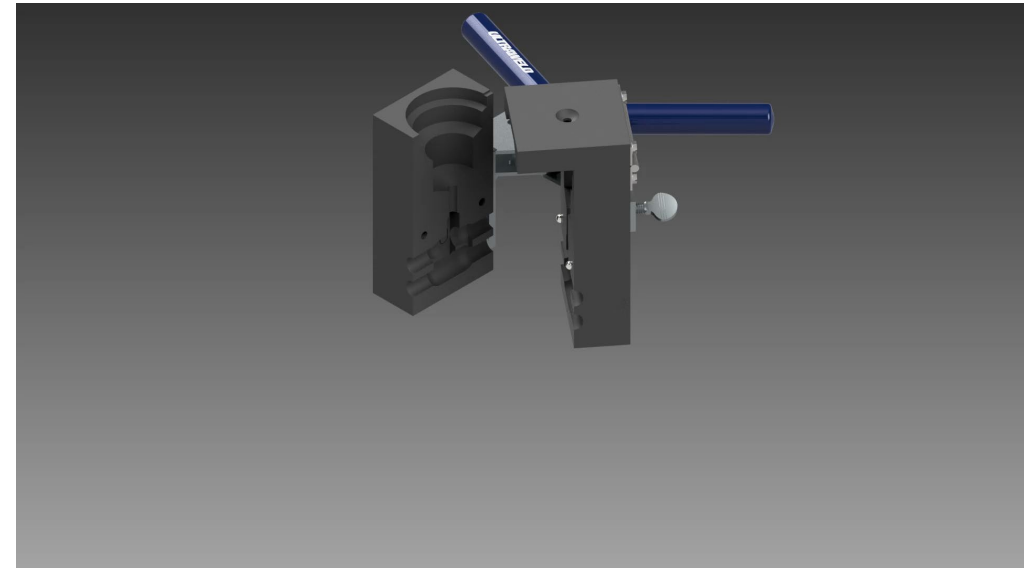
Sponsored by:



Session 1: *Practical Bonding Practices*  
March 16, 2022

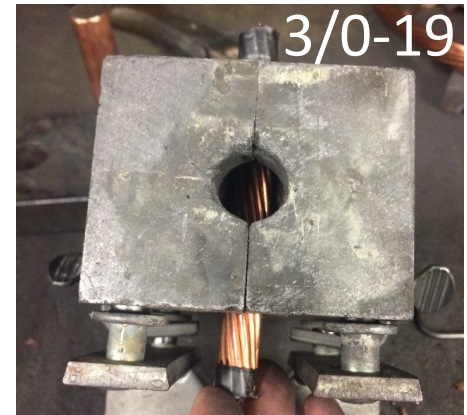
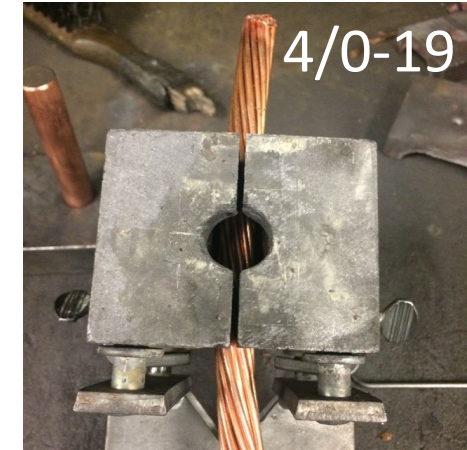
## Common Obstacles/Field Issues

- Surface/Conductor prep
- Pre-heating mold



## Common Obstacles/Field Issues

- Mold does not close all the way
  - Dirt, slag, other material in mold
  - Bent or out of round conductors
  - Handle clamp not shut/out of adjustment
  - Wrong Mold for the application



## Common Obstacles/Field Issues

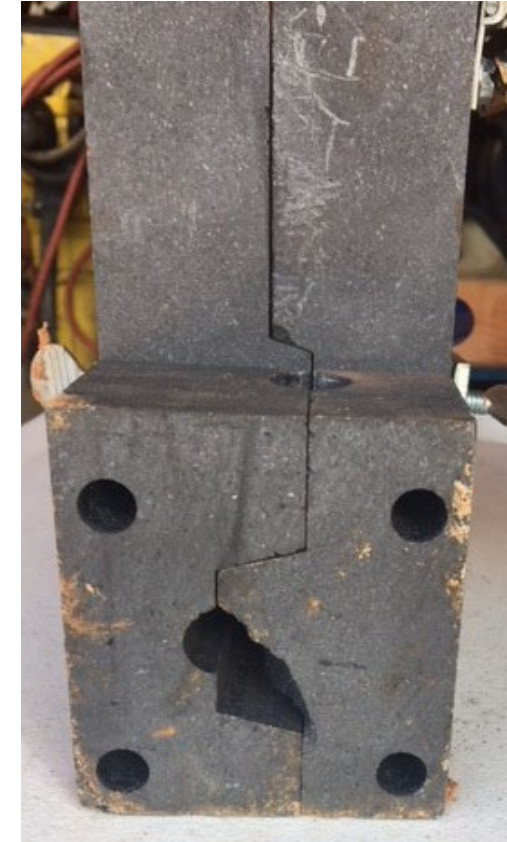
- Weld underfills
  - Leakage
  - Incorrect mold for application
  - Wrong size weld metal





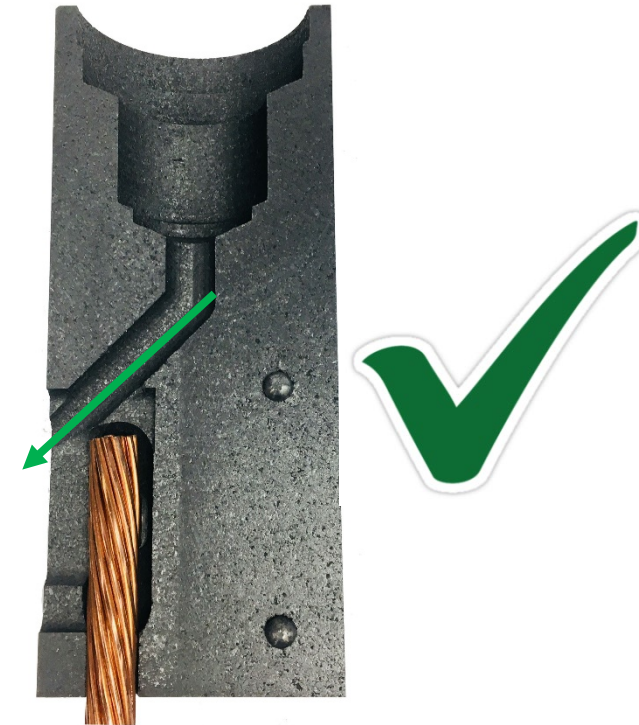
## Common Obstacles/Field Issues

- Mold breaks
  - Use care when removing



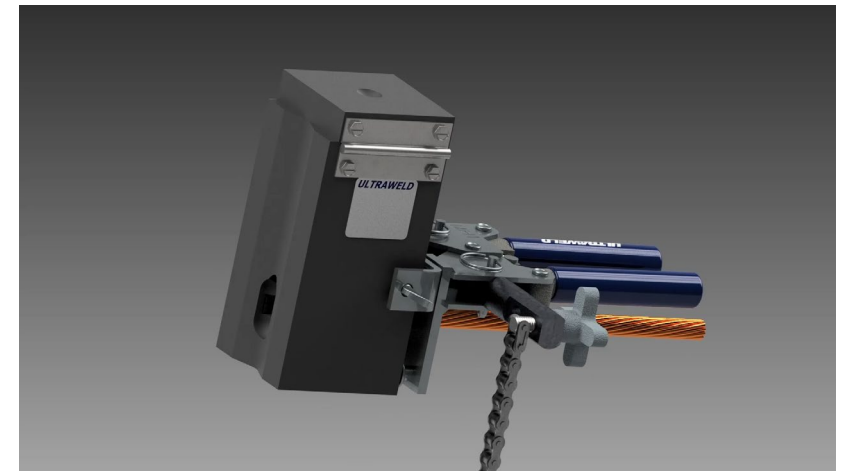
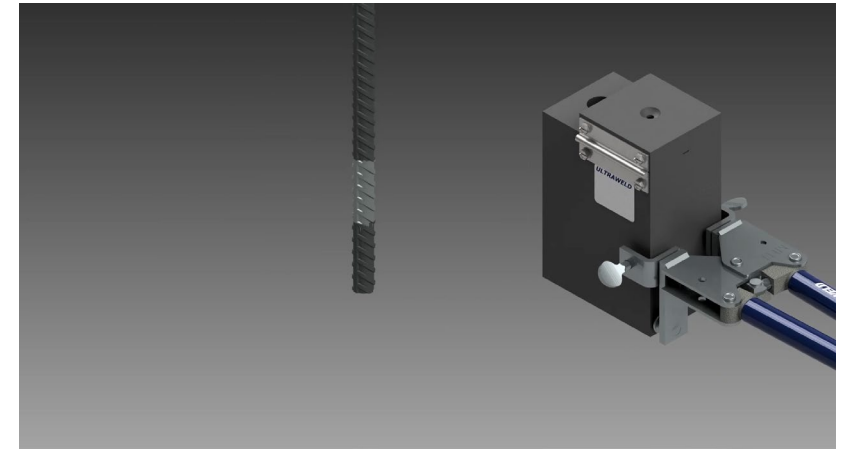
## Common Obstacles/Field Issues

- Connection not sticking to steel surface
  - Surface preparation
  - Cable placement



## Common Obstacles/Field Issues

- Connection not sticking to reinforcing steel
  - Surface preparation
  - Not using sleeve or packing pad



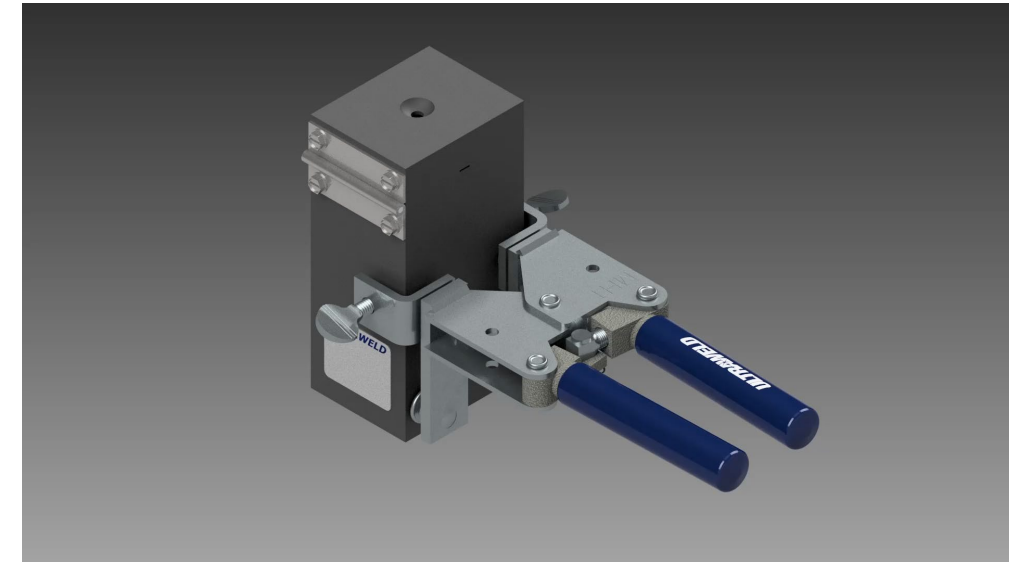
## Common Obstacles/Field Issues

- Burn through on thin material
  - Verify on extra piece of material
  - Thin wall fence post



## Common Obstacles/Field Issues

- Melt thru on cable to grd rod
  - No tension on conductor
  - Mold not supported



## Common Obstacles/Field Issues

- Molds leaks
  - Mold worn out
  - Handles not fully closed
  - Wrong mold for application



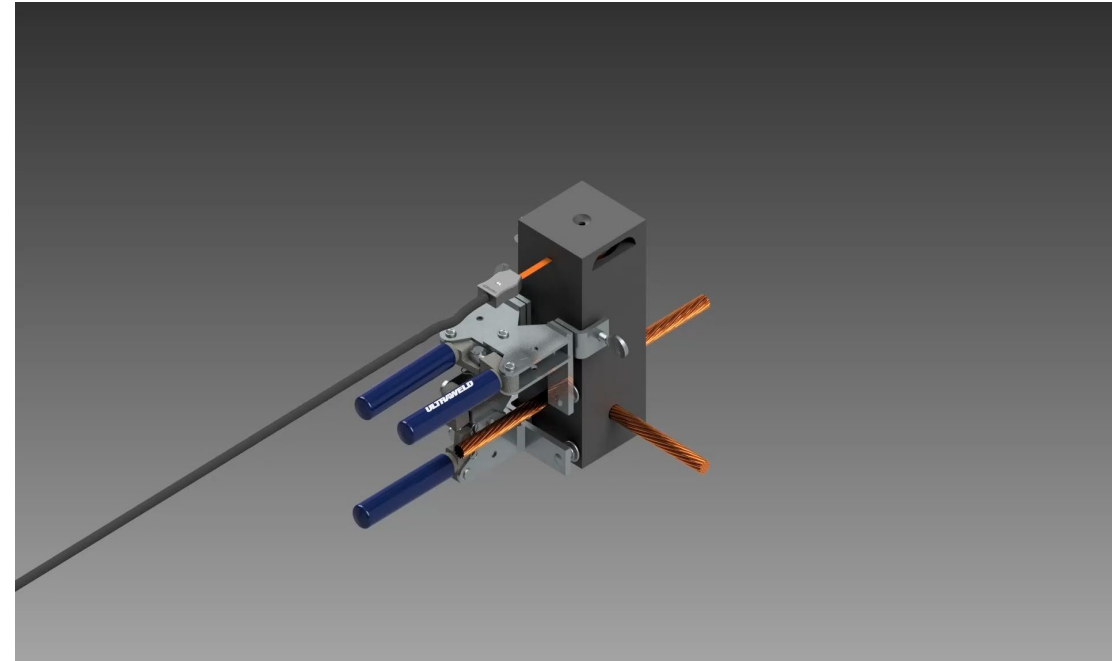
## Common Obstacles/Field Issues

- Mold is closed, but leaks after weld metal is ignited
    - Cables are not supported in a manner that removes tension
    - Cables can pry mold open
- Note: weight on lid is not needed



## Common Obstacles/Field Issues

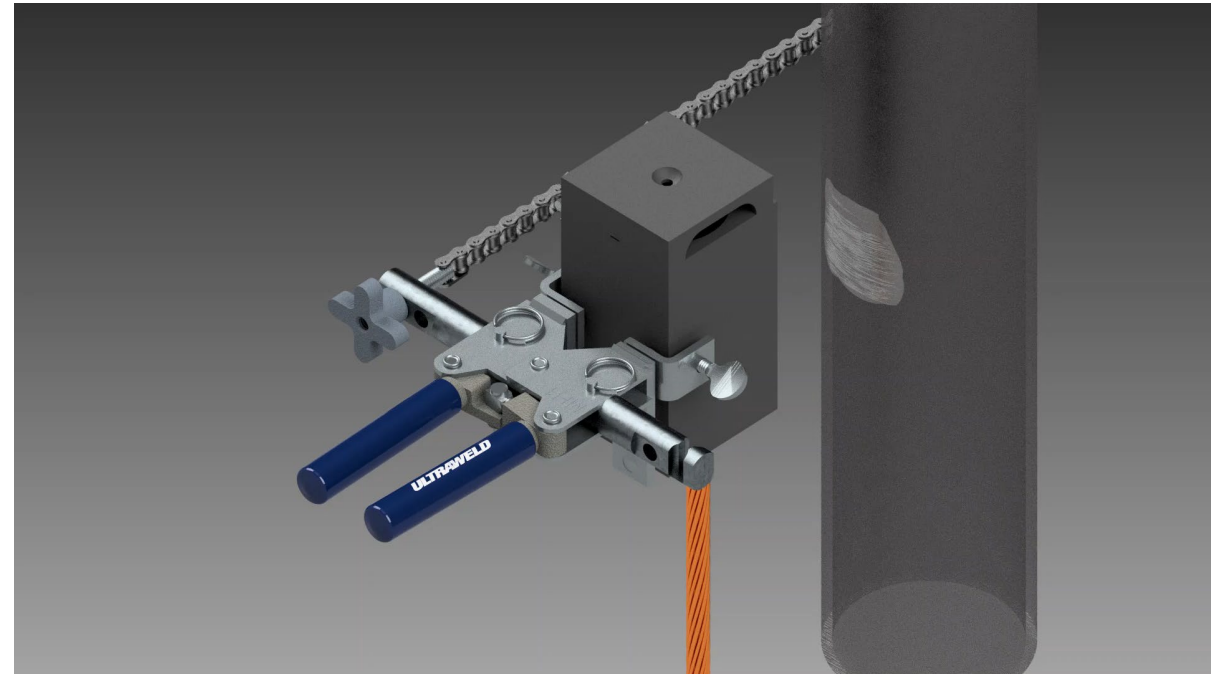
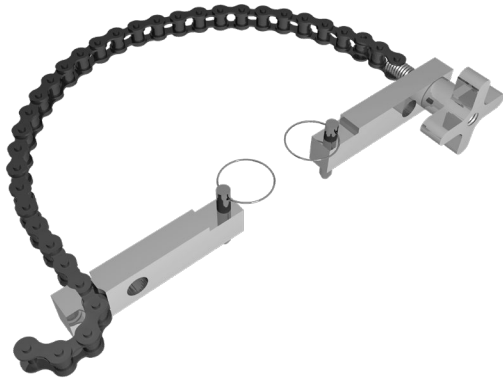
- 3 piece molds vs 2 piece
  - Easier to clean
  - High riser will not lock mold on connection
  - Easier to use than molds with frames





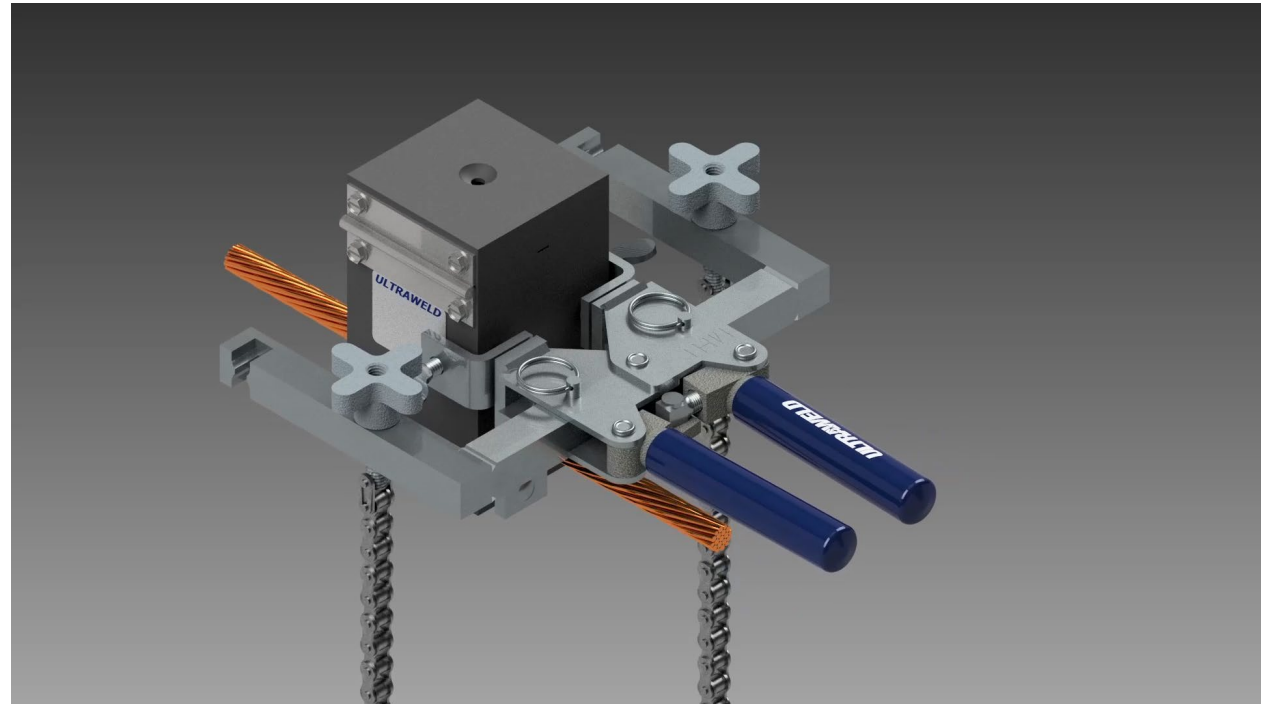
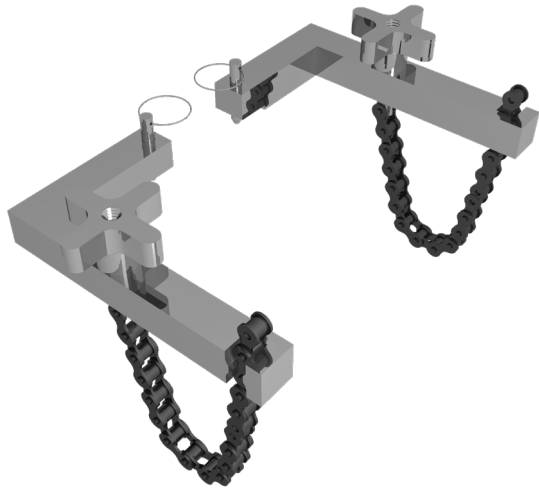
## Productivity, Quality, Safety

- Chain supports



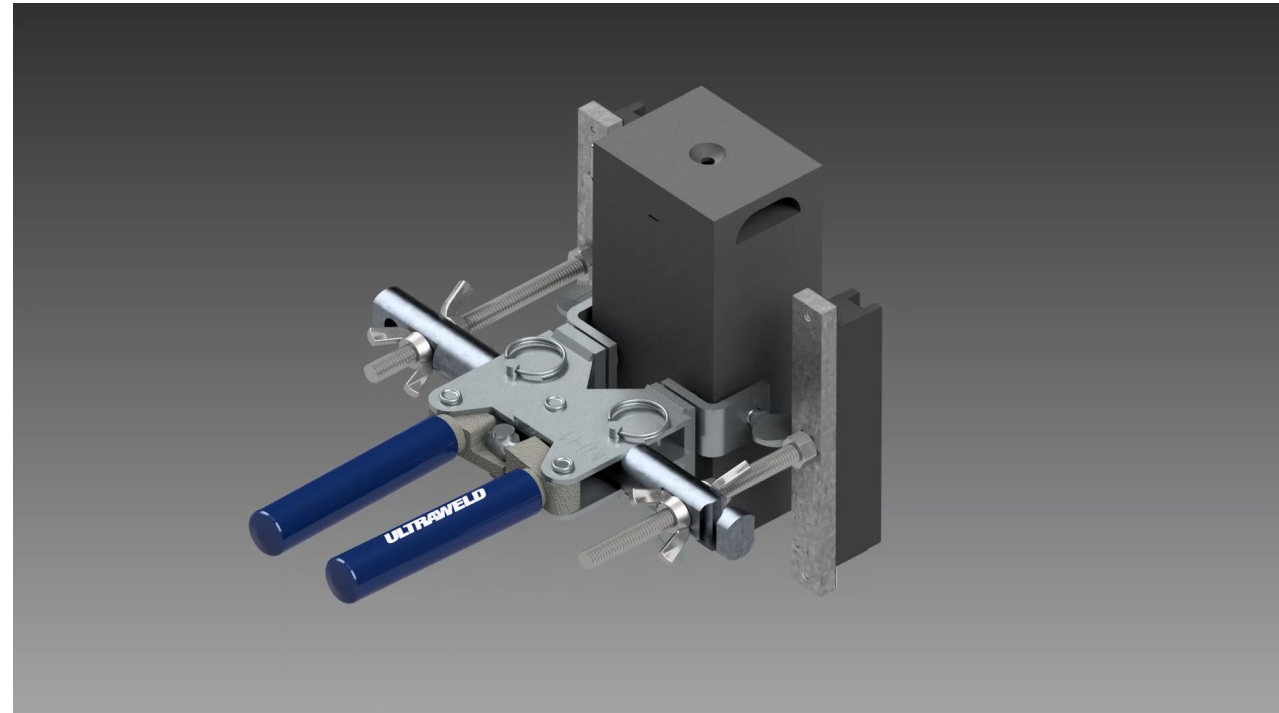
## Productivity, Quality, Safety

- Chain supports



# Productivity, Quality, Safety


- Magnet supports



# Thank you

Exothermic Welding Training

Andy McElroy

  
Grounding - Exothermic - Lightning Protection

Sponsored by:



Session 1: *Practical Bonding Practices*  
March 16, 2022