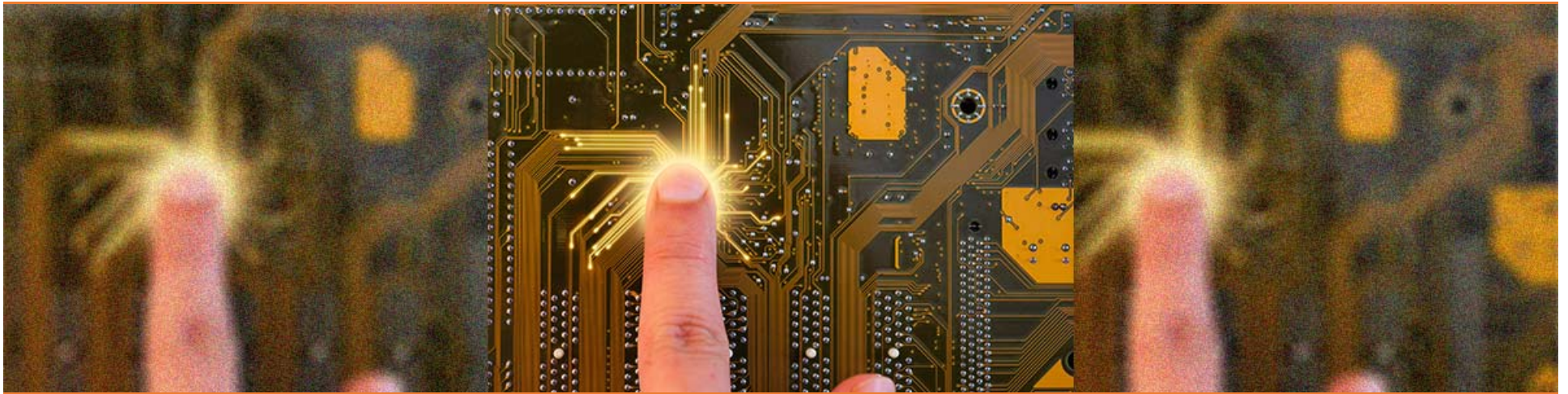


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**HERMETIC SOLUTIONS GROUP**  
*Enabling Technology*

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## **Explosive Metal Welding**

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# The Hermetic Solutions Group Bonded Metals Division

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2249 Diamond Point Road  
Sequim Washington



# The Hermetic Solutions Group Bonded Metals Division

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## Who we are:

Hermetic Solutions Group Bonded Metals Division

- In operation since 1970
- Formally known as Northwest Technical Industries

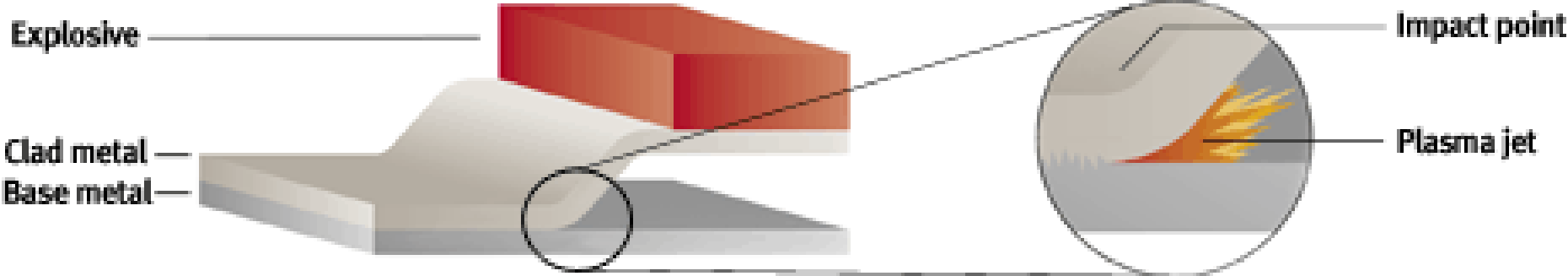
## What we do:

We use explosives to weld or bond dissimilar metals together and to explosively form metals into exotic shapes that are difficult or impossible to do by conventional methods.

Explosives are also used to compact or consolidate metal powders into near net shapes.

# The Explosive Metal Bonding Process

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# Why Explosive Bonding?

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- Perfect for meeting both heavy weight and light weight design requirements
- Much stronger than friction and diffusion welded joints
- Location of bond layers can be controlled within a design
- Weldable bi-metallic transitions (ferrous to non-ferrous)
- Eliminates galvanic corrosion (between dissimilar metals)
- Reduced need for mechanical integration (bolt-on vs. welding)
- Precious metal conservation (linings, facings, etc.)
- Markets for this technology include:
  - Chemical industries (corrosion resistance)
  - Power plants
  - Naval applications
  - Particle accelerators
  - Semiconductor production (sputter targets)
  - Space satellites

# The Explosive Metal Bonding Process

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## Step 1: Metal Preparation

Here, copper and nickel sheets are surface prepped:



Copper Plate



Nickel Plate



# The Explosive Metal Bonding Process

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## Step 2: Metal Preparation

Shot assembly applied to bond Inconel to nickel



# The Explosive Metal Bonding Process

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## Step 3: Transporting Material to Remote Blast Site

Noise created by blasts require material to be transported to a remote area for detonation





# The Explosive Metal Bonding Process

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## Step 4: Preparing for Detonation



Final shot readied for detonation



Hoppers for pouring explosives into charge gap

# The Explosive Metal Bonding Process

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## Step 5: Detonation



# The Explosive Metal Bonding Process

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## Step 6: Flattening



Ni/Inconel plates before flattening



Plates after flattening

# Explosive Metal Bonding Examples

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## Aluminum/Stainless

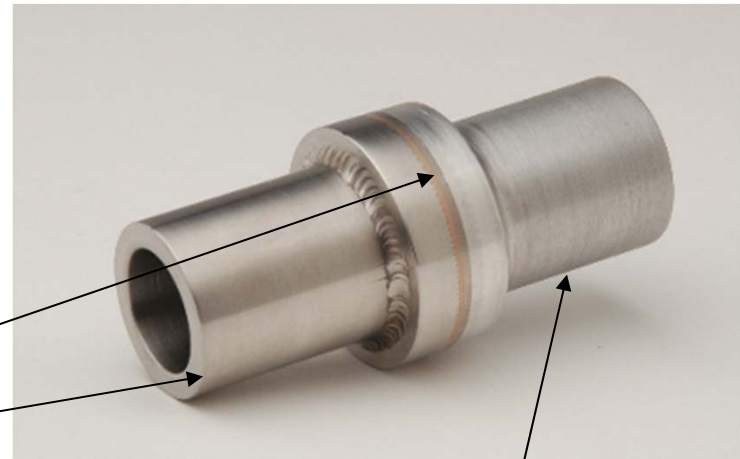


SS Rib

SS Weld

Transition Bar

Al Rib



Transition Ring

SS Pipe

Al Pipe



# Explosive Metal Bonding Examples

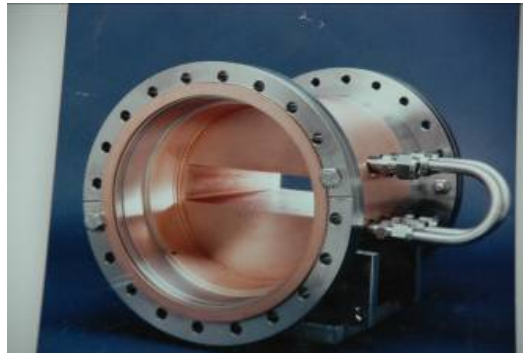
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Copper/stainless  
UHV conflat flange



Custom 6" conflat  
flange with  
stainless, copper  
& stainless



Cu/stainless exit slit  
for UHV beam line



# Explosive Metal Bonding Examples

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Al Tube/Steel Billet

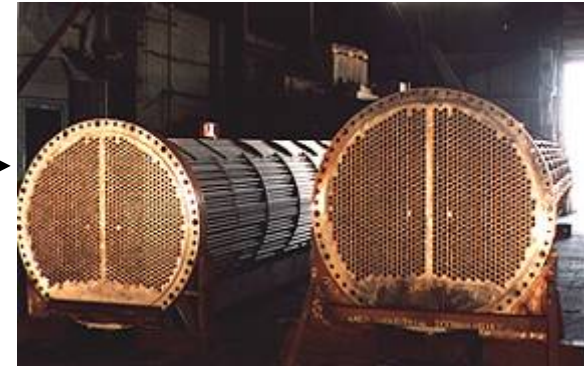


Copper/Stainless

# Explosive Metal Bonding Examples

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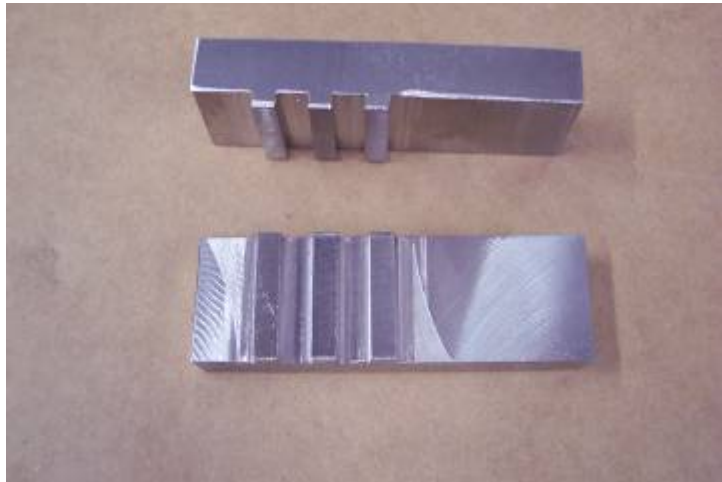
SA 240 2507 SS / SA 516 Grd 70 steel to be machined into a tube sheet in heat exchanger



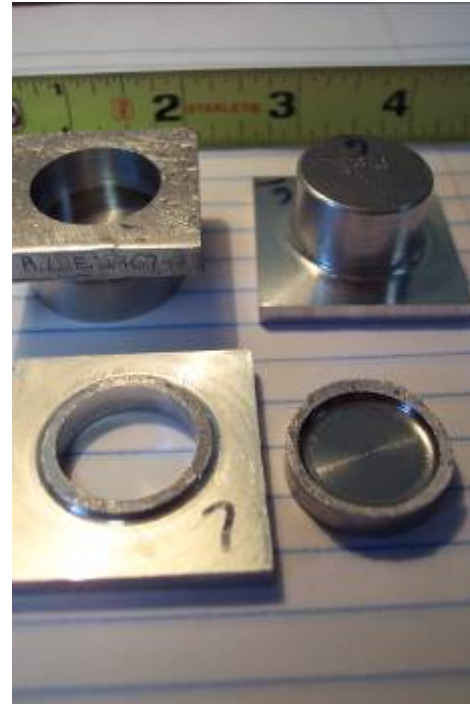
Copper/aluminum

# Testing the Bond

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Shear lug testing



Ram tensile testing

# Bonded Metal Applications

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Current conducting arms made from copper/steel clad



Current conducting arms (CCA)  
for Electric Arc Furnaces (EAF)



Electric Arc Furnace



# Bonded Metal Applications

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## Clad Tubes



Copper/stainless



Aluminum/steel



Tantalum on I.D. of steel pipe



70/30 Cu-Ni/steel



# Explosive Metal Bonding Applications

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Alum tube/  
steel billet



Deployed on US Navy aircraft carriers

Fabricated into  
high-strength,  
corrosion-resistant  
aircraft tie-downs



# Explosive Metal Bonding

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## Learn More

Contact the Hermetic Solutions Group's Bonded Metals Division via:

- E-mail at [bondedmetals@hermeticsolutions.com](mailto:bondedmetals@hermeticsolutions.com)
- Phone at: 360-683-4167

Or Visit:

- <http://www.hermeticsolutions.com/explosive-forming.htm>