

**Cerrobend**  
**Originated by Bruce Felix on April 27, 2011**

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Hi All,

An email from one of my techs that I thought I would share. We are looking for a substitute for Cerrobend and are wondering about Field's metal.

Has anyone used this or any other substitute? Generally we use compression terminations now, but we have several terminations with pressure/depth sensors that still require potting.

Thank you in advance,

Bruce

Bruce Felix  
Marine Electronic Technician Supervisor  
Raytheon Polar Services Company

Cerrobend (the low melting point metal we use in the CTD termination) contains about 10% cadmium. Fumes from cadmium are toxic, and known to cause liver, lung, and kidney failure and has been causally linked to various forms of cancer.

Field's metal is usually considered the non-toxic alternative, containing neither lead nor cadmium.

<http://www.rotometals.com/product-p/LowMeltingPoint144.htm>

I'm no metallurgist, but what I can find about Field's metal says that it's a suitable sub in most applications.

Can you guys ask around UNOLS/WHOI to see if anyone has any experience with this? I mean, if it contracts too much when cooling, it won't be a suitable bonding metal. If no one knows, we should get a few ounces to give it a try.

The downside it's about \$10/ounce instead of \$1/ounce, but if it checks out, we really should spring for a few pounds so we can eliminate the cadmium from Chance's liver. He prefers his liver damage in Single-Malt form.

W. Kevin Pedigo  
Sr. Marine Computer and Instrument Specialist  
ARSV Laurence M. Gould

## United States Antarctic Program

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### **Reply From: Ben Jokinen on Wed, 27 Apr 2011**

Hello Bruce,

We use <http://www.mcmaster.com/#8921K16> for our potted ctd terminations. Its a Bismuth and Tin mixture and looks to be about the same price per Oz (though the mcmaster site does not specify weight), but thought I would throw it out there.

Ben

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Ben Jokinen  
Senior Marine Technician  
Moss Landing Marine Labs

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### **Reply from Tom Wilson on Wed, 27 Apr 2011**

Hi All,

It's been five years since I had to buy any low melting point alloy but I'm quite certain I stayed away from the toxic cadmium and the pricey indium formulations. I'm pretty sure our last buy was for the 203F bismuth/lead/tin alloy which McMaster sells for \$49.89 per pound. This still contains lead but we're used to dealing with that in solder.

Speaking of which, has anyone located a lead free electronic solder that is any good?

Tom

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### **Reply from: Marshall Swartz on Thu, 28 Apr 2011**

Kevin,

I applaud the effort to evaluate less toxic alternatives if a user must use a low-melting-point metal termination.

I have encouraged our technicians at WHOI to use the Preformed Line Products GDE-series Guy-grip dead ends as an alternative termination where possible, due to the faster preparation, obvious inspectability, and lower cost. The downside is the dead-end length overall may preclude certain uses.

When a dead-end is not possible, I have normally used poured terminations with Cerrobend 158, although I have experimented with CerroShield 203 (Bi 52.5%, Pb 32%, W 15.5%), 203 deg C eutectic melt point, and found it was entirely satisfactory.

I've obtained these alloys from CS Alloys and Alchemy Castings- see references below.

If you are considering other low melting point alloys, and there are literally dozens, it is important to understand the metallurgical behavior of this family of alloys to know whether they may be suitable for mechanical wire terminations. Some alloys demonstrate expansion on cooling, some contract. Some alloys have hardness properties dependent on the cooling quenching rate, and some are less sensitive.

The two main concerns I have with the use of cadmium containing alloys are:

1. Inhalation of CdO fumes. While it is important to note that cadmium oxide fumes are not known to form under 320 deg C, it is quite common for technicians to expose Cerrobend to temperatures above this by a torch to re-melt Cerrobend 158.
2. Inhalation or ingestion of cadmium alloy dust: The process of filing or grinding solid Cerrobend 158 can cause unacceptably high airborne exposures.

When heated over 320 deg C, Cerrobend 158 will decompose and can begin to fume.

The brown CdO powder may form at temperatures below 320 deg C due to various contaminants and oxidation.

3. The common use of aluminum hot pots to melt Cerrobend 158 can contaminate the Cerrobend, but it is not known if this represents a significant mechanical performance change in the cooled alloy.

I have used high-temperature plastic water hot-pots successfully for Cerrobend 158, with the alloy fully immersed in water to avoid oxidation, as recommended by original Cerro Metal Industries practices (see the section on Melting Equipment, designed to avoid overheating and oxidation, at [http://www.canadametal.com/pdf/cerro\\_bending.pdf](http://www.canadametal.com/pdf/cerro_bending.pdf) )

Using water-covered plastic pot melting techniques reduces the production of dross (oxide and contaminant skin over the liquid alloy)

Bottom line is a user should consider any brown or reddish-brown material at the top of liquid Cerrobend as possible CdO (unless demonstrated to be otherwise) and handle it as a KNOWN CARCINOGEN according to the MSDS for CdO: <http://www.sciencelab.com/msds.php?msdsId=9923229>

"Extremely hazardous in case of ingestion. Very hazardous in case of inhalation. Hazardous in case of skin contact (irritant), of eye contact (irritant). Severe over-exposure can result in death."  
Cadmium is not generally considered to be toxic through the unbroken skin.

I'll let you all google your own references, but I would suggest starting with CDC or NIOSH

information.

Many people know that Cerro Metal Products of Bellefonte, PA, is no longer in active production of low melt point alloys.

CS Alloys has at least one former principal of Cerro in its employ, and has much of the old Cerro product line available. For info on current products of CS Alloys see: <http://csalloys.com/Specifications.htm>

Also see Alchemy Castings references on alloy characteristics: <http://www.alchemycastings.com/lead-products/fusible.htm>

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Marshall Swartz  
Physical Oceanography Dept.  
Woods Hole Oceanographic Institution

**Reply from: David Fisichella on October 19, 2012**

RVTEC members,

Attached is a report generated by the Woods Hole Oceanographic Institution Health & Safety office on the exposure of certain compounds when creating or disassembling Cerrobend terminations. The results showed no hazards when using the material as directed. This may be a topic of discussion during RVTEC.

David

[Cerroband Exposure Assessment Report](#)