

# Epoxy for Microboone Cradle Attachment

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## Abstract

The Microboone detector tank will be supported by two cradles, made from dense poly-urethane (PU) foam. The cradles will be attached to the tank with epoxy to resist motion during cool-down. We evaluated two candidate epoxies that have a long work life, well in excess of one hour. We conclude that the epoxy to be used needs to be tixotropic, which eliminates one of them from consideration.

## Requirements

The Microboone TPS will sit quite securely on the shaped foam saddles. However, on cool down the tank shrinks by an inch or so, which is more than the saddles can comfortably take up in deformation. The design must allow one of the saddles to slide (or roll) easily on the floor (actually, on top of one of the two concrete block pillars). This reduced friction will also prevent or reduce side forces on the pillars when the tank shrinks.

But this is not what the present note is about.

We observe that the tank's weight will prevent sliding on the foam support, given the low friction design of one saddle base plate. Thus there is no risk that the tank's sprayed-on thermal insulation will be damaged or stripped by saddle motion.

From this argument alone, it is not necessary to bond the saddles to the tank.

However, the saddle shape will not perfectly match the tank shape. One would like to even out the support pressure, in the way a grout would. In addition, bonding the saddles to the tank reduces stresses in the saddles.

In addition, bonding may be needed to assure adequate anchoring in case of earthquakes.

The epoxy (or grout or other adhesive needs to meet these requirements:

--it must spread well under the relatively small pressure exerted by the empty tank.

The pressure is approximately 9 psi for the 1" wall, empty tank (57 psi when full)

--it must not run to the low point of the cylindrical upper saddle surface between the time it is applied and the time that the tank is lowered onto the saddles.

This means the epoxy should be tixotropic.

This is particularly important since the epoxy must be installed in small mounds (maybe ¼" to ½" high, maybe 1" diameter) or lines to allow "local" spreading, without requiring the excess epoxy to travel great distances to bleed out.

--it is desirable that the epoxy adhere well to both foam and SS through cooling cycles

## An Acceptable Candidate Epoxy

Some 5 years ago we searched for tixotropic epoxies with good adhesion and long pot life. The epoxy was to be used to assemble blocks of PVC extrusions for NOVA. (In the end the stresses were too high for any epoxy, and we switched to a Devcon Plasticwelder product, but that's another story)

The epoxy we identified, and tested on many samples, is product 59-7 by Magnolia plastics:

(Magnolia Plastics, Inc.  
magnapoxy.com,  
5547 Peachtree Industrial Boulevard  
Chamblee, GA 30341-2296 USA  
800-831-8031, Toll-Free  
770-451-2777, Voice  
770-451-5376, Fax  
websales@magnoliaplastics)

We show the budgetary quote and the technical data sheet at the end of this report.

## Tests

We made a number of glue samples using the Magnolia 59-7, and also the Scotchweld 2216 Translucent for comparison. The Scotchweld 2216 A has a 2 hour pot life, is strong, and stays somewhat pliable, but it is not tixotropic, as the pictures will show.

The figures below show the samples of the Scotchweld and Magnolia epoxies right after they were put down, and after 100 minutes.

We also show that the Magnolia product spread easily even after 100 minutes.

## Conclusions

We have identified a suitable epoxy (Magnolia 59-7) for attaching the tank to the foam cradles.

## Next Steps

We will be receiving larger samples of the stiff urethane foam that will be used to construct the cradles.

We will also purchase some current-production Magnolia 59-7 epoxy.

We will tests on epoxy spreading (e.g. using a toothed trowel, on one or both surfaces).

We will embed fiberglass mesh in one or both epoxy layers.

Samples will be cold-tested, and the present note will be updated.



The Magnolia epoxy does not run or spread until loaded.



The Scotchweld 2216 is a true liquid, and spreads out until limited by its surface tension.

After nearly two hours (100 minutes) we placed 2" thick steel weights on some of the samples. When fully spread, the epoxy is under a pressure of just 0.6 psi, much smaller than the empty tank pressure of 9 psi, yet both epoxies spread to the full area of the weight, and even bled out around the periphery of their weights:





The Scotchweld has spread out like a true liquid would.



The Magnolia 59-78 has not spread at all during the 100 minute time.



The Magnolia epoxy (middle weight) has spread beyond the outline of the weight.  
(So has the Scotchweld, of course)



The Magnolia epoxy has maintained its shape as put down.



The Magnolia has spread over the whole weight area and beyond, after sitting for 100 minutes.

Pricing for 59-7 A/B in gallon kit is as follows:

Part A = 1 Gallon Can @ 5.50 Lbs.

Part B = 1 Quart Can @ 2.15 Lbs.

Price Per Lb. = \$7.30 - Price Per Gallon Kit = \$55.85

Transportation Terms: F.O.B. Chamblee, GA 30341

Lead Time: 15 - 20 Business Days

Minimum Order: \$500.00 Per Product/Per Shipment

Test Report Charge: \$100.00 (Does not apply toward minimum order)

C/C: No Charge

Please let me know if you have questions or need further information.

Thank you.

# Magnobond 59-7, A & B

## *Description*

Magnobond 59-7 is a two-component epoxy adhesive formulated especially for adhesion to plasticized or rigid polyvinyl chloride items.

## *Properties*

Property	Magnolia 59-7
Cure Schedule	Set – 24 hours or 2 hours @ 135°F; Adhesion – 3 days; Full Cure – 7 days
Mix Ratio – Parts By Weight (Part A:Part B)	100:39
Shelf Life	A: 6 months B: 6 months
Specific Gravity	Part A: 1.30 Part B: 1.40 Mix: 1.35
Viscosity @ 77°F	Part A: Semi-paste Part B: Semi-paste Mix: Semi-paste
SPI Classification	A: 2 B: 4
Color	A: White B: Black

## ***Handling Characteristics***

Parts A and B should be thoroughly mixed prior to use.

The two surfaces to be joined should be thoroughly cleaned before application of the Magnobond 59-7.

Magnobond 59-7 A/B is a semi-paste that is easily mixed and applied.

Magnobond 59-7 can be used to adhere polyvinylchloride to itself, to concrete, to steel, to glass, to aluminum, and to wood.

## ***Physical Properties***

Peel strengths (1 inch wide specimens)

PVC to PVC	PVC failure @ 100 lbs
PVC to 2024 T-3	PVC failure @ 100 lbs
Aluminum (.063 inches)	
PVC to Steel (.060 inches)	PVC failure @ 100 lbs
PVC to Concrete	PVC failure @ 134 lbs
PVC to 2 x 4 (Pine)	PVC failure @ 110 lbs
PVC to Pressboard	Pressboard failure @ 55 lbs

**DANGER****FIRST-AID**

- May cause severe irritation.
- Do not get in eyes, on skin or clothing.
- Do not inhale vapors.
- Wear rubber gloves & aprons.
- Use with adequate ventilation.
- Wash thoroughly after handling.

- Eyes - Immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.
- Skin - Wash immediately with soap and water.
- Clothing - Remove clothing and wash before reuse.

**For Industrial Use ONLY. Keep container closed. Do Not Reuse this Container.**

Updated: 09/25/00

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TBMagnolia 59-7.doc

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