

## **Appendix 1.**

### **Detailed Performance Data of Masking Materials**

## PHASE 1 TESTING - OVERVIEW OF SUCCESSFUL MASKING MATERIALS

Product	Price	Standardized Price	FLAT PLATE			BURIED THREADED HOLES			BOLT THREADS		
			Success	Application Time	Removal Time	Success	Application Time	Removal Time	Success	Application Time	Removal Time
DAP 100% Silicone Adhesive	\$3.98 / 2.8 oz. tube	\$1.42 / oz	-	N/A	N/A	Yes	6 mins., 30 secs.	12 mins., 5 secs.	Yes	9 mins., 30 secs.	4 mins., 22 secs.
Galva Stop	\$48.00 / liter	\$1.42 / oz	Yes	2 mins., 21 secs.	2 mins., 38 secs.	-	N/A	N/A	Yes	3 mins.	6 mins., 50 secs.
GE 100% Silicone Caulk	\$4.97 / 10.1 oz. tube	\$0.49 / oz	Yes	1 min., 22 secs.	1 min.	Yes	1 min., 15 secs.	5 mins., 18 secs.	Yes	10 mins., 30 secs.	7 mins., 30 secs.
Macropoxy 846	\$89.78 / gal. of Part A & B	\$0.35 / oz	-	N/A	N/A	Yes	32 mins., 26 secs.	8 mins., 40 secs.	Yes	37 mins., 10 secs.	1 min., 11 secs.
Maskote Zinc Stop - Off	\$120.00 / gal.	\$0.94 / oz	Yes	2 mins., 37 secs.	1 min.	Yes	5 mins., 13 secs.	3 mins.	Yes	5 mins., 12 secs.	3 mins., 5 secs.
NAPA RTV Red	\$14.19 / 11 oz. tube	\$1.29 / oz	Yes	1 min., 32 secs.	1 min.	-	N/A	N/A	Yes	9 mins., 45 secs.	4 mins., 18 secs.
Stop Galv	\$45.00 / qt.	\$1.41 / oz	Yes	4 mins., 26 secs.	5 mins., 48 secs.	-	N/A	N/A	Yes	5 mins.	10 mins., 20 secs.
Valmont Masking Compound	\$4.75 / small tube	\$0.37 / oz	Yes	2 mins., 32 secs.	1 min.	Yes	10 mins., 30 secs.	5 mins., 28 secs.	-	N/A	N/A
ZYP Boron Nitride Hardcoat	\$170.00 / gal.	\$1.33 / oz	-	N/A	N/A	Yes	3 mins., 24 secs.	7 mins., 52 secs.	-	N/A	N/A

## FLAT PLATE - PHASE 1 TESTING

Product	Application Time	Application Notes	Masking Success	Notes	Removal Time	Removal Notes
3M High Temperature Aluminum Tape	17 mins., 26 secs.	Thoroughly ensured the edges were sealed.	Almost	About 12% of the area galvanized. Seepage at ends caused galvanizing in those areas.	9 mins., 24 secs.	Used a flathead screwdriver to scrape the tape and then pulled it off.
DAP Household Adhesive Sealant	3 mins., 20 secs.	Squirted the product onto plates, then spread it with a foam paint brush. Material was very easy to work with.	-	One plate galvanized completely and the two other plates had large areas that galvanized.	2 mins., 11 secs.	Scraped off with a small metal-bristled brush. The material was very gummy and hard to remove.
Dow Corning Compound #111	3 mins., 42 secs.	Squirted the product onto plates, then spread around with a foam paint brush. Material spread easily, but was messy because it does not dry.	-	At least 80% of the area galvanized.	40 secs.	Scraped with a small metal-bristled brush.
Duct Tape	25 mins.	Wrapped 2 times around plates.	-	Less than 90% remained bare	10 mins., 52 secs.	Scraped off burnt tape with a metal-bristled brush. Scraped off very easily.
Galva Stop	2 mins., 21 secs.	Shook can, poured, then spread using a foam brush.	Yes	Entire area was completely free of galvanizing	2 mins., 38 secs.	Used a small metal-bristled brush to scrape since the big metal-brush was ineffective. Had to scrape very hard to get this material off.
GE 100% Silicone Caulk	1 mins., 22 secs.	Used a caulk gun, then spread using a foam brush. Went on very thick.	Yes	The material prevented galvanizing, but the surface was stained black.	1 min.	Used big and small metal-bristled brushes to scrape away the product. It came off fairly easily.
Kapton Tape	30 mins.	2 wraps. Tape did not stick well, much harder to work with than the duct tape.	-	Less than 90% remained bare	18 mins., 39 secs.	Scored tape with a flathead screwdriver, then used a metal-bristled brush to scrape away remaining debris.
Macropoxy 846	32 mins., 14 secs. (31/32 mins. spent on prep time for epoxy)	Poured onto the surface and spread with a foam paint brush.	-	About 15% of the area galvanized	1 min., 37 secs.	Used a small metal-bristled brush to scrape the material off.
Maskote Zinc Stop - Off	2 mins., 37 secs.	Very runny - dries very quickly, making it hard to spread around. Used a foam brush for spreading.	Yes	Entire area was completely free of galvanizing, very clean.	1 min.	Used a big metal-bristled brush. The material came off very easily.
NAPA RTV Red	1 min., 32 secs.	Used a caulk gun, then spread using a foam brush. Went on easy, but kind of thick.	Yes	Almost the entire area remained free of galvanizing	1 min.	Used a big metal-bristled brush to scrape away the material.
Stop Galv	4 mins., 26 secs.	Poured the product on, spread with a foam paint brush. Product went on thick and dried quickly.	Yes	Very slight seepage at perimeters.	5 mins., 48 secs.	Used a small metal-bristled brush to scrape the material off. The material adhered to the surface tenaciously, which required much harder scraping.
Valmont Masking Compound	2 mins., 32 secs.	Very thick, like a paste. Used a foam brush to spread around.	Yes	Entire area was completely free of galvanizing.	1 min.	Used big and small metal-bristled brushes to scrape material off the metal.
VHT Header Paint	1 hr., 33 mins.	Applied 2 coats of paint. Allowed for dry time between coats.	-	All the plates galvanized	N/A - product failed completely.	N/A
ZYP Boron Nitride Hardcoat	3 mins., 48 secs.	Two minutes of application time was to stir the product. Poured onto the surface and spread with a foam paint brush.	-	About 20% of the area galvanized.	2 mins., 32 secs.	The burned product adhered to the steel very well. I had to score it with the edge of a flathead screwdriver and then scrape it with a small metal-bristled brush.
ZYP Boron Nitride Lubricant	4 mins., 16 secs.	Poured onto the surface and spread with a foam paint brush. Material had the runniness of paint and was very messy. 3 minutes of the application time was due to stirring the product like paint.	-	The entire area galvanized.	N/A	N/A

## BURIED THREADED HOLES - PHASE 1 TESTING

Product	Application Time	Application Notes	Masking Success	Notes	Removal Time	Removal Notes
3M High Temperature Aluminum Tape	9 mins., 41 secs.	Balled up tape, hammered it into hole using a wooden dowel.	-	4 holes galvanized completely, the other 2 had considerable amounts of zinc in each.	6 mins., 17 secs.	Used flathead screwdriver and small, metal-bristled brush to pry out the tape.
DAP 100% Silicone Adhesive	6 mins., 30 secs.	Squeezed material out of tube and into holes. Hardened like caulk, still flexible. Material remained waxy after 14 hours.	Yes	None of the holes galvanized.	12 mins., 5 secs.	Scraped blob of material out with flat-head screwdriver. Used a metal-bristled brush to scrape the rest of the material out. Consistency of dry caulk. Some small crumbs remained.
Dow Corning Compound #111	3 mins.	Squeezed product out of tube and into holes. The material was very hard to squeeze out of the tubes.	-	4 out of 6 holes did galvanize	3 mins., 50 secs.	Scraped product out with flat-head screwdriver. Hard, flexible consistency like dry caulk.
Duct Tape	5 mins.	Balled up tape, then stuffed in the holes.	-	5 of the 6 holes galvanized	6 mins., 17 secs.	Scraped w/ metal-bristled brush. Some unmasked areas around holes did not galvanize, which could fail inspection after galvanizing.
Galva Stop	2 mins., 30 secs.	Poured into holes	-	In 5 of the 6 holes, a small area galvanized. The area was about 10% of the holes.	8 mins., 26 secs.	Used a metal-bristled brush to scrape material out, which was very hard to do.
GE 100% Silicone Caulk	1 min., 15 secs.	Squirted into holes w/ a caulk gun	Yes	The very top of one hole galvanized a tiny bit, but it could have been an application error, as the hole was not filled to the very top.	5 mins., 18 secs.	Used flathead screwdriver to break apart material, then used a small metal-bristled brush to scrape material out.
Kapton Tape	8 mins.	Slightly harder to work with than duct tape. Balled up, then stuffed in the holes.	-	3 out of the 6 holes galvanized	5 mins., 40 secs.	Used flat-head screwdriver to scrape out tape, then used a metal-bristled brush to get the rest. Some unmasked areas around holes did not galvanize, which could fail inspection after galvanizing.
Macropoxy 846	32 mins., 26 secs.	Preparation time for product took 31 minutes. Poured into holes; very runny and messy.	Yes	None of the holes galvanized.	8 mins., 40 secs.	Used flathead screwdriver to break apart material inside the holes. Material was extremely hard, required considerable force. Used a small metal-bristled brush to scrape out rest of the material, which also required considerable effort.
Maskote Zinc Stop - Off	5 mins., 13 secs.	Poured into holes; runnier than Galva Stop or Stop Galv. Dries faster than other products; too.	Yes	None of the holes galvanized. Holes looked very clean.	3 mins.	Used a small metal-bristled brush to clean material out of the holes. Material came out very easily.
NAPA RTV Red	1 min.	Squirted into holes with a caulk gun	-	2 of the holes galvanized completely, 4 holes galvanized partially.	5 mins., 51 secs.	Used flathead screwdriver to pry out material, then used a small metal-bristled brush to clean the rest of the material out.
Stop Galv	4 mins.	Poured into holes.	-	1 of the 6 holes galvanized	11 mins., 30 secs.	Used a metal-bristled brush to scrub the material out. Holes were charred black inside.
Valmont Masking Compound	10 mins., 30 secs.	Had to cut into the side of the roll, since an industrial size caulk gun was not available.	Yes	In addition to masking intended areas, it caused bare spots in surrounding areas.	5 mins., 28 secs.	Used flathead screwdriver to break apart material, then used a small metal-bristled brush to scrape out remaining material.
VHT Header Paint	N/A	N/A	N/A	N/A	N/A	N/A
ZYP Boron Nitride Hardcoat	3 mins., 24 secs.	2 minutes of application time was due to stirring product. Poured material into the holes. Material dried fast.	Yes	None of the holes galvanized, but there was some frozen zinc inside the holes that had to be wedged out. Wedging out the zinc might not always be possible for all fabrications.	7 mins., 52 secs.	Used flathead screwdriver to break apart hard ash, then used small metal-bristled brush to scrape out the rest. Some small particles remained inside the holes.
ZYP Boron Nitride Lubricant	4 mins., 16 secs.	3 minutes of application time was due to stirring the product. Poured into holes.	-	All of the holes galvanized 100%.	N/A	N/A - all holes galvanized 100%.

## BOLT THREADS - PHASE 1 TESTING

Product	Application Time	Application Notes	Masking Success	Notes	Removal Time	Removal Notes
3M High Temperature Aluminum Tape	11 mins., 16 secs.	Wrapped tape around bolts 3 times. Adhesive is very sticky, and difficult to get off roll and apply.	-	Many areas galvanized. Some bare areas, but about half of threads galvanized.	7 mins., 55 secs.	Scraped tape w/ a flathead screwdriver until it could be peeled off.
DAP Household Adhesive Sealant	9 mins., 30 secs.	Very thick, messy. Smelled awful. Smear on w/ foam paint brush. Dried hard, like caulk.	Yes	A few small areas picked up a little zinc. Got 5 bolts back.	4 mins., 22 secs.	Used big metal-bristled brush to scrape away material. Threads were very clean after scraping material off.
Dow Corning Compound #111	8 mins.	Squeezed material onto threads, smeared on w/ foam paint brush. Had wet, waxy feeling after drying.	-	All bolt threads galvanized to some extent. Got 4 bolts back.	2 mins., 40 secs.	Crusty white material came off very easily w/ a small metal-bristled brush.
Duct Tape	5 mins., 30 secs.	Wrapped 5-6 times around each bolt.	-	Had large bare areas, but many areas still galvanized.	5 mins., 44 secs.	Used a big metal-bristled brush to scrape away the material, which came off very easily.
Galva Stop	3 mins.	Dipped bolts into bottle to apply material. Hardened, but still flexible. Will stick to itself if it touches other coated products.	Yes	A few tiny areas did galvanize.	6 mins., 50 secs.	Brushed off black ashy material very easily with a big metal-bristled brush.
GE 100% Silicone Caulk	10 mins., 30 secs.	Smeared material on w/a foam paint brush. Somewhat easier to handle than NAPA RTV red.	Yes	Threads were completely bare.	7 mins., 30 secs.	Used a small metal-bristled brush to scrape away the material, which came off pretty easily.
Kapton Tape	6 mins., 30 secs.	N/A	-	Could not remove masking material. One bolt was lost during the galvanizing process.	Tape was nearly impossible to remove from threads	Unable to remove tape from threads. This material would not work as a masking material, as it cannot be removed w/o damaging the threads.
Macropoxy 846	37 mins., 10 secs.	Preparation of the product took 31 mins. Dipped bolts into masking material to apply. Material was runny, like paint.	Yes	Received only 1 bolt back (the rest must have fallen out of the basket during the galvanizing process). A few very small areas did galvanize.	1 min., 11 secs.	Used a small metal-bristled brush to scrape away the product, which came off pretty easily.
Maskote Zinc Stop - Off	5 mins., 12 secs.	Very runny, hard to smear around. Rather than smearing, it dries, lumps up, and comes off the metal. Very strong, nauseating smell - similar to nail polish remover.	Yes	Some small areas did galvanize.	3 mins., 5 secs.	Used a small metal-bristled brush to scrape off the material, which came off very easily.
NAPA RTV Red	9 mins., 45 secs.	Smeared material on w/ a foam paint brush. Applied thick in many areas because of product consistency.	Yes	A few small areas picked up a little zinc.	4 mins., 18 secs.	Used a small metal-bristled brush to scrape away the material, which came off very easily.
Stop Galv	5 mins.	Dipped bolts into bottle to apply material. Thicker than Galva Stop. Hardened, but still flexible. Sticks to itself if it touches other coated products.	Yes	Got 5 bolts back. Almost all threads were completely bare.	10 mins., 20 secs.	Scraped the material off with a big metal-bristled brush. The material came off very easily and the threads had very little residue.
Valmont Masking Compound	9 mins., 10 secs.	Goes on very thick, so it could get expensive. Used a foam paint brush to spread around. Need an industrial size caulk gun.	-	All bolts lost during testing.	N/A	N/A
VHT Header Paint	N/A	Not tested, as paint cannot be easily removed after galvanizing.	-	N/A	N/A	N/A
ZYP Boron Nitride Hardcoat	4 mins., 5 secs.	Three mins. of application time due to stirring. Dipped bolts into material. Dries very fast.	-	Many areas had zinc frozen between the threads.	4 mins., 57 secs.	Used small metal-bristled brush to scrape material off. Baked-on material was much harder than other products. Could not remove all of the product.
ZYP Boron Nitride Lubricant	5 mins., 14 secs.	Three minutes of application time was stirring the product. Dipped bolts into masking material to apply.	-	All bolts picked up excessive zinc. A lot of the zinc was just frozen, but many areas galvanized too.	N/A	N/A

## PHASE 2 TESTING - OVERVIEW

Product	Price	FLAT PLATE		BOLT THREADS		
		1 Hour Cure Time Success	2 Hour Cure Time Success	30 Min. Cure Time Success	1 Hour Cure Time Success	2 Hour Cure Time Success
DAP Household Adhesive Sealant	\$3.98 / 2.8 oz. tube	-	-	-	Yes	Yes
Galva Stop	\$48.00 / liter	Yes	Yes	Yes	Yes	Yes
GE 100% Silicone Caulk	\$4.97 / 10.1 oz. tube	-	-	-	-	Yes
Maskote Zinc Stop - Off	\$120.00 / gal.	-	-	-	Yes	Yes
NAPA RTV Red	\$14.19 / 11 oz. tube	-	-	Yes	Yes	Yes
Stop Galv	\$45.00 / qt.	Yes	Yes	-	Yes	Yes

## PHASE 2 TESTING - OVERVIEW

Product	Price	Standardized Price	FLAT PLATE		BOLT THREADS			
			1 Hour Cure Time Success	2 Hour Cure Time Success	30 Min. Cure Time Success	1 Hour Cure Time Success	2 Hour Cure Time Success	
DAP Household Adhesive Sealant	\$3.98 / 2.8 oz. tube	\$1.42 / oz	-	-	-	Yes	Yes	Yes
Galva Stop	\$48.00 / l.	\$1.42 / oz	Yes	Yes	Yes	Yes	Yes	Yes
GE 100% Silicone Caulk	\$4.97 / 10.1 oz. tube	\$0.49 / oz	-	-	-	-	-	Yes
Maskote Zinc Stop - Off	\$120.00 / gal.	\$0.94 / oz	-	-	-	Yes	Yes	Yes
NAPA RTV Red	\$14.19 / 11 oz. tube	\$1.29 / oz	-	-	Yes	Yes	Yes	Yes
Stop Galv	\$45.00 / qt.	\$1.41 / oz	Yes	Yes	-	Yes	Yes	Yes

## BOLT THREADS - PHASE 2 TESTING

Product	30 MINUTE CURE TIME		2 HOUR CURE TIME		2 HOUR CURE TIME	
	Success	Notes	Success	Notes	Success	Notes
DAP Household Adhesive Sealant	-	2 of the 5 bolts galvanized	Yes	Material was gummy and took a long time to remove.	Yes	Applied w/ a foam brush. One bolt out of the 5 had a little zinc on it. The material was very gummy and took longer to remove.
Galva Stop	Yes	One bolt had a tiny spec of zinc on it.	Yes	1 bolt galvanized a little less than 10%. Other bolts had miniscule amount of zinc.	Yes	Applied with a foam brush. Went on very thin. The outermost part of the threads looked like very little if any material went on those areas. The product still prevented galvanizing though.
GE 100% Silicone Caulk	-	3 of the 5 bolts galvanized	-	3 of the 5 bolts had zinc between the threads at the top 25% of the threads. Material was gummy and hard to remove.	Yes	Applied with a foam brush. One bolt out of the 5 had a little zinc on it.
Maskote Zinc Stop - Off	-	3 of the 5 bolts galvanized	Yes	The product scraped off the bolts very easily.	Yes	Applied with a foam brush. One bolt out of the 5 galvanized about 10-15%. This material dries extremely fast, which can make working with it hard. After applying masking material the outer edges of the threads appeared to be bare. It still masked the zinc effectively though.
NAPA RTV Red	Yes	None of the bolts galvanized, but the material was extremely sticky and was nearly impossible to get off the threads.	Yes	Material was very gummy and took a long time and considerable effort to remove.	Yes	Applied with a foam brush. Material was the gummiest out of the other materials and took the longest time to clean from the threads.
Stop Galv	-	All five of the bolts galvanized to some extent.	Yes	A few small specs of zinc here and there.	Yes	Applied w/ a foam brush. Went on slightly thicker than Galva Stop and seemed to cover surfaces better than Galva Stop too.