

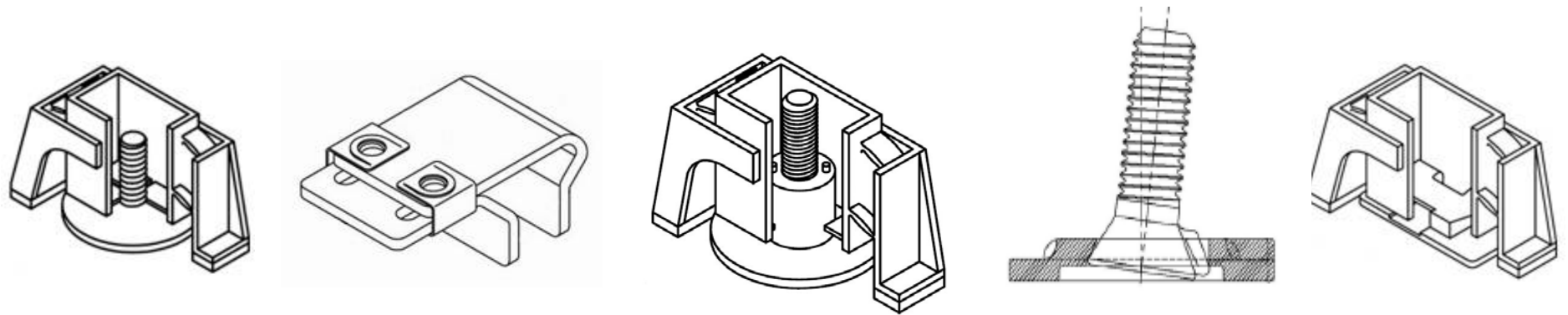


Adhesively Bonded Surface Mounted Fastener System

Keith Register
Applications
Engineer

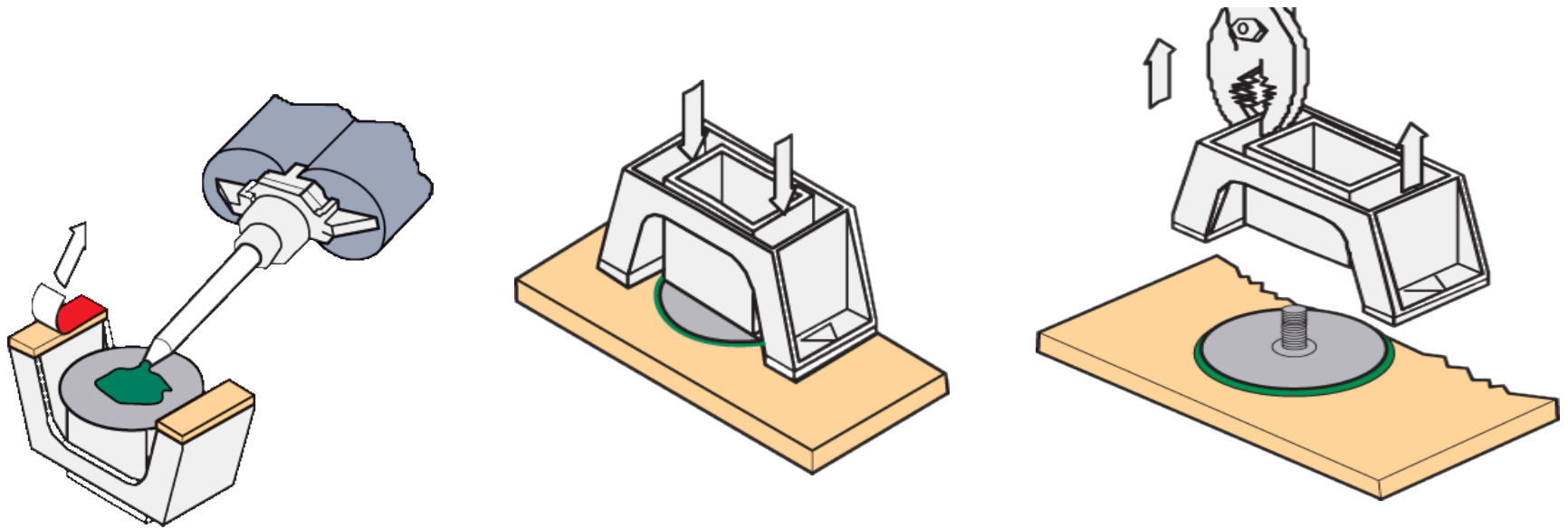


What is Click Bond?



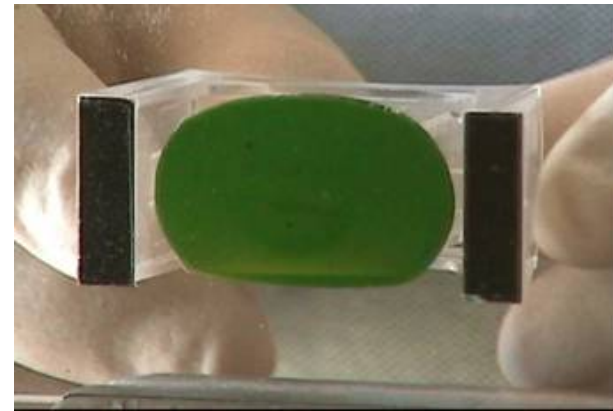
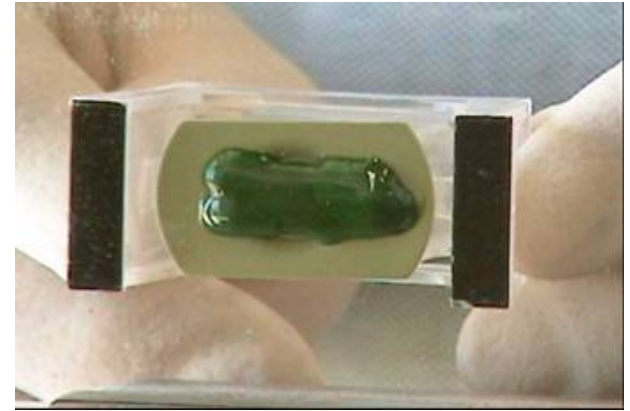
A unique way of attaching studs, standoffs, cable ties, and nut plates through the use of adhesives

Click Bond fasteners come with a fixture. Internal or External. The fixture keeps the joint under constant pressure during the adhesive cure, and ensures a consistent bond line thickness.



3 PSI of Pressure/Bond Line .005” Thick

Positive Pressure enhances adhesion. Bonds that have been set under pressure have higher adhesive strength. Pressure imparts better wetting and consequently a more complete interfacial contact (enhancing absorption.)



What can adhesively bonded fastener be used for

- Systems support
- Wire Runs
- Insulation Mounts
- Furniture Installation

Benefits

- Elimination of hot work and costs associated with it
 - a. Gas freeing of fuel and storage tanks
 - b. Removal of insulation
 - c. Fire Watchers
- Minimizes galvanic corrosion between fastener and bulkhead
- Eliminates holes/leak paths in composite/balsa joiner bulkheads- leading to long term durability
- Allows for stud installation later on in build process (no hot work)- limiting stud damage and replacement
- Reduction in labor time for installation- 6 minutes for bonded stud installation-surface prep to final installation.
- Skilled labor isn't required

Labor savings

Keppel AfMELS

- Comparison between the installation time of 20 bonded studs and 20 welded studs, savings 177 minutes



BVT

- Cost reduction per compartment \$2,500

Kevin Bowers
4. Fixing System

Benefits (reduced labour costs)

Average Cost of <i>Discon</i> activities required for using <i>Welded studs</i> vs. <i>Adhesive studs</i>						
Item	Number of People	Manhours	Rate	Traditional Costs	Adhesive Costs	
Slather Tools	1	1	1 hour 1 Person	£17	£17	
Secure hotwork permit	1	1	1 Hour 1 Person	£17	£17	
Move welding equipment into compartment	1	1	1 Hour 1 Person	£17	£17	
Chase surface to have studs applied	2	0.5	1/2 hour 2 Persons	£9	£9	
Locate and mark out items	2	0.5	1/2 hour 2 Persons	£9	£9	
Fit welder	1	8.25	2100 rate @ required	£157	£157	
Remove frame on reverse BHD	3	55.5	2 person per day 2 days	£344	£344	
Remove insulation on reverse BHD	1	8.25	1 person 1 Day	£157	£157	
Remove paint on reverse BHD	1	4.8	1/2 day	£78	£78	
Weld / glue studs in place	2	1	1/2 hour 2 Persons	£17	£17	
Attach frame to studs	2	1	1/2 hour 2 Persons	£17	£17	
Fit paint reverse BHD	1	13.9	2 coats 1/2 a day per coat	£206	£206	
Fit insulate reverse BHD	1	8.25	1 person 1 day	£157	£157	
Fit mount frame on reverse BHD	3	5.55	2 person per day 2 days	£344	£344	
Touch up paint on compartment side	1	13.9	2 coats 1/2 a day per coat	£206	£206	£336
Sign off	1	4.8	1/2 a day 1 person	£78	£78	
Total time required in hours per average compartment				131.8	25.5	
Total spent per average compartment				£2,372	£46	

Savings Total per average compartment in manpower 109.3 hrs.

Total reduction in cost per compartment £1,967.

Production Engineering
Reducing cost, time and waste through innovation & technology
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Click Bond Marine Fasteners

- CB9522 studs
- **CB3200 studs**
- CB9157, CB9600 ground studs
- CB9120 wire way supports



CB3200CRM Stud Bulkhead Installations

- 316 SS
- 2" diameter primed base
- Thread sizes from $\frac{1}{4}$ -20 to $\frac{1}{2}$ -13
- Lengths up to six inches
- Typical strength

1500 lbs. tensile

2000 lbs. shear

350 in-lb modified shear

(.125 or greater substrate thickness)



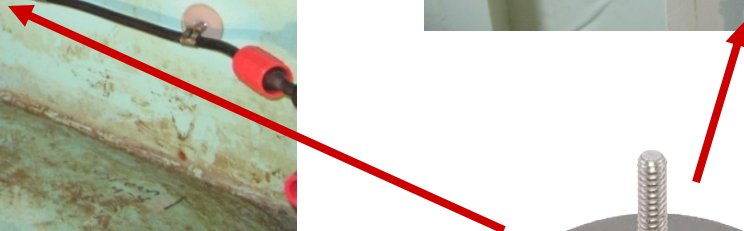
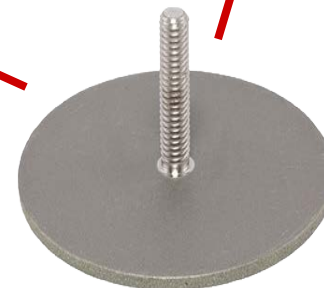
CB3200 Studs-Typical Application

Securing junction boxes and wire runs

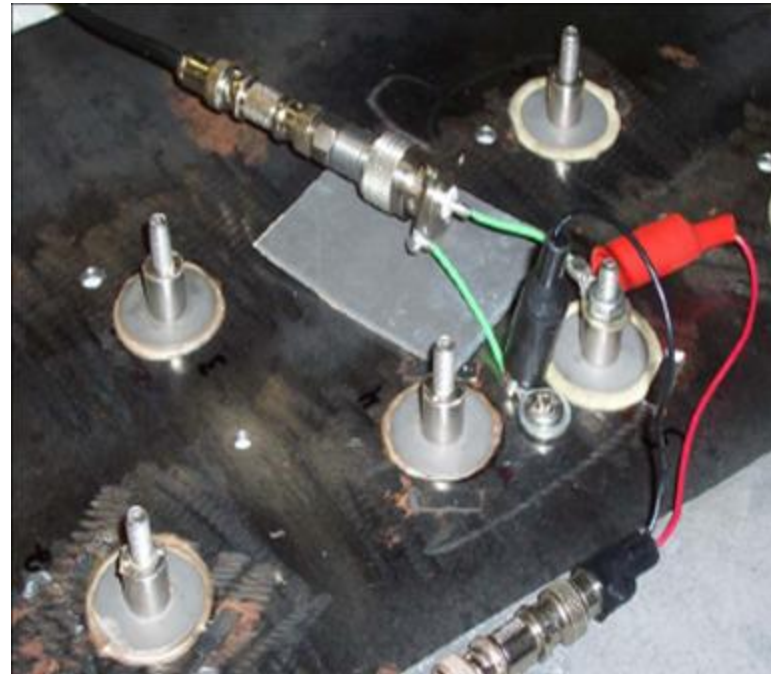
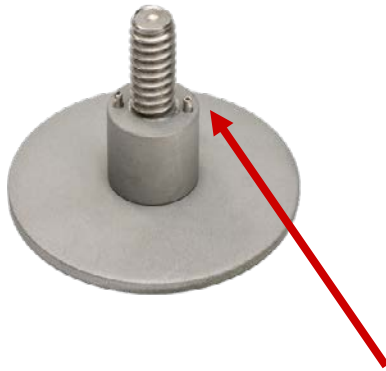
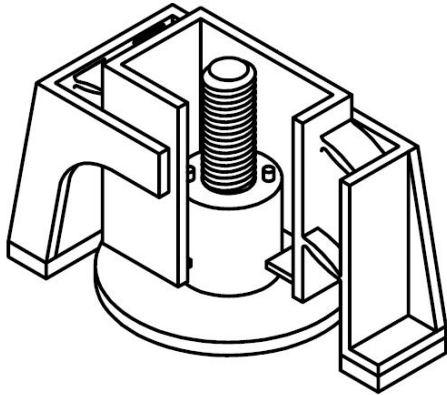


CB3200 Studs-Typical Application

Mounting Corrosion Sensors, Ballast tanks



CB9600 Ground Stud



- Grounding pins
- Meets MIL-STD-1310 DC resistance requirements

Design Criterion DDG1000

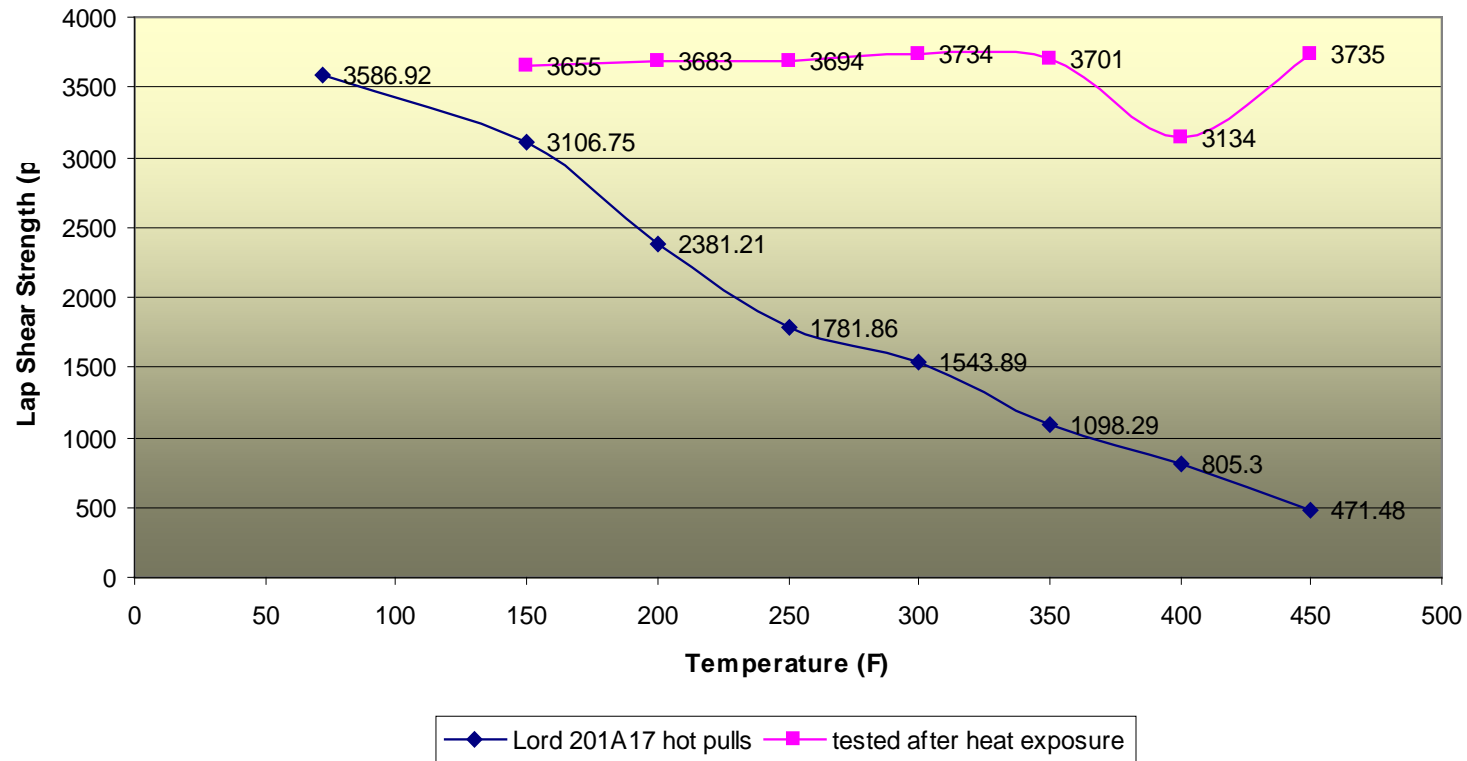
(Deck House Composite Bulkheads, and Helo Hangar)

- Secure 100 lbs. or less
- Maximum height - 6 foot from deck
- If used overhead - every 4th stud should be a hard mount

(in the event of a fire)

Adhesive shear strength as a function of temperature - 1/2 hour duration at each data point

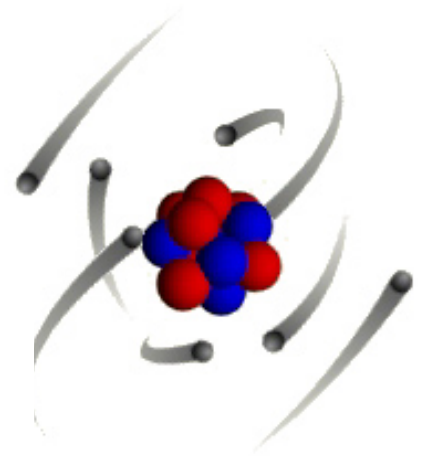
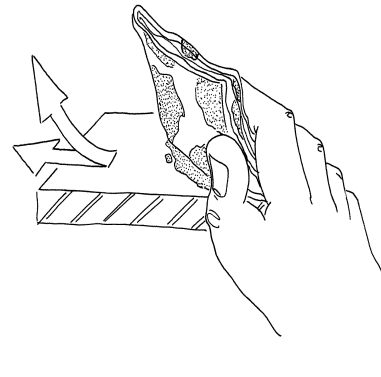
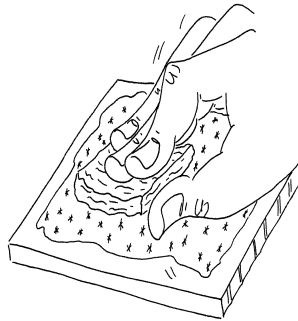
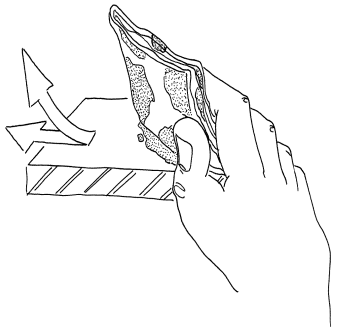
Strength as affected by temperature on Lord 201/A17 at 7:1 by weight



Installation Surface Preparation

Create a clean high energy surface !!!!

Solvent Wipe, Abrade-grinder/sander, Solvent Wipe

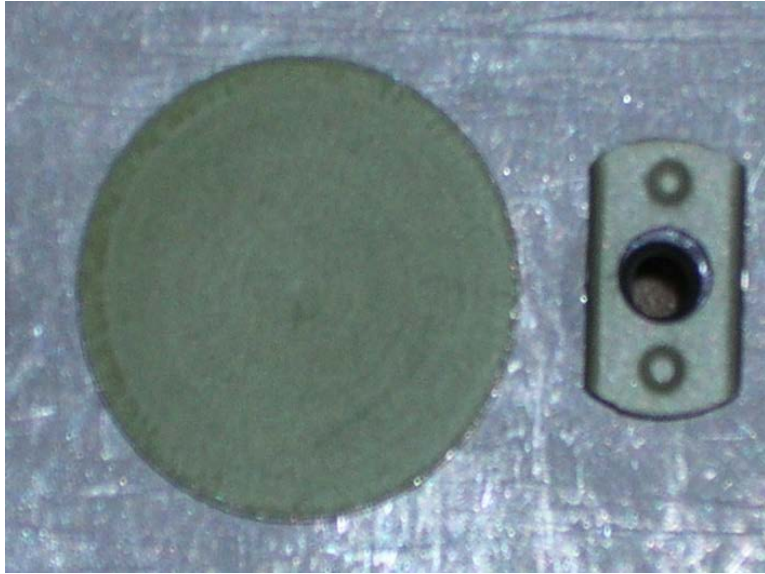


Substrate preparation

- Locate
- Abrade - to remove paint, primer and scale- creating a high energy surface
- Solvent wipe



Base Plate Surface Preparation



Epoxy Primer



Foil bags

Good bond strength and long term durability is dependant on bonding to high energy surfaces.

Click Bond provides two options for base plate protection (minimizing oxidation/contamination)

Epoxy primer and Nitrogen Purged Foil bags, in both cases a simple solvent wipe is required to reactivate the surface.

Mixing and Dispensing

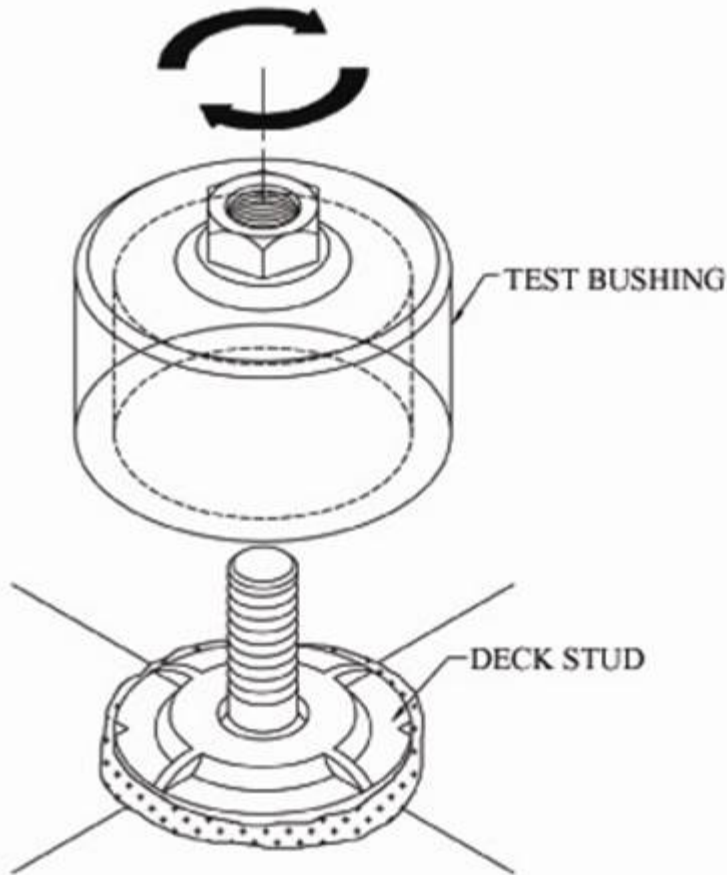


**Dispenser/Mixing Tip Summary:
Takes guess work out of mixing.
Only adhesive in Mixing Tip is wasted.**

Installation



Bond Verification Tools



- The tester is used to verify surface preparation, and bond strength.
- After the adhesive is cured for two hours the bushing is placed over the stud and the nut is torqued to a specified load

History-Furniture Install (5+ years) LPD19 1000 studs

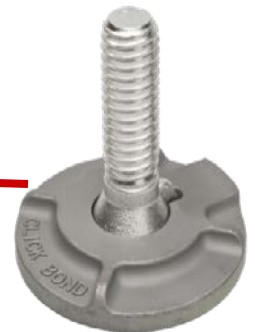


- Axially as well as radial float
- 5000 lb. Tensile / 10,000lb. Shear
- Passed MIL-S-901D Grade A shock, medium weight.
3 man 1600 lb. sit up berth. 8 studs

History - Well Deck Panel Repair LSD42 (7+ years at sea)

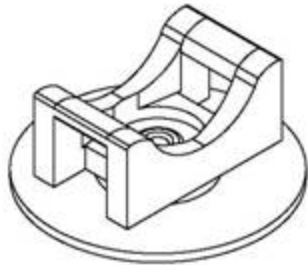
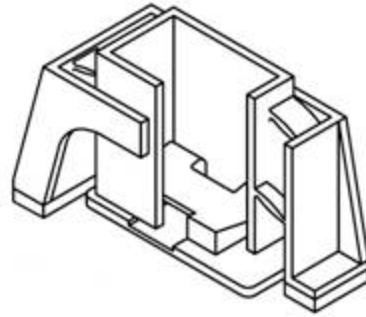


USS Gunston Hall Completed Well Deck Repair
utilizing Click Bond Adhesive bonded Deck Studs



Cable Tie Mounts

MRAP Field repairs and upgrades



Testing to date (2" base)

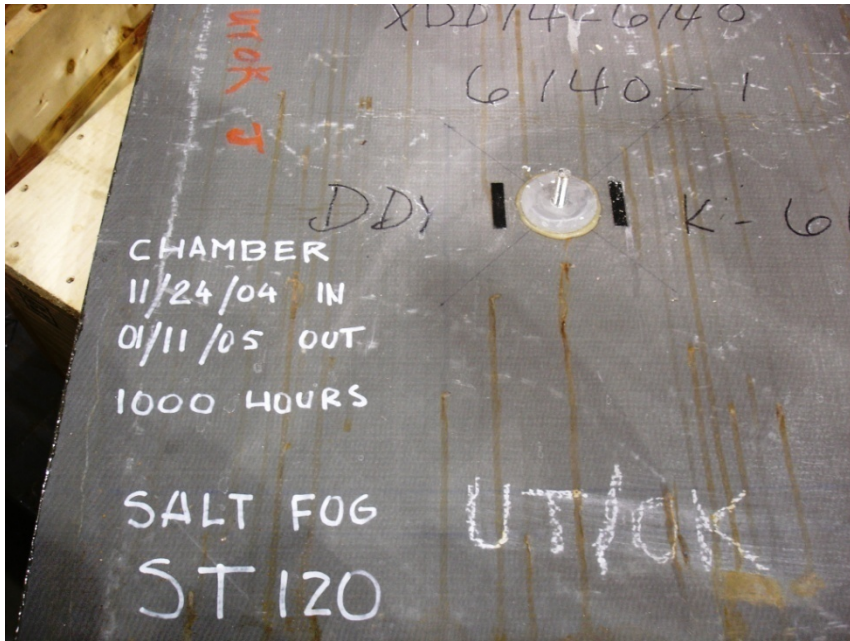
- Shock and Vibration, composite bulkhead
- Fatigue, composite bulkhead
- Accelerated aging, composite bulkhead
- Salt spray, composite bulkhead
- Shock and vibration, LPD mast
- -40F Shock, LPD mast
- Salt water immersion, Well deck repair



Click Bond Studs after 30 days hot/wet and Salt Spray

Salt Spray

Immersion



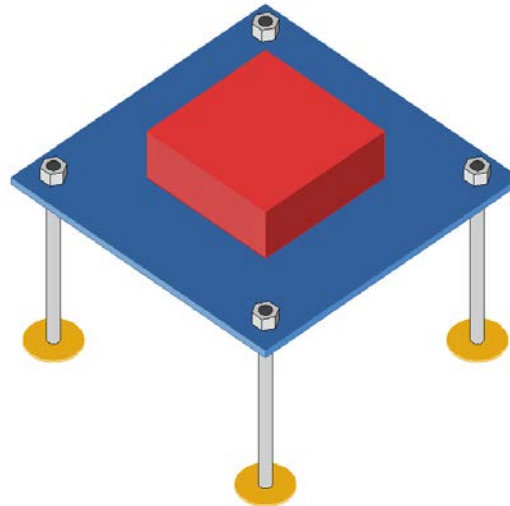
The Future

- Click Bond would very much appreciate the support of NSRP, particularly this panel, in identifying new applications, new products, as well as in coordinating requirements and required testing. For example shock testing on metallic bulkheads.

The Future - shock testing

Identifying representative

- Masses
- Mass offset
- Number of fasteners & fastener spacing



The Future - shock testing

Identifying bulkhead materials and bulkhead thickness

Nomex Honeycomb

Stainless Steel Honeycomb

Aluminum

Steel (3/16" and 1/2" thick)

- 1/2" thick Fastener, Adhesive, and representative mass sees highest shock load
- 3/16" thick Fastener, Adhesive and representative mass sees highest peel load (substrate panel flex)

In Summary

Benefits

- Elimination of hot work and costs associated with it
 - a. Gas freeing of fuel and storage tanks
 - b. Removal of insulation
 - c. Fire Watchers
- Minimizes galvanic corrosion between fastener and bulkhead
- Eliminates holes/leak paths in composite/balsa joiner bulkheads leading to long term durability
- Allows for stud installation later on in build process (no hot work) limiting stud damage and replacement
- Reduction in labor time for installation - 6 minutes for bonded stud installation-surface prep to final installation.
- Skilled labor isn't required

In Summary

Need a way forward

- Identifying applications and requirements

Thank you
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