

# Railway Interiors Expo 2007

- Click Bond's Focus
- A new manufacturing process that utilizes adhesive to permanently attach fasteners to structure.

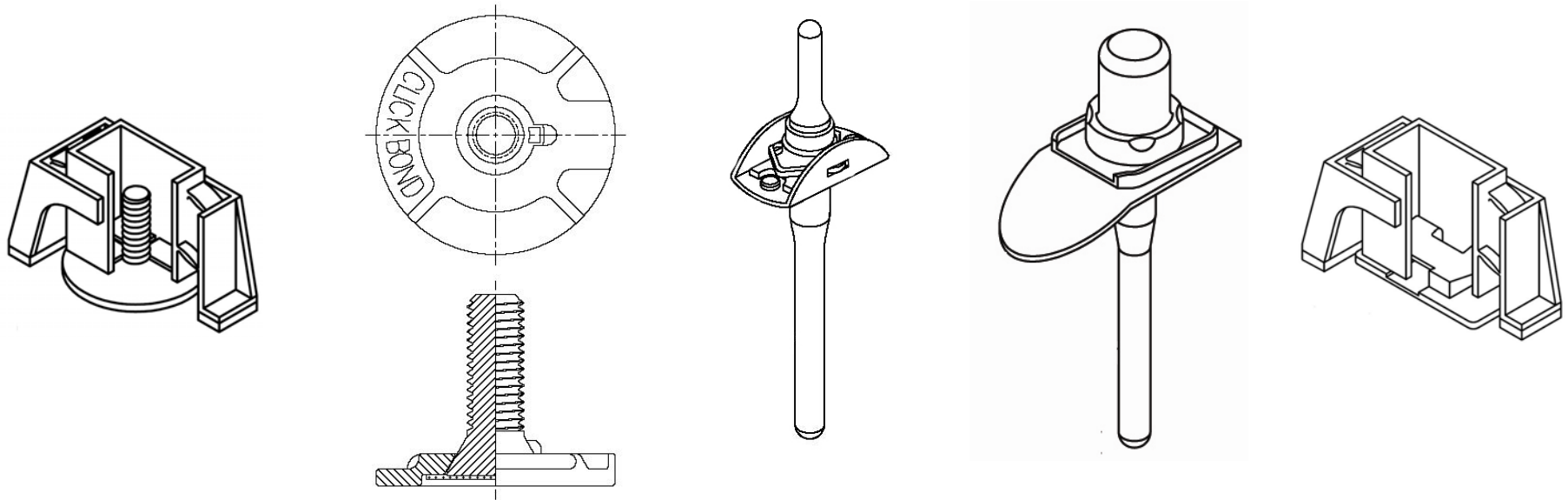


# Introduction



- Overview: product line and benefits
- Test and Evaluation
- Applications

# What is Click Bond?

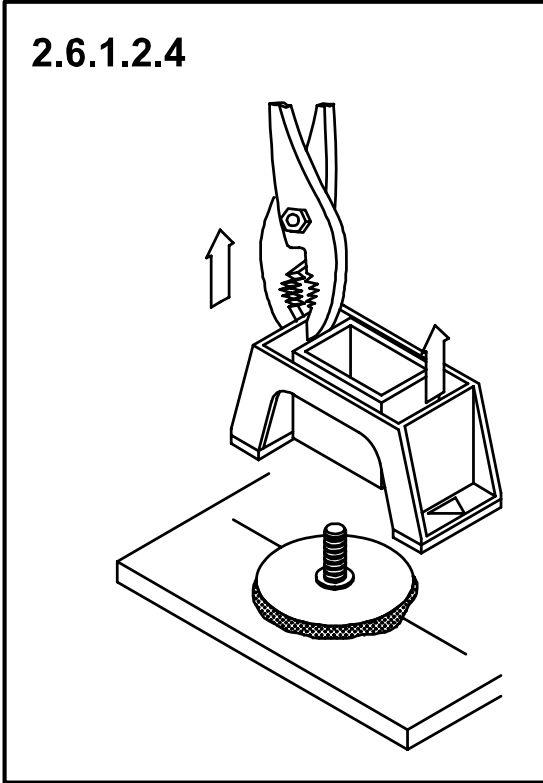
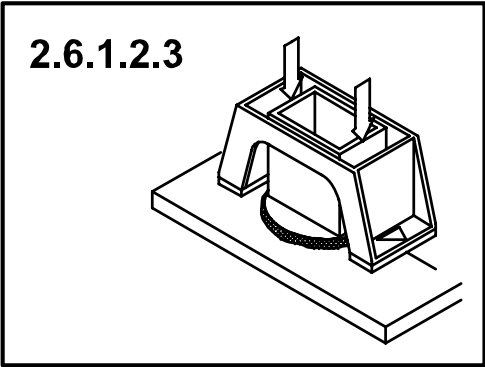
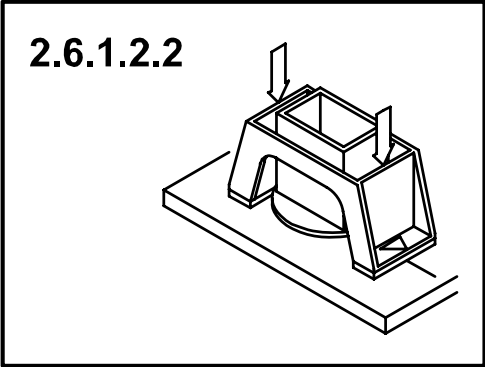
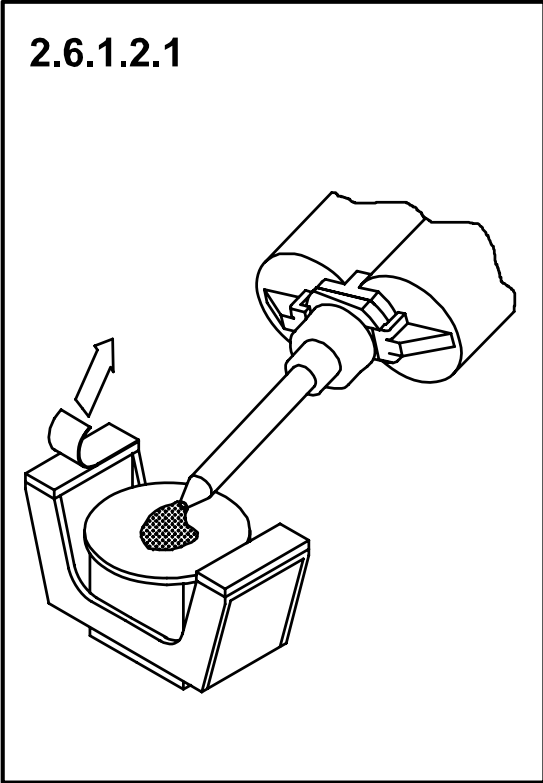


- A unique way of attaching studs, standoffs, cable ties, and nut plates through the use of adhesives

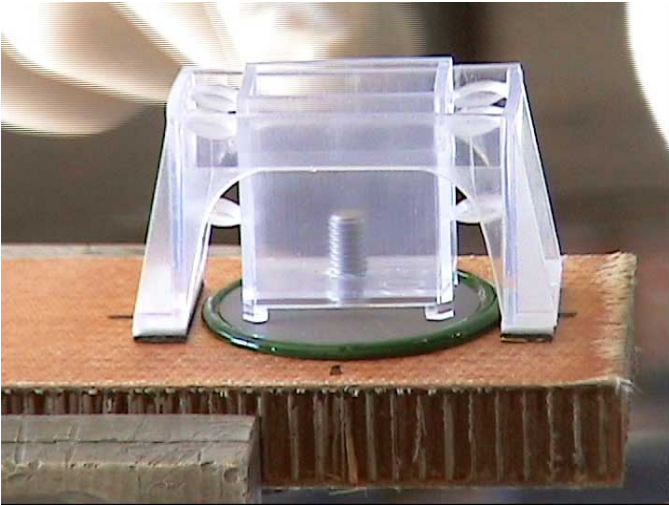
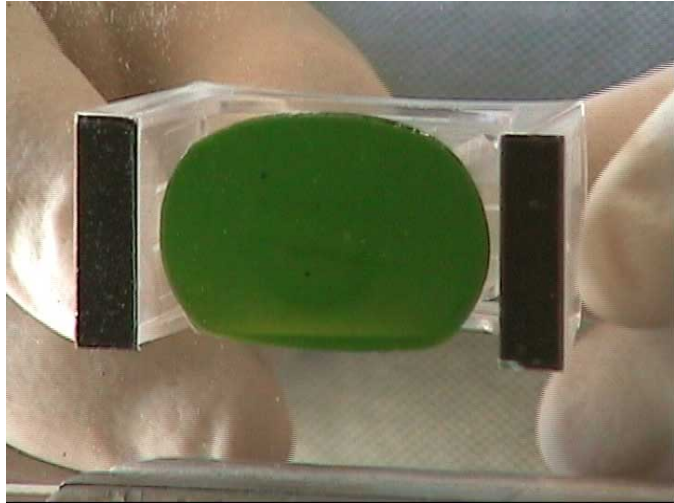
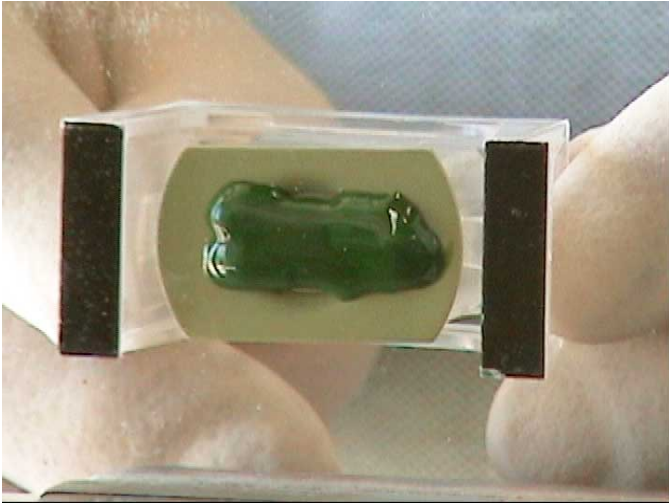
# Installation Process



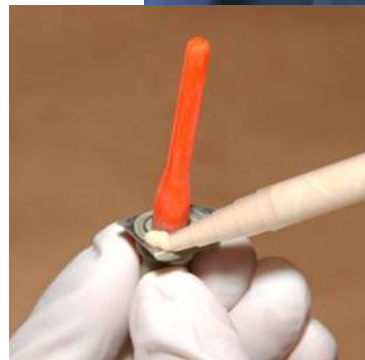
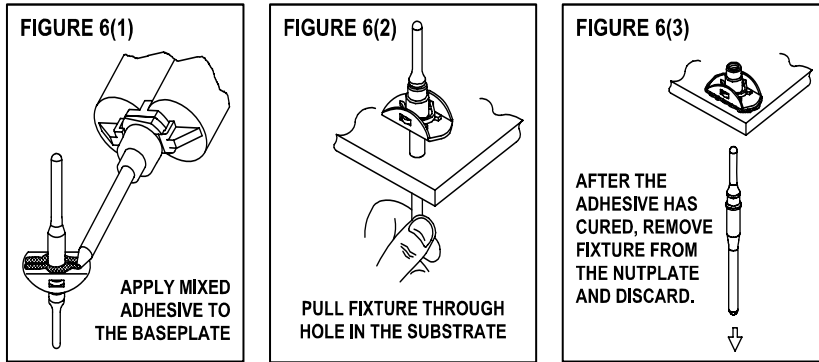
Click Bond fasteners come with a fixture. Internal or external. The fixture keeps the joint under constant pressure during the adhesive cure, and insures a consistent bond line thickness.



# 20 KPa of Pressure/Bond Line .125mm Thick



# Similar idea with the nut plates



# Applicable Transportation Systems

- mass transit,
- commuter rail,
- high speed and intercity,
- trams, trolley buses; and
- other public transport vehicles.



# Why Bonded Fasteners?

- New materials being introduced for interiors, shell and floor structures.
- Lightweight composite materials.
- Bonding provides easier more cost effective manufacture.



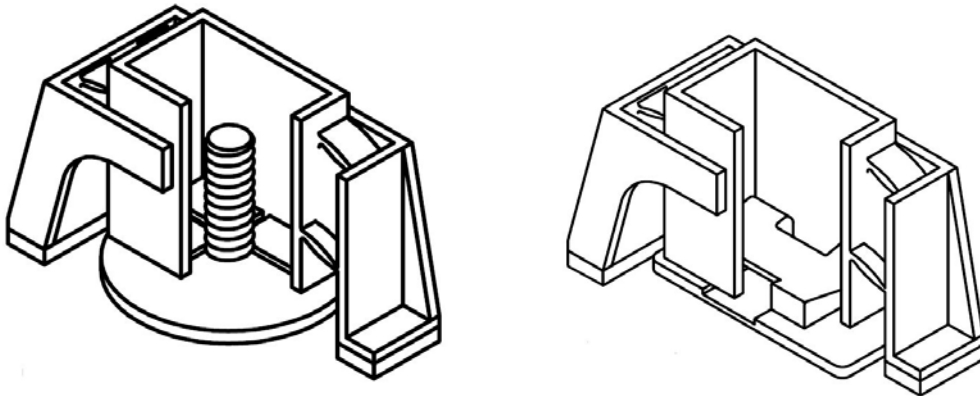
# Benefits



- Ease of manufacture
- Ideal in composites
- No rivets or rivet holes, moisture doesn't collect in and around the holes-preventing corrosion and eliminating potential leak paths
- Simple manufacturing process for lower skilled laborers.
- Reduced Labor cost – 75% less time to install bonded fasteners versus potted fasteners.

# Product Line-Surface mounted Parts

- 15,9 mm, 31,8 mm, and 50,88 mm diameter parts, full as well as trimmed.
- Carbon Composite, Fiberglass, Thermoplastic (Ultem 40% glass), Al, and Stainless Steel (A286 & 316)
- Thread size from 3M to 10M

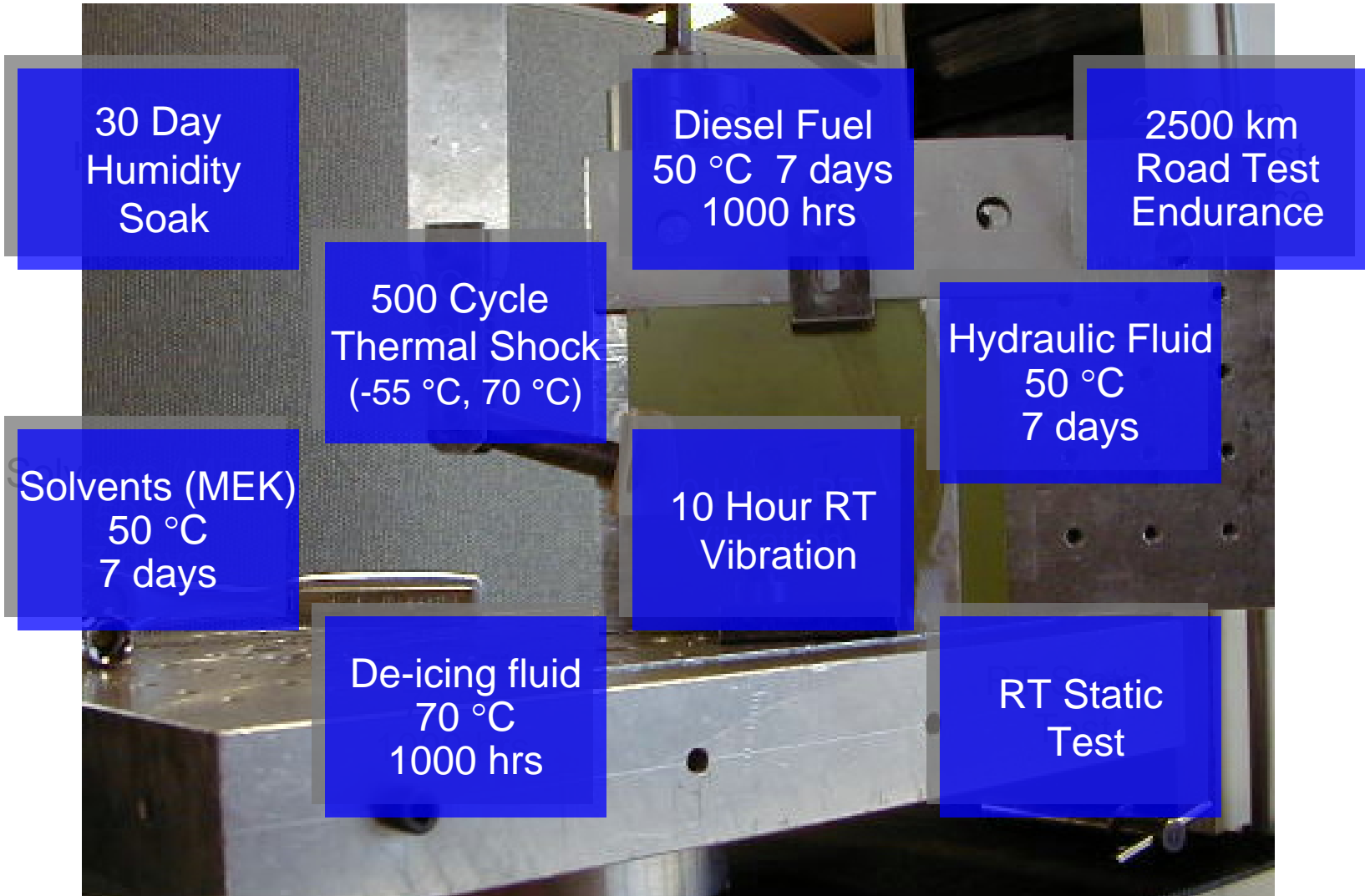


# Test and Evaluation

- Testing to address users biggest questions
- Fluid susceptibility
- Cyclic durability
- Vibration concerns
- Hot/Cold cycling
- Long term durability
- Corrosion



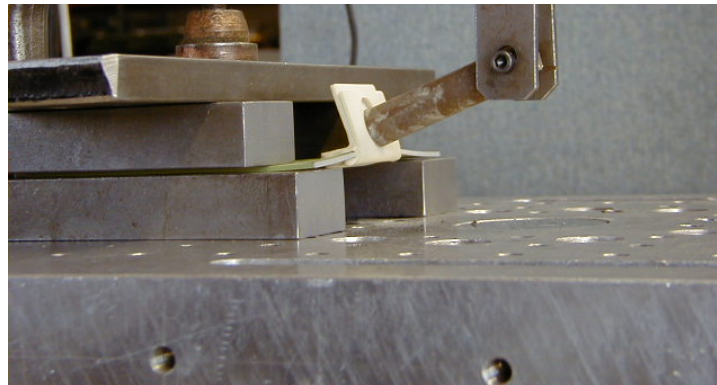
# Test and Evaluation: Environments



# Test & Evaluation: Extensive Test Data



- Click Bond Test Data over 5000 bonded fasteners over the last 10 years
- All adhesives, all substrates, full range of fastener sizes.
- All environments: Aircraft, Land Transport, Marine, Space, Industrial, Military, Civilian.

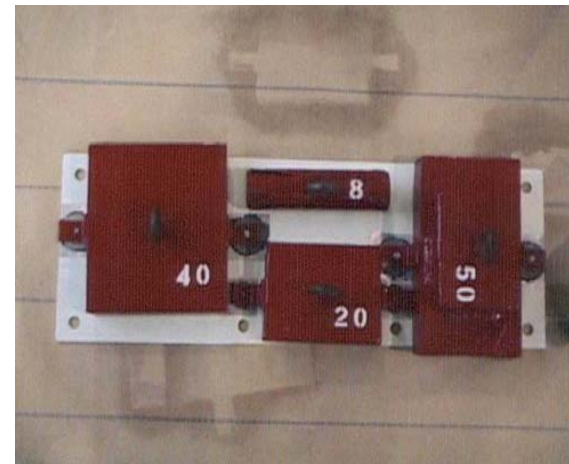
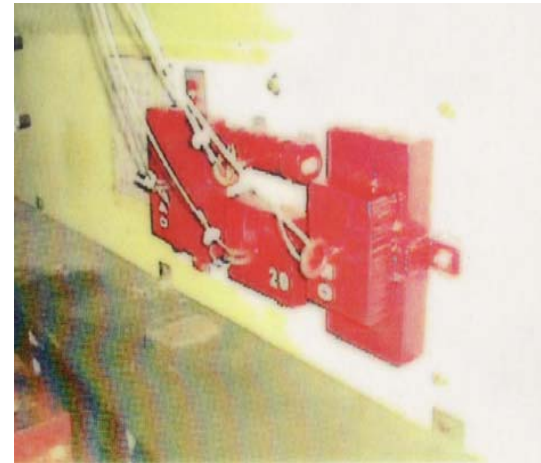


# Test & Evaluation: Extensive Test Data



Independent Test Data  
(shock, vibration, road tests)

- Boeing
- Bombardier
- Northrop Grumman
- General Dynamics
- Various independent Labs



# Test & Evaluation: Extensive Test Data



# Conclusions From Testing



- Click Bond fasteners meet and exceed industry requirements.
- Most challenging environment is heat
- Worst Case conditioning-Hot wet conditions reduce adhesive strength by 10% to 15%
- Avoid bonding to thin, unsupported structures
- Surface prep is key to successful bonding

# Installation Process – Surface Prep

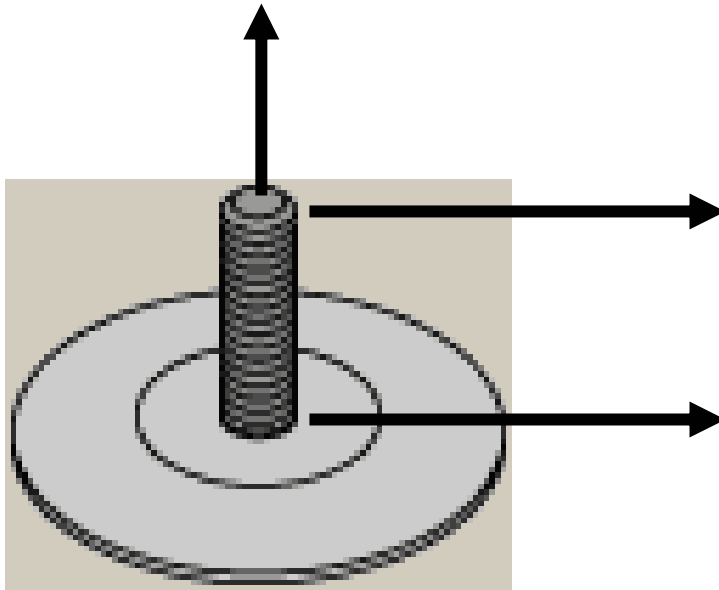


- Clean faying surfaces provides permanent installation
- Faying surfaces must be free from foreign material or residues that would inhibit a good bond.
- Mechanical abrasion, solvent wipe, dry wipe
- Proper surface preparation is the most critical part of the installation procedure, and the simplest to get right

# General Strength Values

- **31.8 mm DIAMETER BASE CRES STUD**
- **AVERAGE FAILURE**

TENSION: 5.6 KN



MODIFIED SHEAR:  
1700 N/cm

SHEAR: 11.1 KN

# General Applications

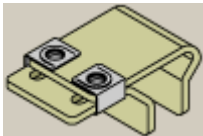
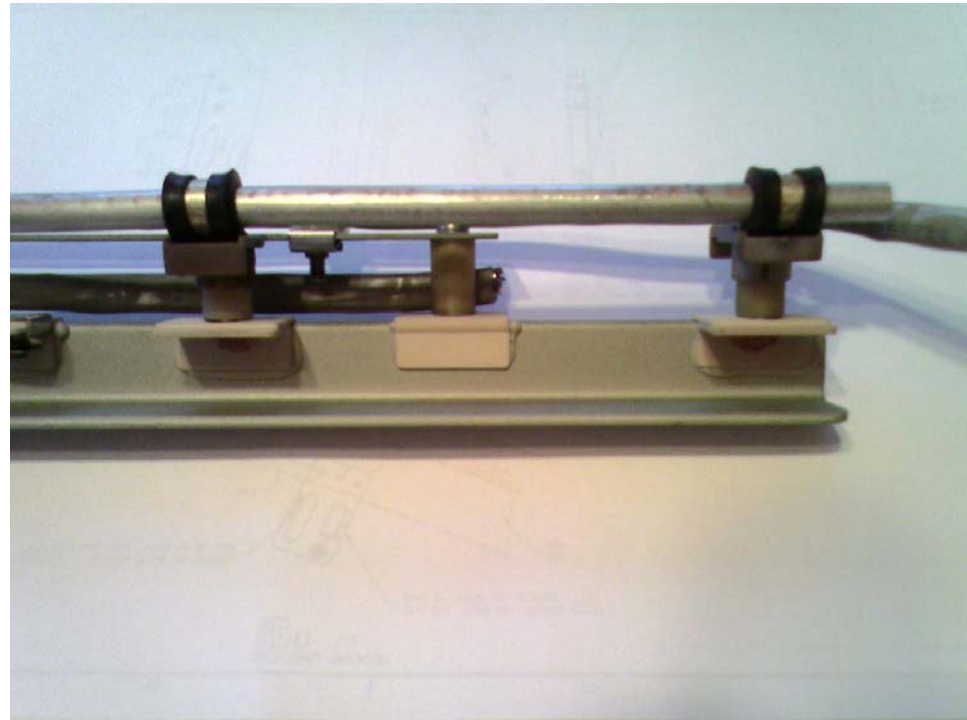
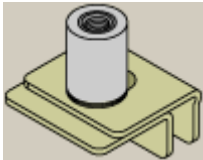
Interior refurbishment

Installation of various interior systems:

- Safety Equipment
- Lighting
- Galley installations
- Wi-Fi and communications system installations
- Refrigeration
- Electronic displays
- Food service equipment



## Bonded Bracket to attach systems



**No holes or welding to frames or structure**

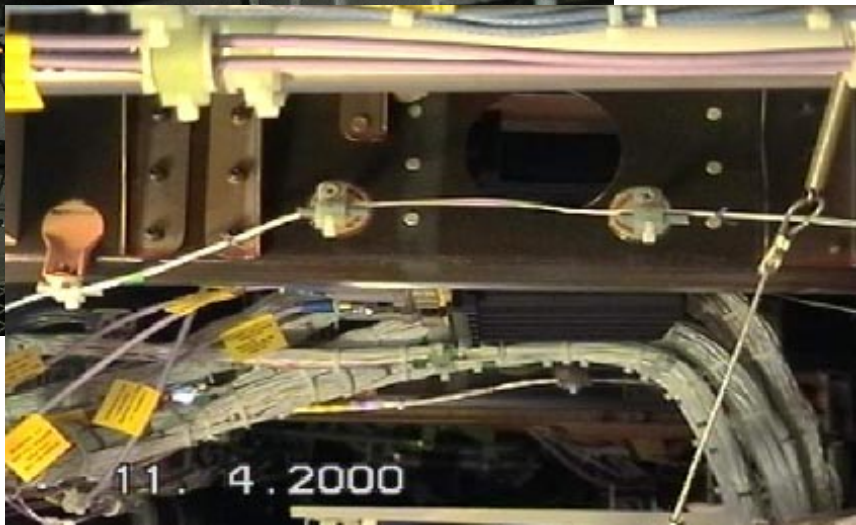
# Cable Ties



Wire Runs  
off of main  
cable runs

CB3019

CB9120



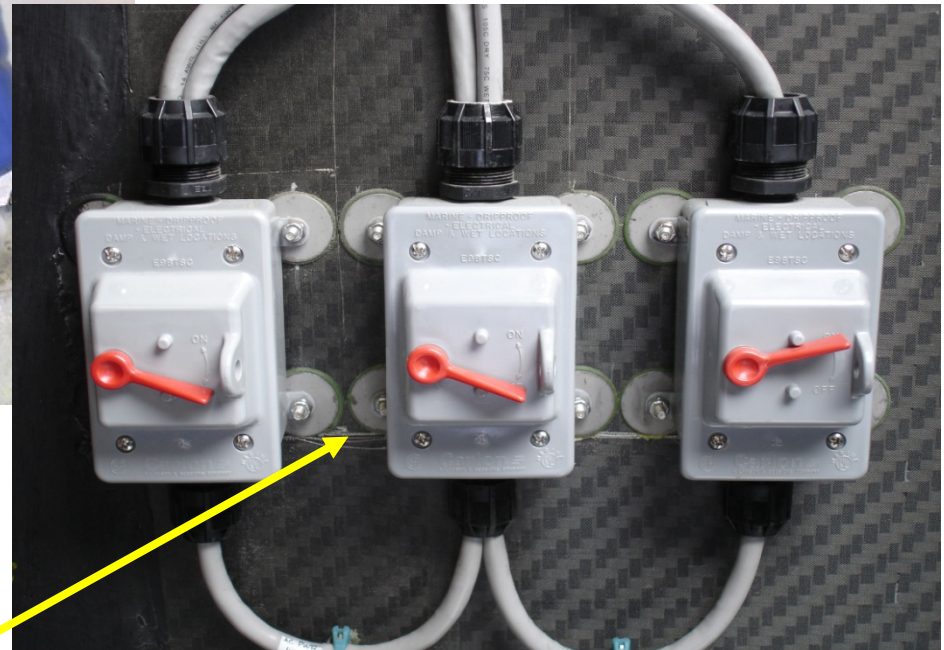
# Component installations



Fluid Reservoir

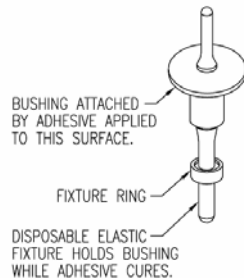
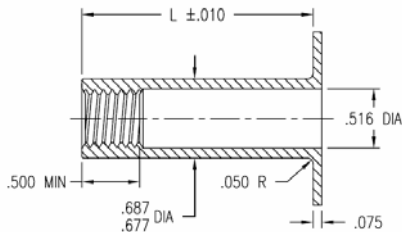
CS125

Elect. Junction Box



# Reinforcement of Composite Floorboards

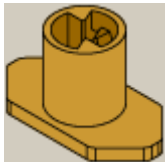
- Function, bushing takes up compressive load (various cores: balsa, honeycomb). Protects hole during life of structure.
- Installation Loads: Shear load due to bolt torque and loads due to clamp up.



# Lighting and Electrical Components



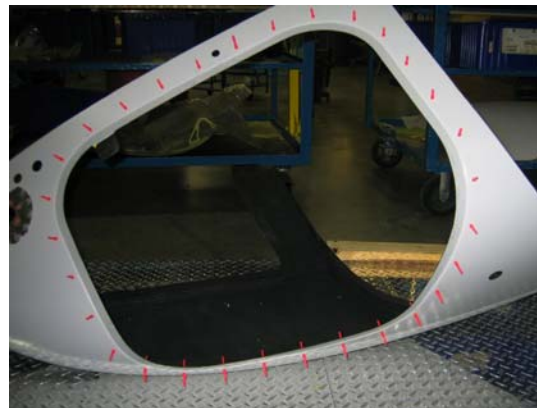
**2 part bushings**



**1/4 turn receptacles**



**captured nuts**



**Lighting  
installation**

**Thank you**