EPA SF_6 Emissions & Reduction Conference

SF_6 Leak Reduction Using Online Leak Sealing

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Benefits of Online Leak Repair for HV App

- No need to remove the gas or pull a vacuum
- Many repairs can be made in service
- If an outage is required, it will be minimal
- The sealant is not an epoxy – it's flexible and easily removed

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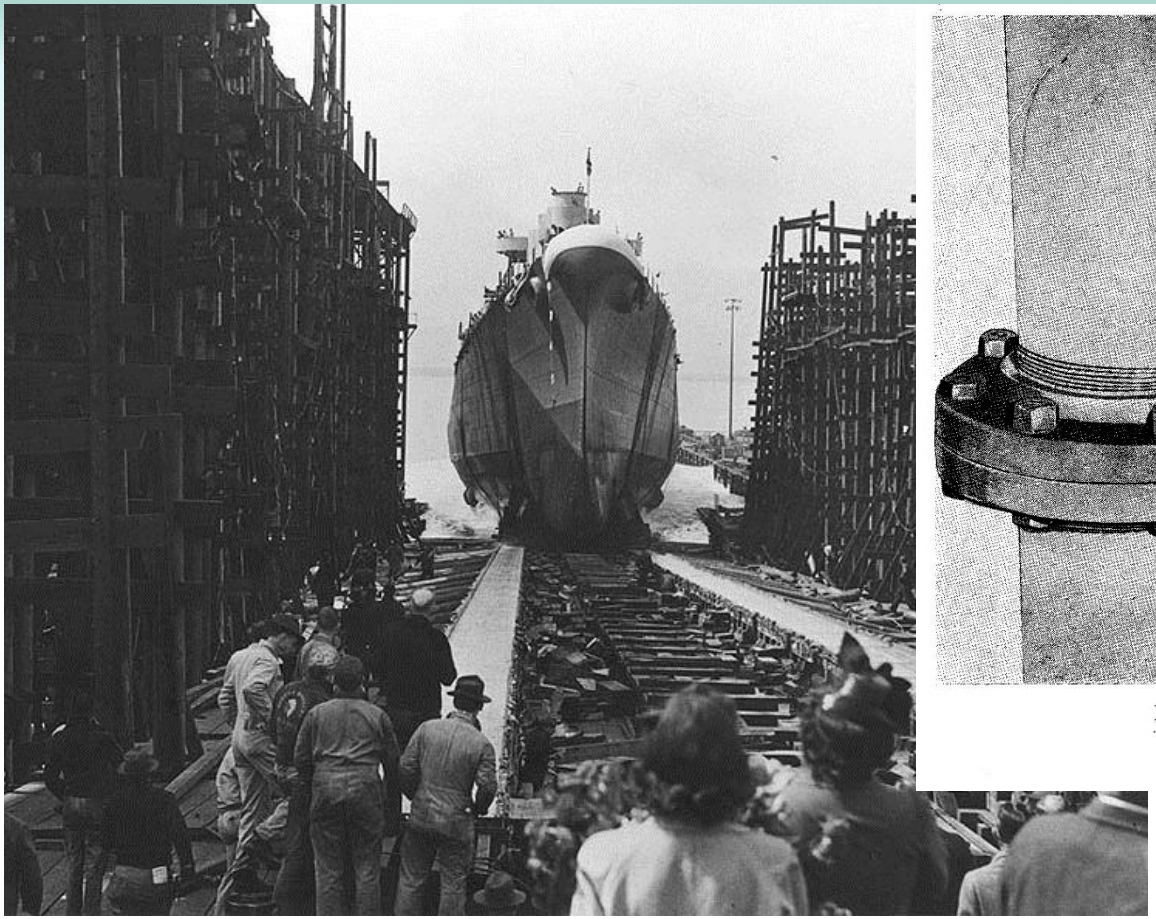
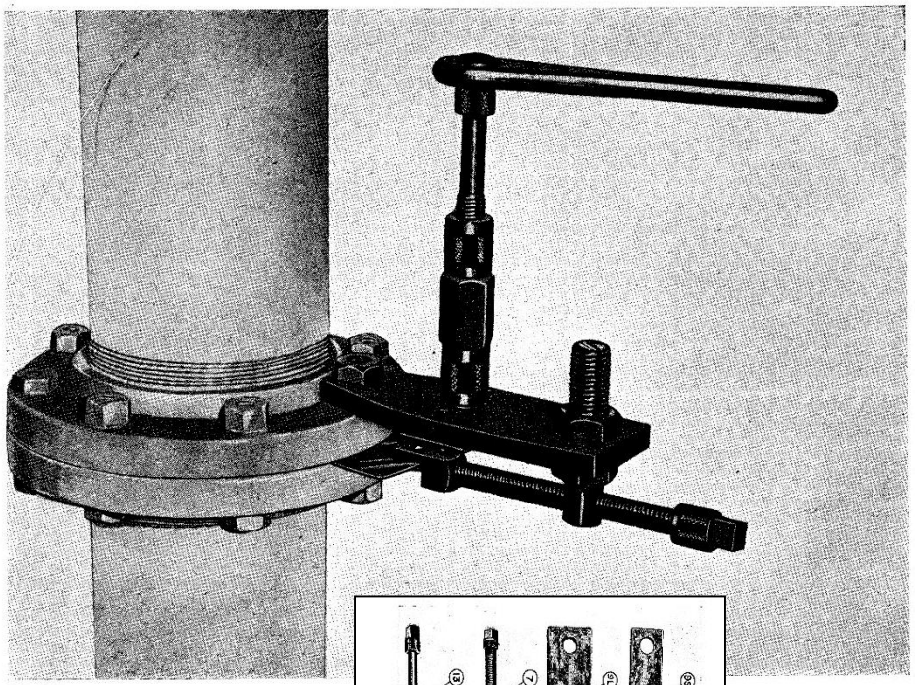
The History of Online Leak Repair





PHOTOGRA
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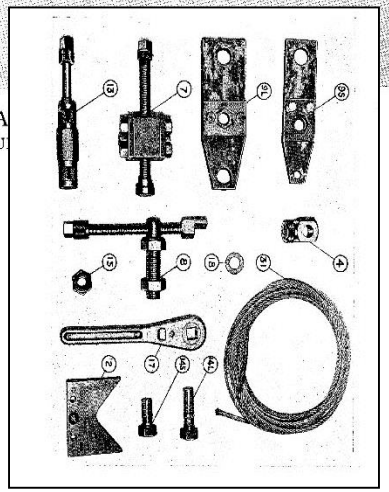

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A Proven Process

15,323 jobs completed since 2002

6,286 Flanges

5,691 Valve packings

1,045 Custom clamps & enclosures

875 Drain plugs

287 Cover plates

91 Miscellaneous

38 Tap changer flanges

24 CTs

987 re-pumps over twelve years or 6.4%. A 93.6 success rate

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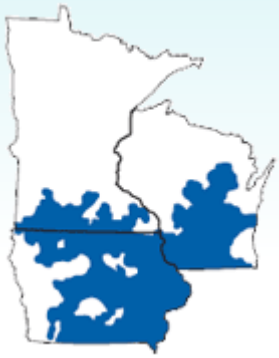
SF_6 Leak Repair Case Study



Alliant Energy
Eddyville Substation 69 kv SF6 Breaker
Eddyville, Iowa

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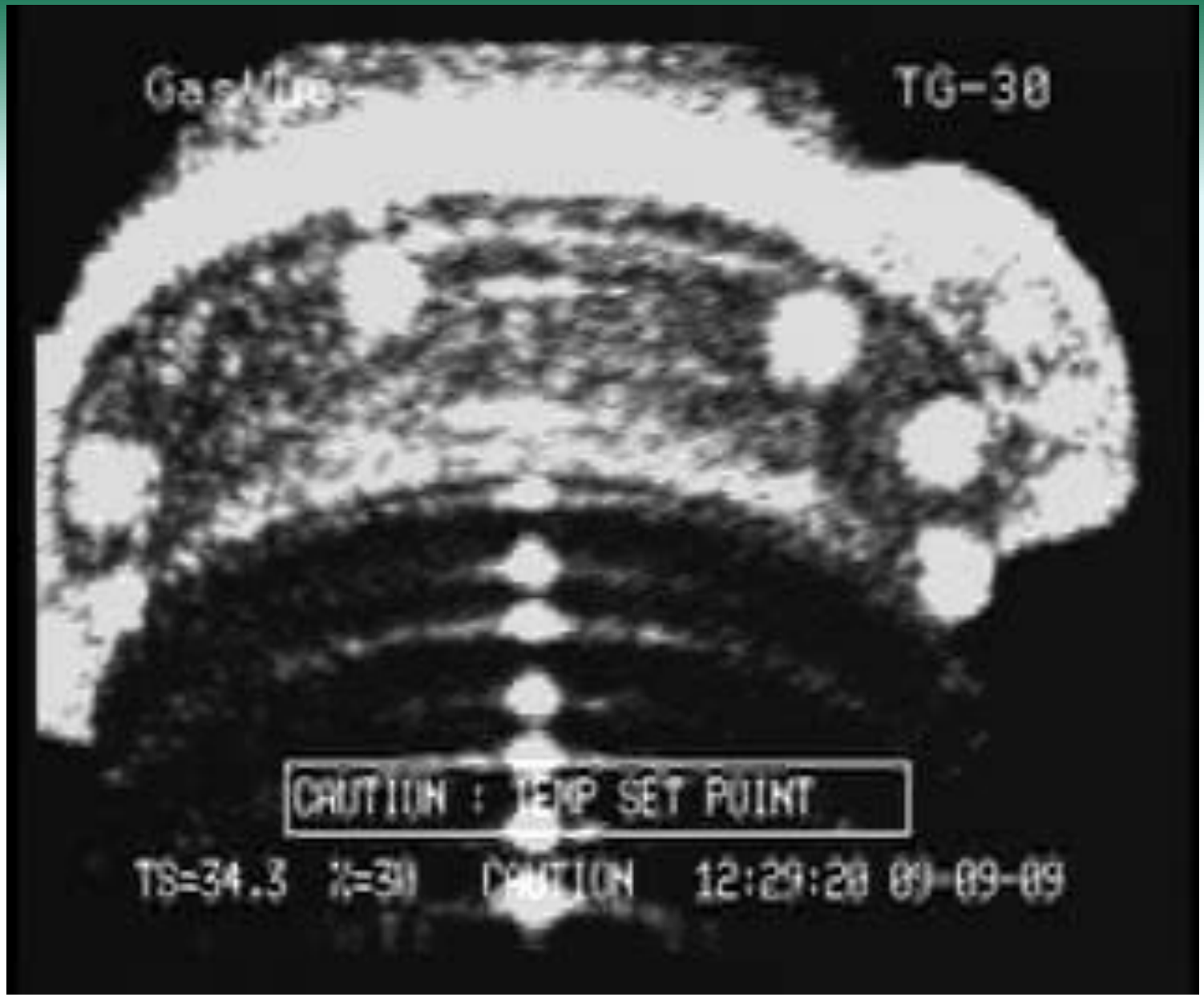

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Alliant options

1. Let it leak. Not an option, environmental concern

2. Re-gasket. Time to take the breaker out of service was the primary issue.
   Would require 5 days of down time, loss of transmission and $20,000.00 in costs

3. **Leak Repair – Installing custom enclosure and injecting sealant. Determined as the optimal solution**

Justification: Reduced downtime for critical apparatus.
Just 1 day of down time and $20,860.00 to fix all leaking components
Savings = 4 days of transmission

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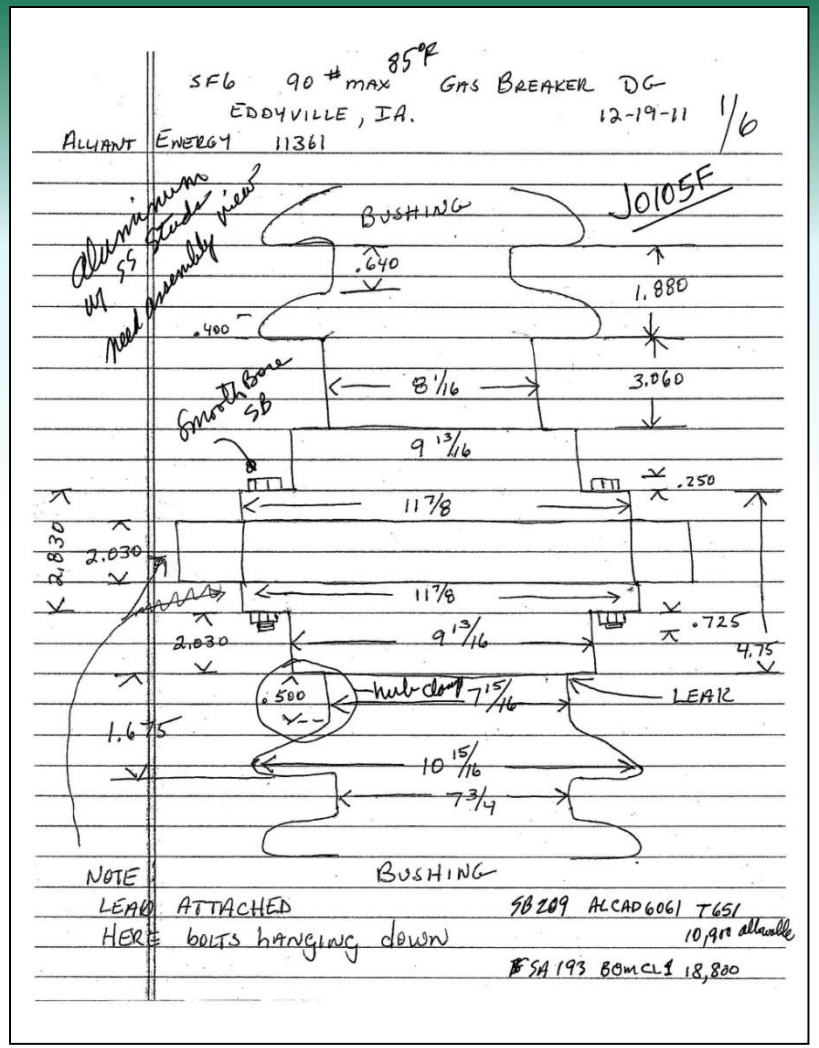

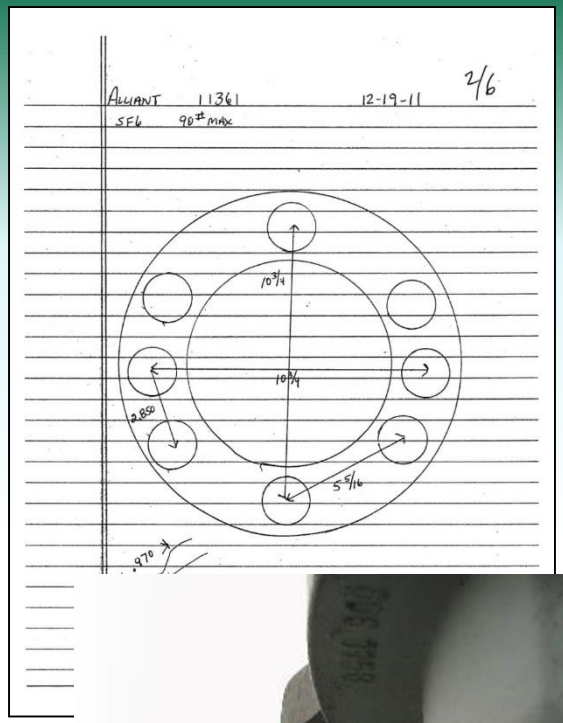

Technician takes precise measurements for custom clamp

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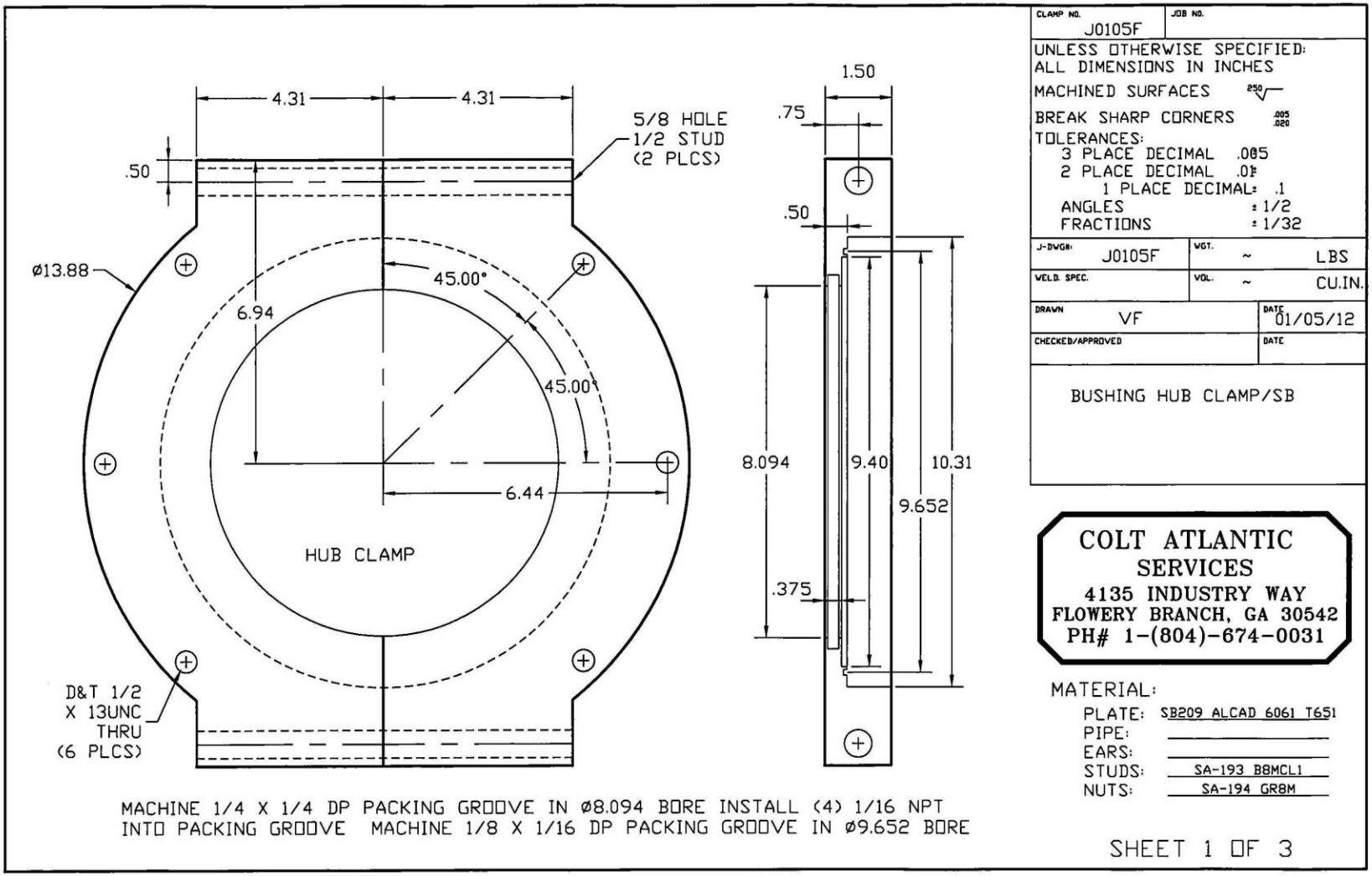

Engineering package is developed and reviewed

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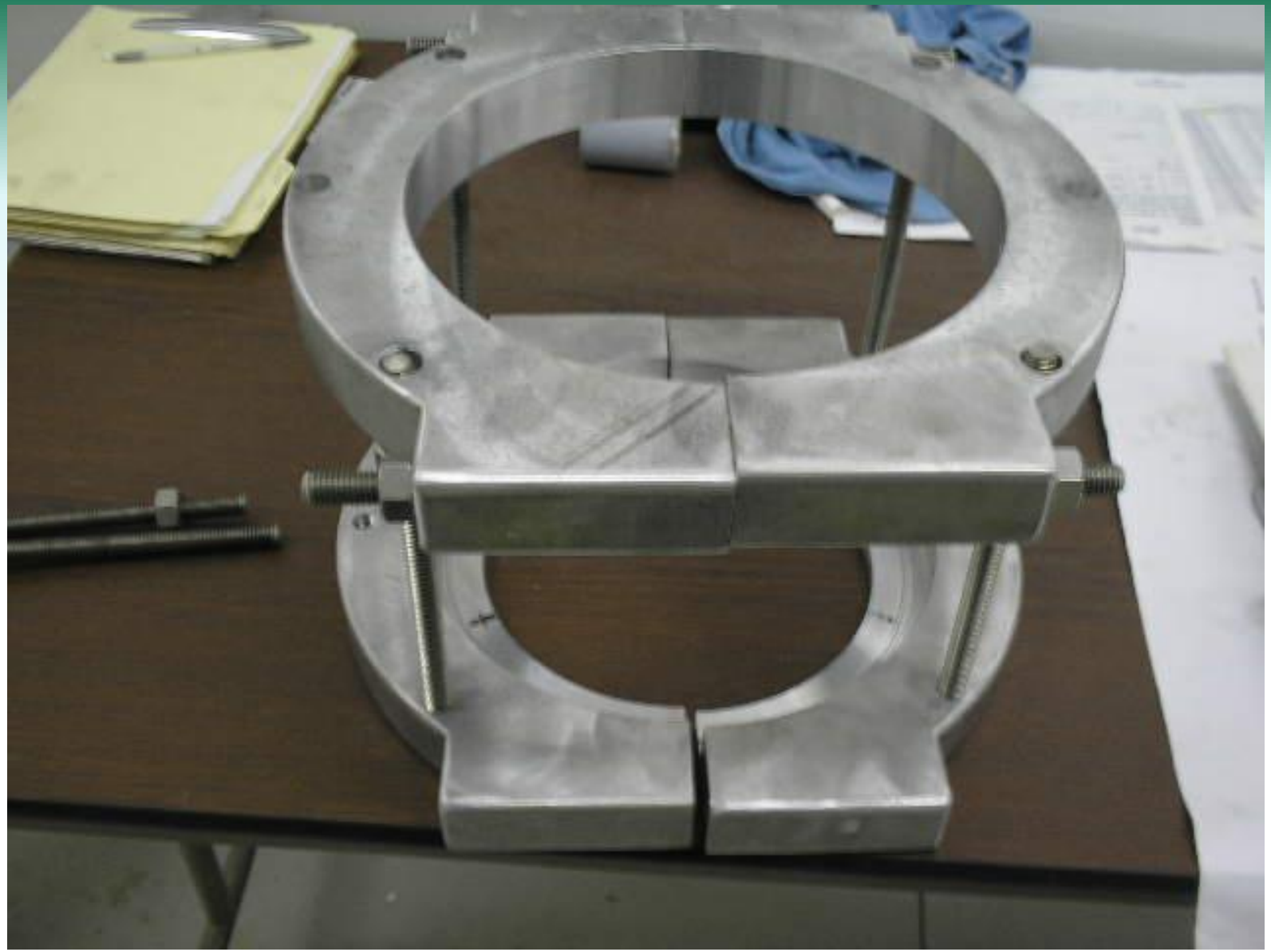

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The completed clamp (lower piece) and strong-back

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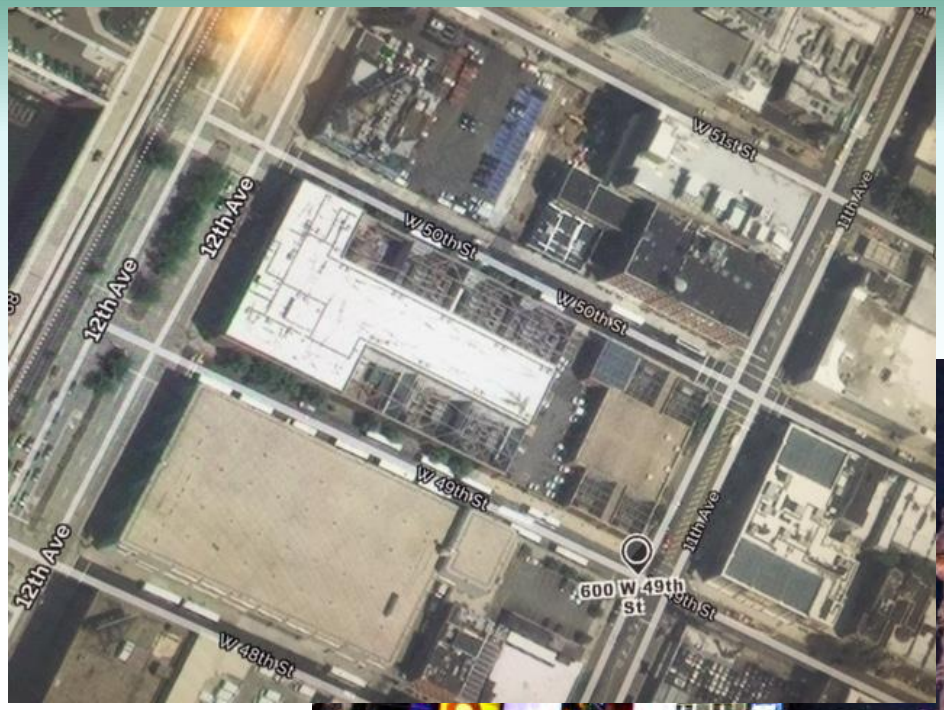
Installation in progress, waiting for sealant to cure

Case Study: ConEd West 49th Street GIS



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Station Overview

- West 49th Street Substation reduces voltage from 345 kV to 138 kV
- Five 345 kV feeders
  - Two from Sprain Brook Substation
  - Two from East 13th Street Substation
  - One inter-utility feeder from Public Service Electric and Gas Company
- Eleven 138 kV feeders from the station supply W 42nd St., W 50th St., W 65th St. and Astor Substations
- Gas Insulated Switchgear (GIS) at the station was put into service in 1978
  - No design requirements to control leakage were in place in 1978
  - Fifteen SF_6 insulated 345 kV and 138 kV bus sections
  - Five autotransformers
  - Ten 345 kV circuit breakers

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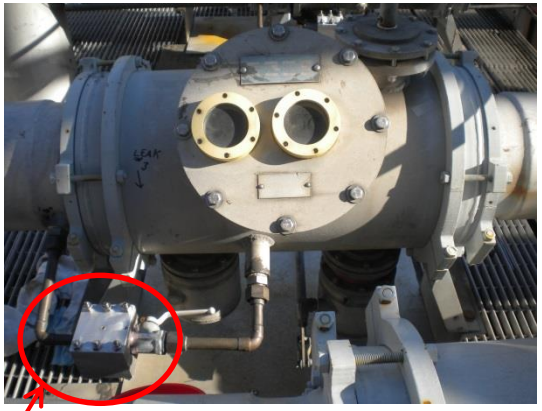
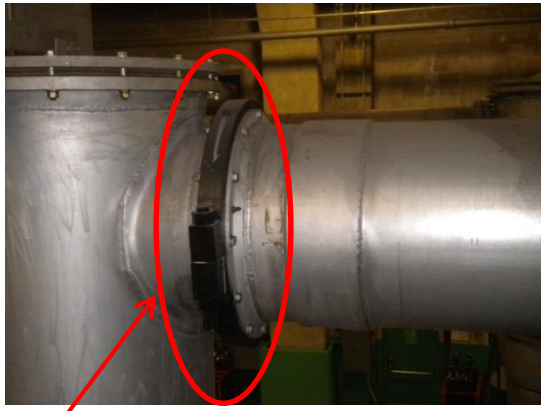
SF6 Leak Repair Status

49th Street Substation SF_6 Repair Summary			
Total clamps installed (including on bypasses)	Total bypasses	Total patches	Total Active leaks
94	100	35	0



Clamp on leaking bypass in Transformer 3 Secondary Bus



Clamp on leaking flange in Bus Section 7

Welded patch on secondary CCPD

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Issues

- Lack of O&M funding
- No long range plans to replace equipment and no plan for added capacity
- Limited availability for outages

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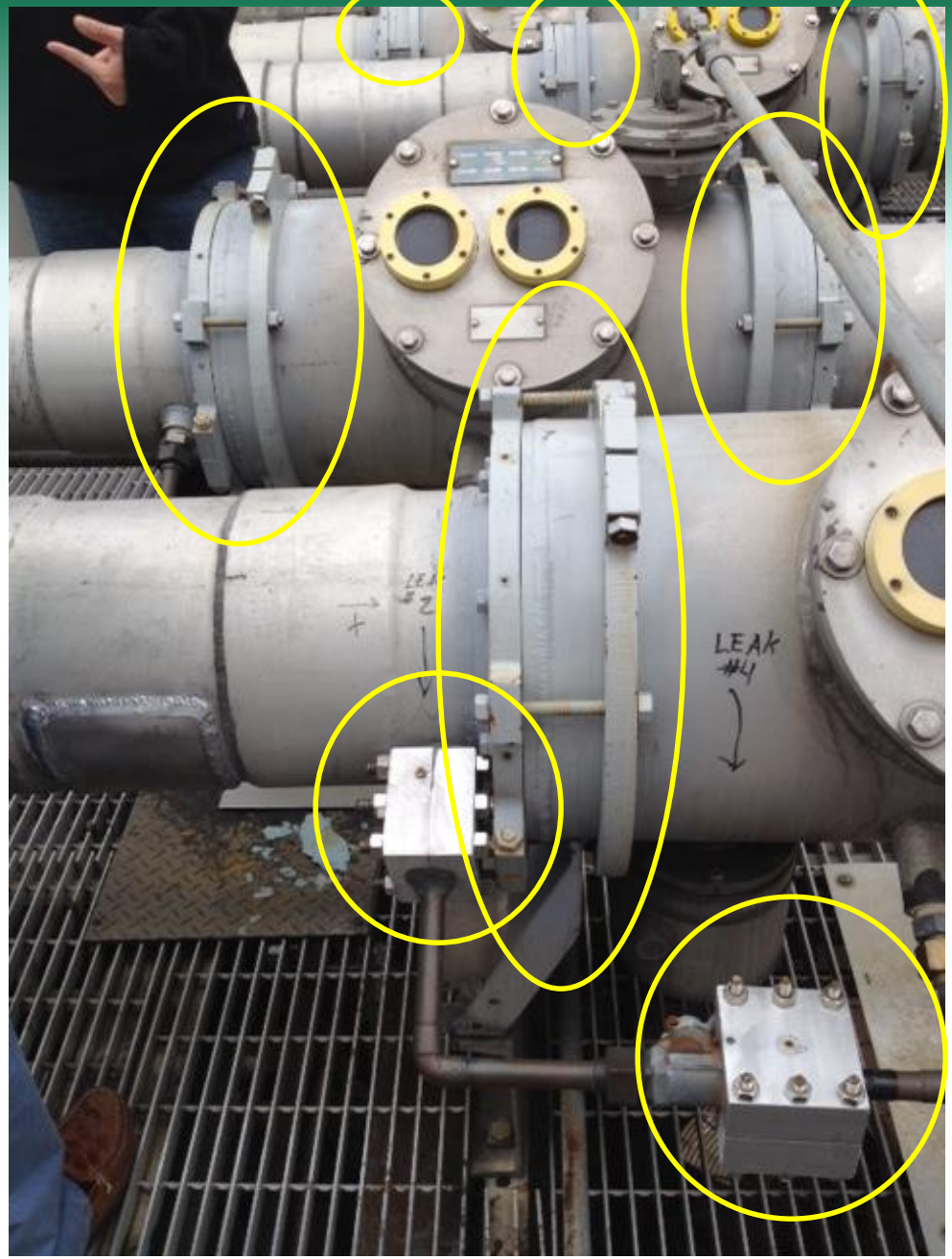

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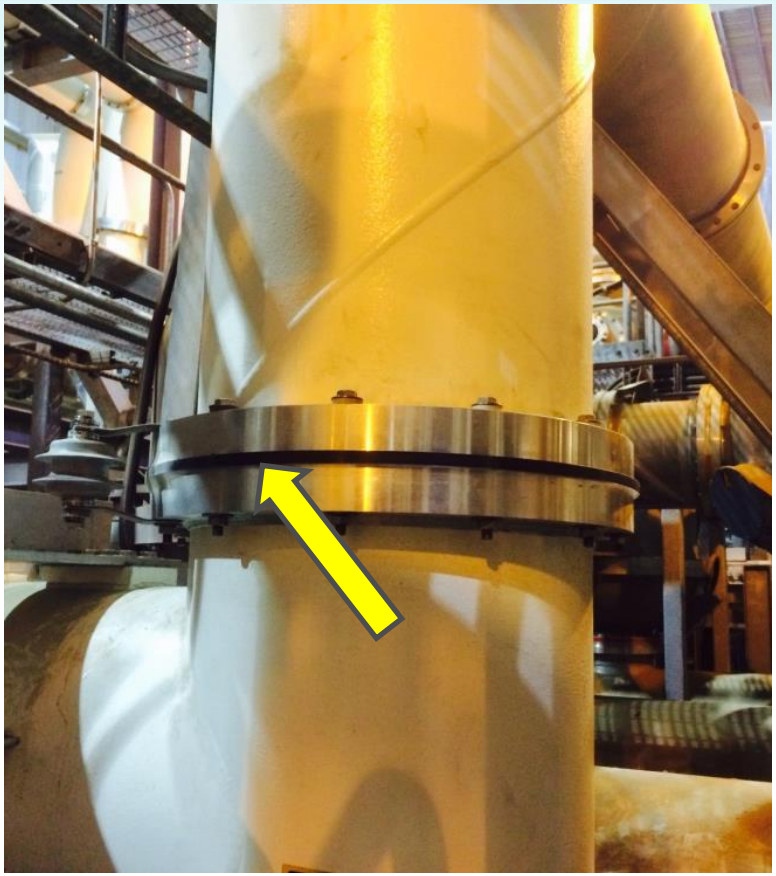
Southern California Edison SF6 Repair



Before

After

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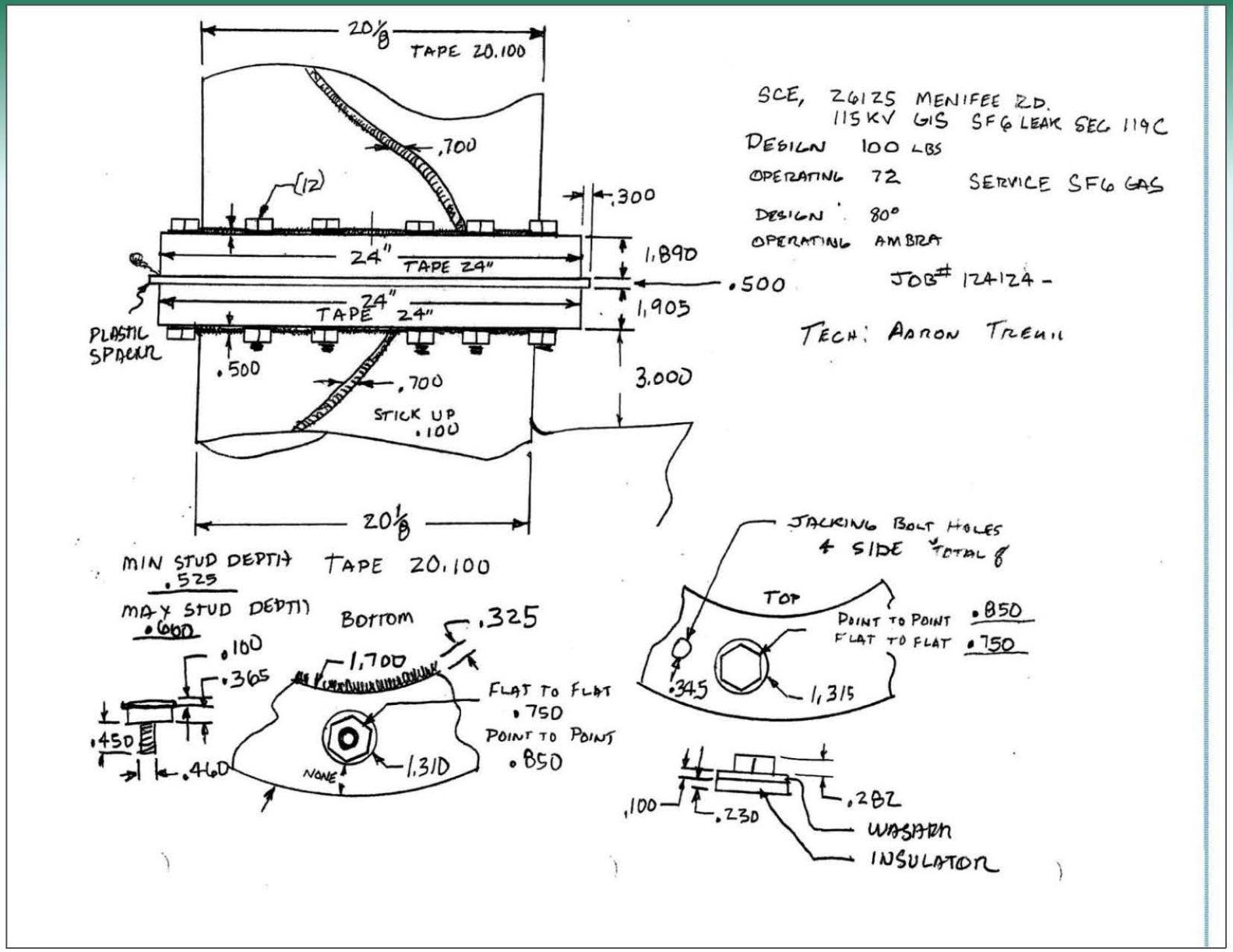
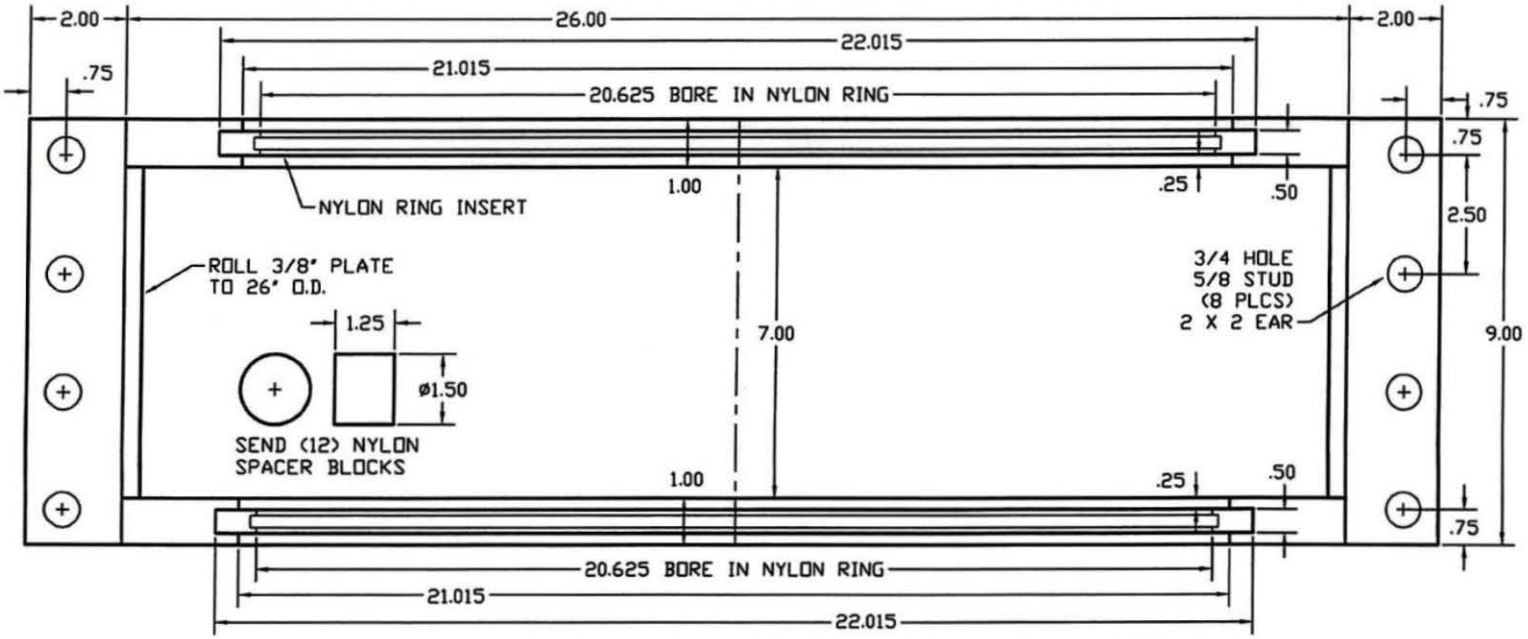


Technician's drawings and measurements



MACHINE 1/2 X 1/2 DP GRV IN EACH 1" ENDPLATE FOR 1/2 X ø22.015 NYLON INSERT
MACHINE 1/4 X 1/8 DP PKG GRV IN CENTER OF NYLON RING INSERT IN EACH BORE AND INST 1/4" PKG IN EACH GRV
INST (12) 1/16 NPT HLF CPL INJ PTS INTO CAVITY FOR VENT/VOID FILL

J0717F	WGT. ~215 LBS	UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS IN INCHES	TOLERANCES: 3 PLACE DECIMAL : .005	20" LINE TO LINE
	VOL. ~690 CU.IN.	MACHINED SURFACES 250	2 PLACE DECIMAL : .01	OVER FLANGE ENCLOSURE
	JOB NO. 12009	BREAK SHARP CORNERS .005 .020	1 PLACE DECIMAL : .1	REV. 2
DM	DATE 7/23/14		ANGLES : 1/2	
SF	DATE 7/23/14		FRACTIONS : 1/32	

MATERIAL: PLATE: SB209 ALCLAD 6061 T651 STUDS: SA-193 B8MCL1
PIPE: NUTS: SA-194 GR8M
EARS:

COLT ATLANTIC SERVICES
4135 INDUSTRY WAY
FLOWERY BRANCH, GA 30542
PH# 1-(804)-674-0031

SHEET 1 OF 2

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Page from final Engineering package

Nylon insulating rings

Installation of enclosure

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The completed repair is tested and successful

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Example - Casting Leak

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Small repair with supporting arms to hold in place

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Clamp Removal is easy

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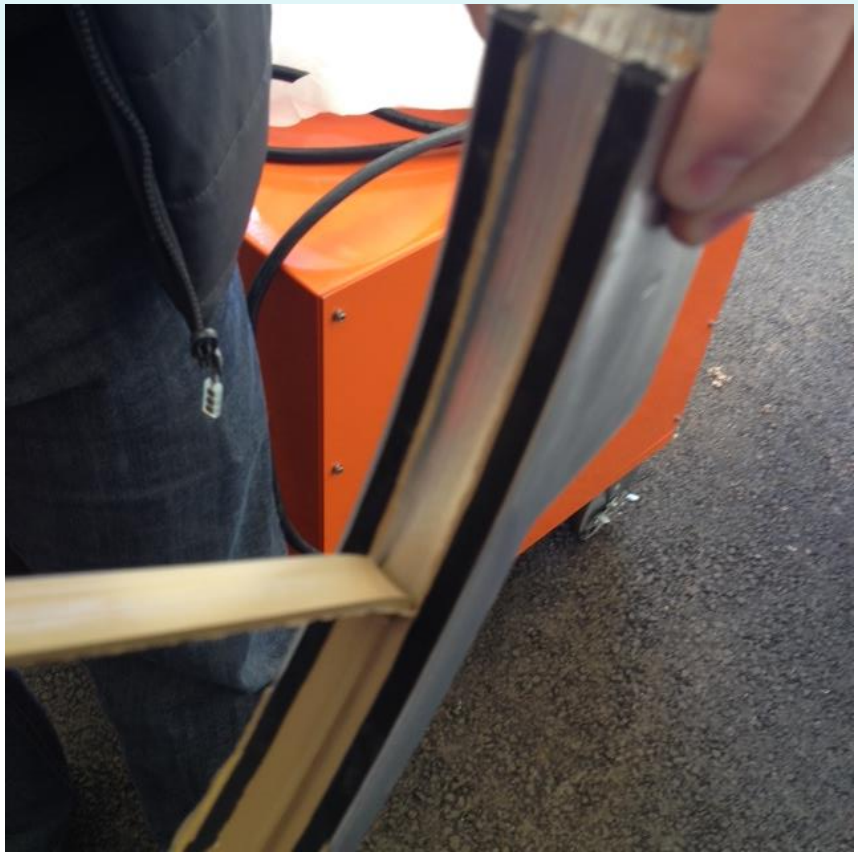
Sealant Removal is easy also



Note that sealant injected remained within designated area

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Thank you!

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