PE20-001

MCI

6-11-2020

REQUEST 8 - MCI
RESPONSE TO ODI PE20-001

ROW 1_J4500 MY2019
Maintenance Manual P10-7

6-COOLING SYSTEM Maintenance Operation	Months	Service Interval (Miles)								Specification Code
		Custom Intervals	6,000	12,000	24,000	48,000	96,000	150,000	300,000	
DRAIN, CLEAN, AND FILL THE COOLING SYSTEM - DD13	24								■	S-19
DRAIN, CLEAN, AND FILL THE COOLING SYSTEM (FLUSH) - CUMMINS **(250,000 Miles)**	24	■								S-19
INSPECT ALL CLAMPS AND RE-TORQUE	6				■					
INSPECT AND REPAIR ALL FLUID LEAKS			■							
INSPECT BOOST PUMP OPERATION (BEFORE WINTER SEASON)	12					■				
INSPECT CAC INLET, OUTLET, AIR SEALS, MOUNTS, AND FASTENERS				■						
RE-TORQUE ALL CHARGE AIR COOLER CLAMPS	6									
CLEAR DEBRIS FROM HEAT EXCHANGERS BY ACTIVATING THE FAN TEST/REVERSE SWITCH **(WEEKLY)**		■								
INSPECT COOLING SYSTEM FOR LEAKS. SAMPLE COOLANT AND CHECK TO ENSURE COOLANT MEETS MINIMUM COOLANT REQUIREMENTS. **(EVERY ENGINE OIL CHANGE)**		■								
RINSE COOLING UNIT (RAD, CAC) WITH CLEAN LOW-PRESSURE WATER	1									
CLEAN THE RAD, CAC, AND CONDENSER COIL WITH COIL CLEANER	4									
INSPECT EFAN - BLADES ARE NOT MISSING, DO NOT HAVE CHIPS, ARE NOT CRACKED, ARE NOT TOUCHING THE FAN SHROUD, AND ARE NOT OBSTRUCTED FROM TURNING			■							

7-ELECTRICAL SYSTEM Maintenance Operation	Months	Service Interval (Miles)								Specification Code
		Custom Intervals	6,000	12,000	24,000	48,000	96,000	150,000	300,000	
CHECK VOLTAGE SETTING AND RECORD				■						
CHECK BATTERY CONNECTIONS TIGHTNESS AND FREE OF CORROSION			■							
EQUALIZER -CLEAN EXTERIOR/CHECK					■					
INSPECT ALL VISIBLE HARNESS CONNECTORS AND JUNCTIONS			■							
INSPECT STARTER AND ALTERNATOR TERMINALS			■							
INSPECT AND REPAIR ALL EXTERIOR, INTERIOR, BAGGAGE BAY, AND SERVICE COMPARTMENT LIGHTS			■							
INSPECT STARTER AND ALTERNATOR			■							
CLEAN ALTERNATORS	1		■							
APPLY CORROSION INHIBITOR TO ALTERNATORS	1		■							S-33

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ROW 2_J4500 MY2019 Maintenance Manual P10-11

15-WHEELS, HUBS & TIRES Maintenance Operation	Months	Service Interval (Miles)								Specification Code
		Custom Intervals	6,000	12,000	24,000	48,000	96,000	150,000	300,000	
CHECK DRIVE AXLE HUB BEARING AXIAL PLAY	12						■			
CHECK FRONT AND TAG AXLE COMPACT BEARING AXIAL PLAY	12						■			
CHECK TIRE TREAD DEPTH AND RECORD					■					
INSPECT TIRES AND TIRE PRESSURE			■							
CHECK WHEEL SEALS FOR SIGNS OF LEAKAGE				■						

16-HEATING AND A/C Maintenance Operation	Months	Service Interval (Miles)								Specification Code
		Custom Intervals	6,000	12,000	24,000	48,000	96,000	150,000	300,000	
CHECK COMPRESSOR OIL LEVEL				■						
CHECK REFRIGERANT LEVEL					■					
INSPECT AND CLEAN ALL INTERIOR VENTS AND HEAT DUCTS	12									
INSPECT AND CLEAN CONDENSER AND EVAPORATOR MOTOR ASSEMBLIES	12									
CLEAN EVAPORATOR COMPARTMENT DRAIN PAN AND HOSES	12									
CHECK FUNCTIONALITY OF THE DRIVER'S HVAC BLOWER MOTOR ASSEMBLY	12				■					
INSPECT FUNCTIONALITY OF PARCEL RACK EVAPORATOR MODULE	12				■					
CHECK AIR GAP AND FUNCTIONALITY ON COMPRESSOR CLUTCH	3				■					
VERIFY TORQUE ON CLUTCH RETAINING BOLT					■					
RINSE THE CONDENSER COILS WITH LOW PRESSURE DISTILLED WATER	1									
CLEAN THE CONDENSER COILS WITH COIL CLEANER.	4									
CHECK FILTER DRYER FOR RESTRICTION	12									
PROHEAT X45 PLUS										
CHECK AUXILIARY HEATER OPERATION				■						
INSPECT ALL HOSE CLAMPS, FITTINGS AND HARNESS ON THE AUXILIARY HEATER				■						
PERFORM A FALL TUNE -UP	12									
REPLACE THE IGNITION LEAD	60								■	
RUN AUXILIARY HEATER **(RUN WEEKLY)**		■								
SPHEROS 350										
CHECK AUXILIARY HEATER OPERATION				■						
CLEAN THE AUXILIARY HEATER **(36,000 Miles)**	12	■								

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ROW 3_Radiator_External_Corrosion _Summary_161011

MODINE

APPLIED THERMAL INNOVATION™

GOHAR Radiator External Corrosion Resistance

Last Updated: 10/11/16

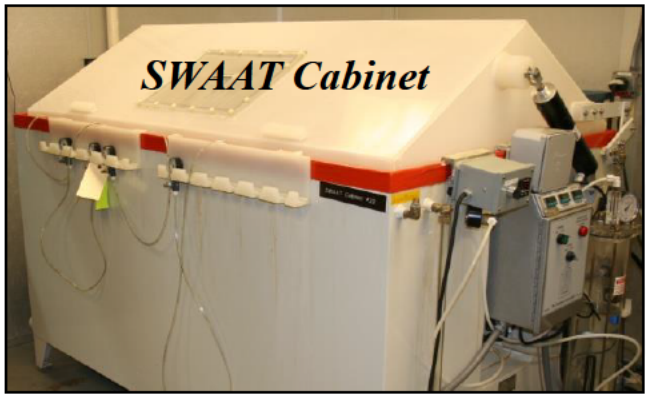
GOHAR External Corrosion Resistance
Overview

- **Salt Fog Corrosion Testing**
  - Test Summary - SWAAT
  - Results Summary
- **Modine Radiator Corrosion Protection**
  - What Gives It Long Life?
- **Field Results**
- **Conclusions/Recommendations**

GOHAR External Corrosion Resistance
Salt Spray Test Description

3 Types of ASTM Testing:

1. B117 – 5% Sodium Chloride
2. B368 – 5 % Sodium Chloride With Acetic Acid and Copper Chloride
3. **G85 Annex 3 – Synthetic Sea Salt With Acetic Acid (SWAAT – Sea Water Acetic Acid Test)**



SWAAT Parameters:

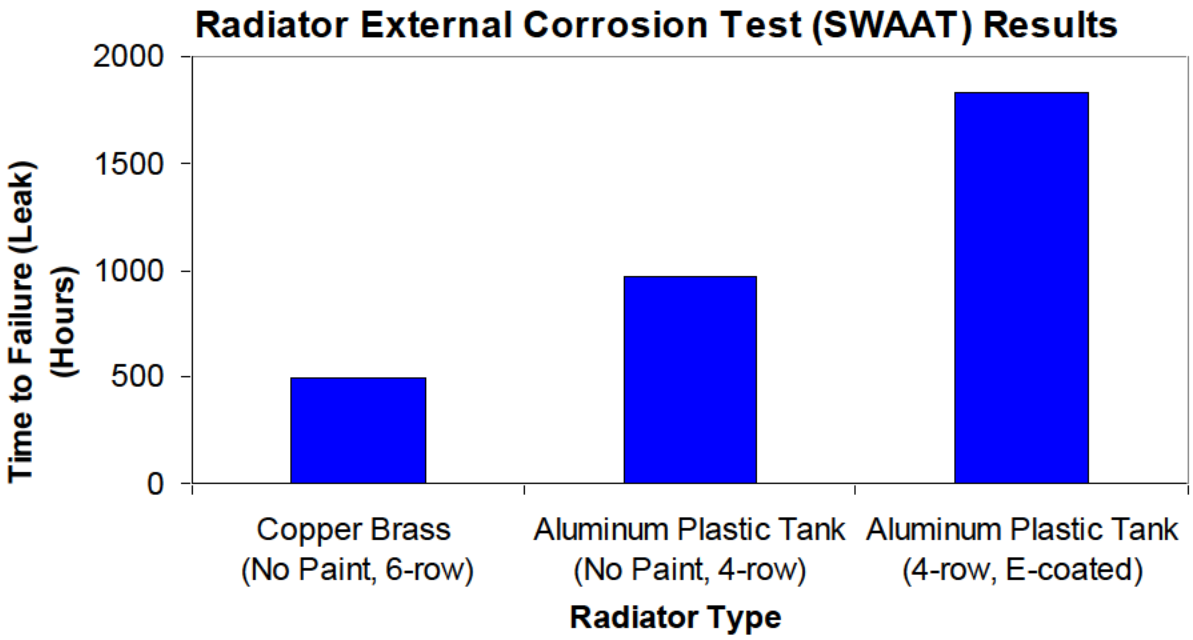
- Salt Water Fog with pH of 2.8 to 3.0
- Cabinet Control Temperature: 120°F
- Cycle is 30 minutes fogging with 90 minutes hold
- Time to Failure Determination (Leak): Pressure decay

SWAAT Testing is the most damaging/rigorous corrosion test out of the 3 ASTM tests.

Industry Standard Test

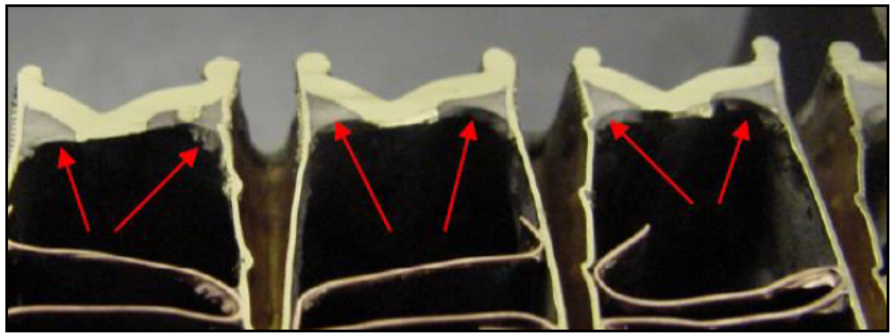
- Used by Automotive, Truck, and Off-Highway
- Field life correlation cannot be established due to variability of field conditions.
- Used for direct A to B comparisons.

GOHAR External Corrosion Resistance
Salt Spray Test Results



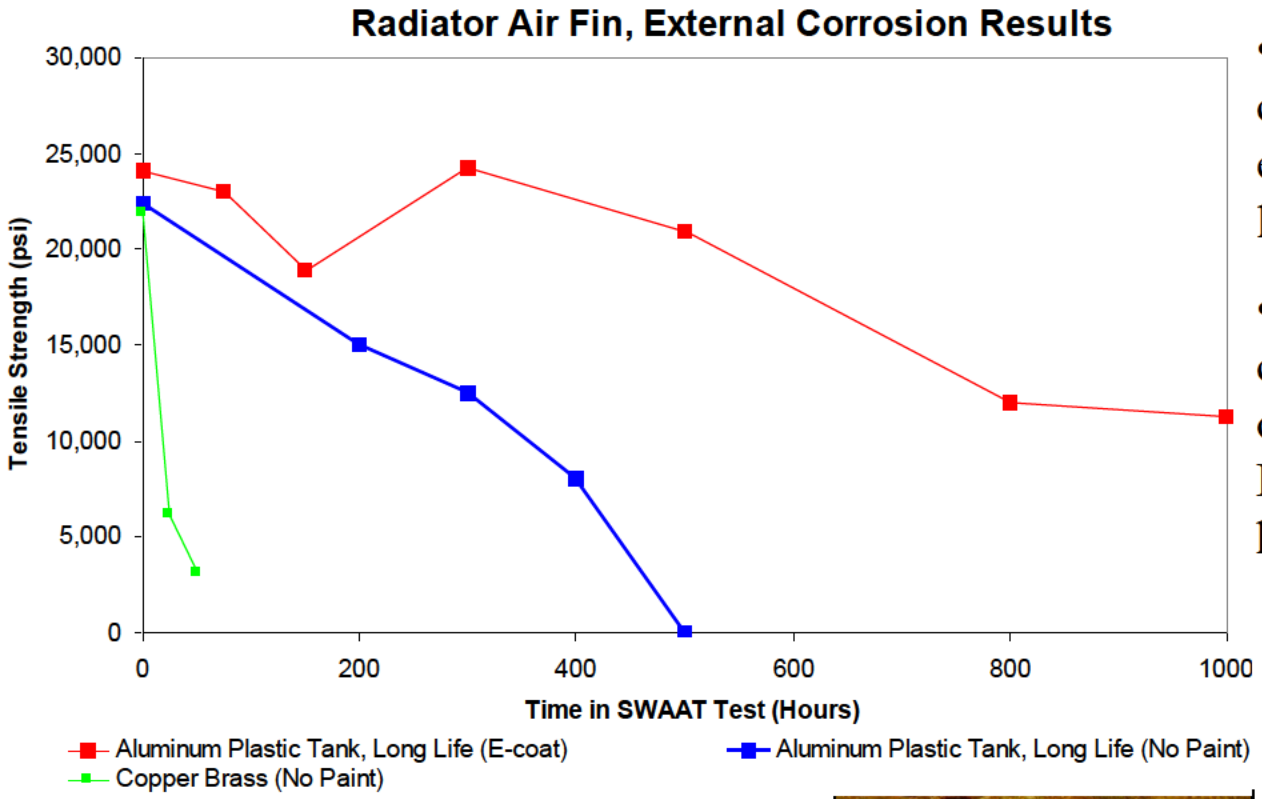
*For this testing, a failure is defined as a leak exceeding allowable pressure decay.

Copper Brass Radiator samples leak checked during SWAAT Test

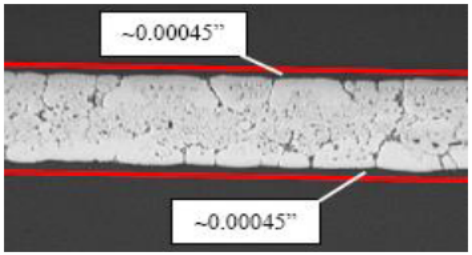


Cross Section of Copper Brass Radiator with Degradation of Backsolder during SWAAT Test

GOHAR External Corrosion Resistance
Salt Spray Test Results



- Air fin life is critical for heat exchanger durability life.
- E-coat is the best corrosion protection option for Copper Brass and Aluminum heat exchangers.

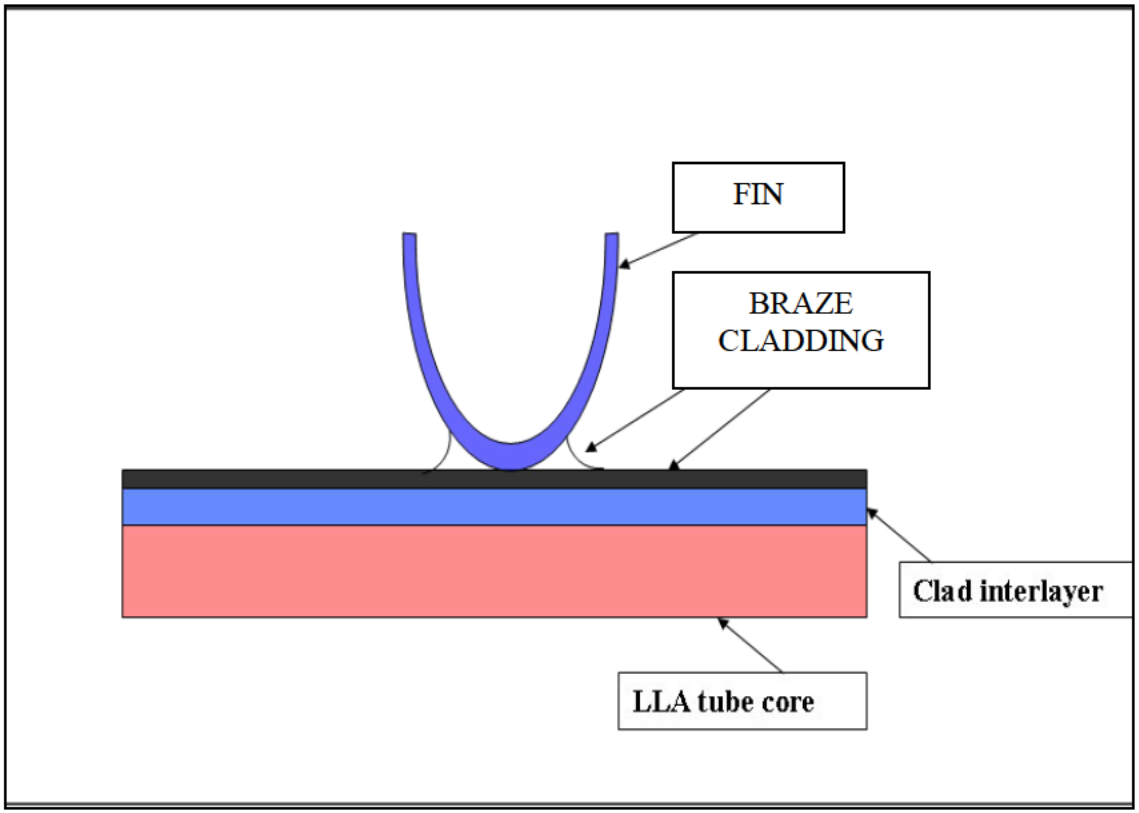


Cross Section of E-Coated Air Fin

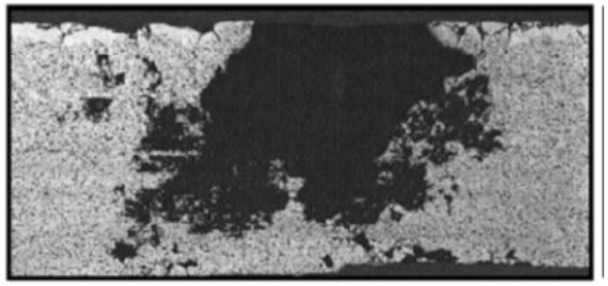
Copper Brass Air Fin Degradation during SWAAT Test

GOHAR External Corrosion Resistance
Radiator Corrosion Protection

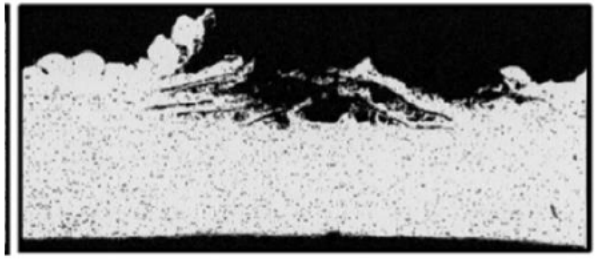
- Components utilize a clad long life modified 3003 base alloy developed specifically for high strength and corrosion resistance.
- Zinc is not added to the fin as fin corrosion reduces the radiator pressure resistance.
- During brazing the special clad alloy diffuses across surface forming a sacrificial layer which promotes lateral vs pitting corrosion attack critical for long corrosion life.



Pitting Corrosion – Standard Alloy



Lateral Corrosion – Modine Alloy



GOHAR External Corrosion Resistance
Conclusions and Recommendations

- Modine GOHAR aluminum radiators utilize proprietary high strength long life aluminum alloys which results in industry leading SWAAT corrosion resistance.
- Aluminum material systems are designed to protect the tube using electrochemical sacrificial fin and tube surfaces to promote lateral surface corrosion.
- E-coat corrosion protection option recommended in any heavy road salt/de-icing/ocean spray environments to increase radiator corrosion life.

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ROW 4_WRC Test Report MCI 19117579-1 13feb

Warranty & Reliability Engineering
Warranty Return Center
Test Report

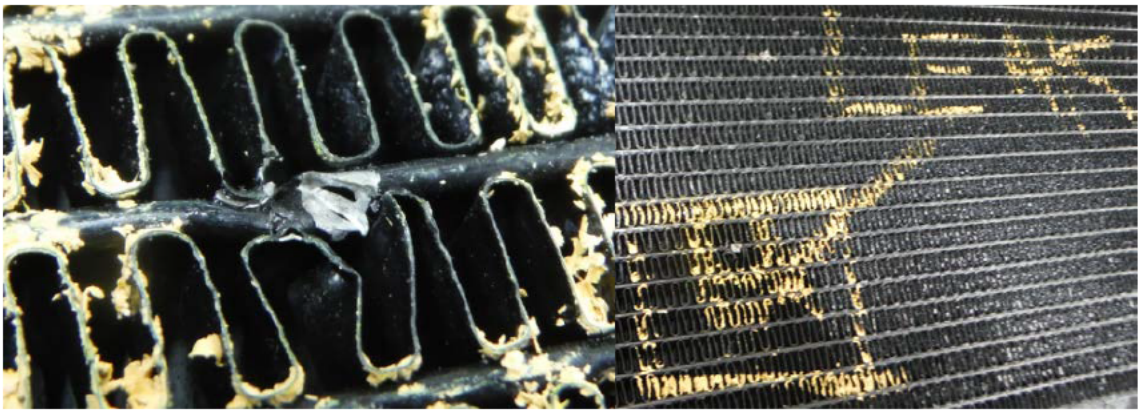
To:	Shannon Groen	Report No.:	[redacted]
Cc:		Test Date:	31 January 2017
From:	Tom Burrows		
Date:	13 February 2017		
Subject:	Radiator Failure		

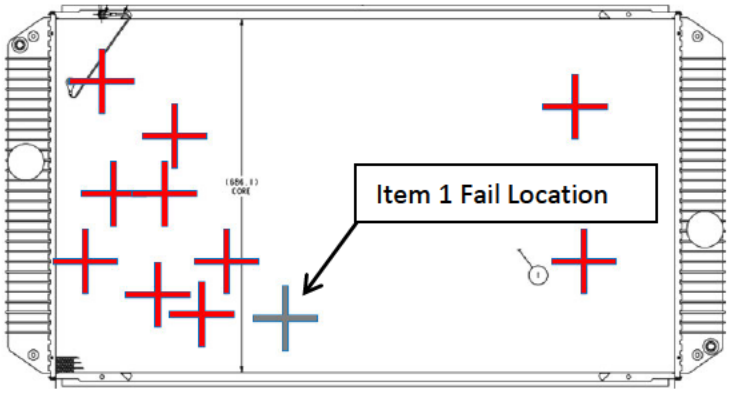
Returned Component Information	
Customer	Motor Coach Industries
Claim #	[redacted]
Production Date	02/01/2016
Customer Part #	2002105C2
Modine Part #	3E012998
RMA	191-17579
RMA Item #	1

Application Information	
Build Date	
Delivery Date	
Repair Date	
Time in Service	
Model	
Identification #	
Length of Service	

Modine Test Results: Inspection of radiator found exterior core tube damage where customer marked it (fan side of core).

Modine Claim Disposition: No defects in material or workmanship found. Reject





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REQUEST 8 - MCI RESPONSE TO ODI PE20-001

ROW 5_PA-00271 Failure Analysis for Returned MCI Hose Part 16-11-1970 REV B

PUROSIL® LLC

MCI Returned Hose Failure Analysis
Part 16-11-1970 REV B

PURPOSE AND SCOPE:

Review returned hose for possible root causes of leaking of the hose.

REFERENCES:

IP Drawing # 16-11-1970 REV B
Specification MCI 712053

PROCEDURE:

1. Examine returned hose visually inside and out.
2. Photograph hose inside and out.
3. Pressure test hose in hydrostatic chamber with water to 25 PSI and let stand for 30 minutes. Examine for leaks.
4. Photograph hose.
5. Record Results.

SAMPLES:

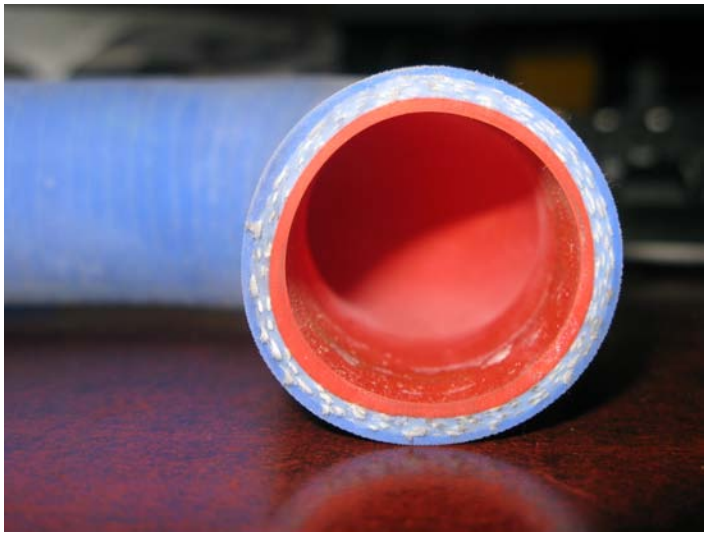
SAMPLE	DESCRIPTION	FABRIC	SILICONE	DATE MARKED ON HOSE
16-11-1970 REV B	FORMED HOSE 1.375 ID 4-Ply Reinforced hose	POLYESTER	105RED1 107BLU9 105 BLU13	E1708

RESULTS:

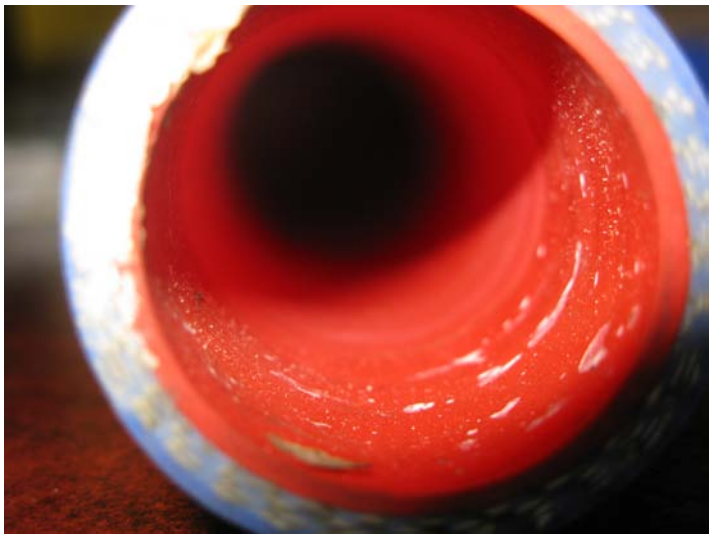
Upon initial examination of the exterior of the hose there was clear evidence of hose wall rupture. The hose was cut in half to fully expose all of the inside surface. The liner material thickness throughout the entire length of the hose was consistence. In the middle of the hose along the seam line material separation of the edges of the seam were visible at two locations. At one of the separation points fluid contamination was detected in the cavity of the separation point. It is plausible to deduce that the liner seam did not fully fuse together along the entire length of the seam during the curing cycle. With this condition the application of fluid, temperature, and constant over pressure and under pressure the structural integrity of the hose was adversely affected with fluid wicking through the reinforcement fibers until full wall rupture occurred.

PHOTOS:

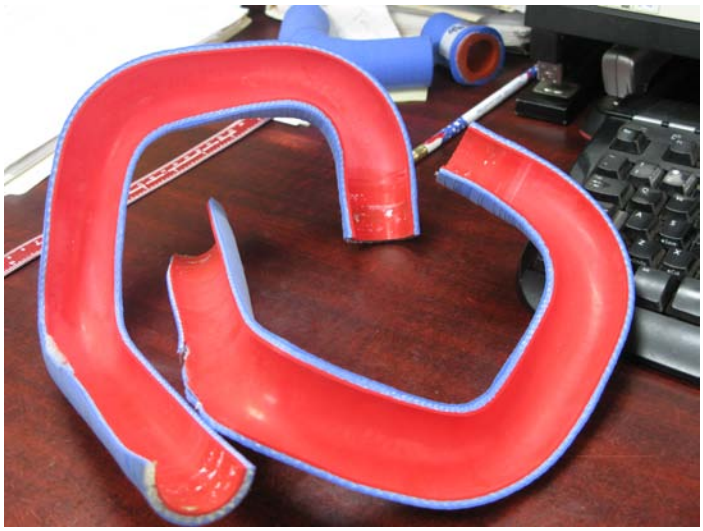
HOSE AS RECEIVED



END VIEW OF HOSE SHORT LEG

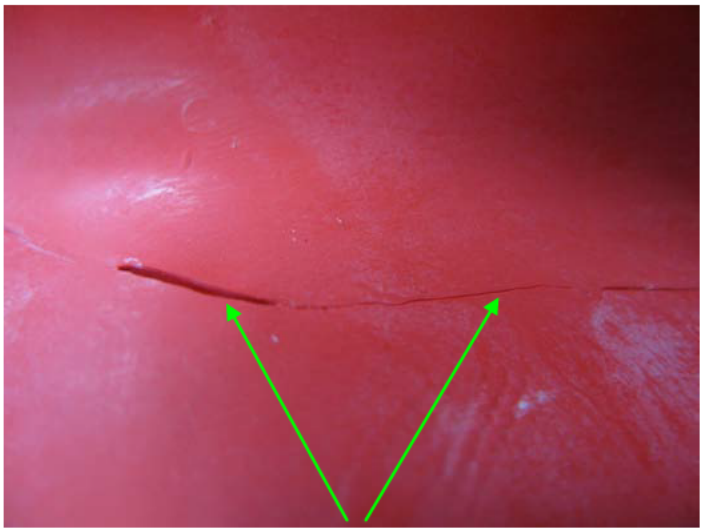


END VIEW OF HOSE LONG LEG



CUT SECTION VIEW

LINER BREACH POINT WITH CONTAMINATION



LINER SEAM SEPARATION

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ROW 6__PA-00272 Failure Analysis for Returned MCI Hose Part 16-11-1969 REV B

PUROSIL® LLC

MCI Returned Hose Failure Analysis
Part 16-11-1969 REV B

PURPOSE AND SCOPE:

Review returned hose for possible root causes of leaking of the hose.

REFERENCES:

IP Drawing # 16-11-1969 REV B
Specification MCI 712053

PROCEDURE:

1. Examine returned hose visually inside and out.
2. Photograph hose inside and out.
3. Pressure test hose in hydrostatic chamber with water to 25 PSI and let stand for 30 minutes. Examine for leaks.
4. Photograph hose.
5. Record Results.

SAMPLES:

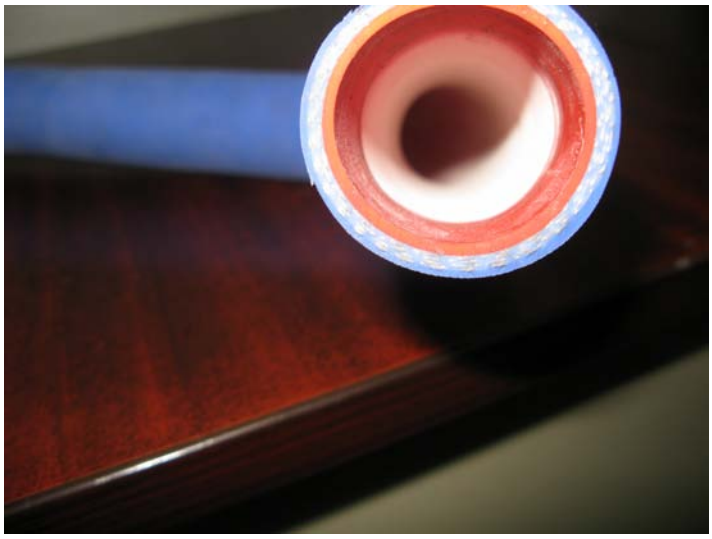
SAMPLE	DESCRIPTION	FABRIC	SILICONE	DATE MARKED ON HOSE
16-11-1969 REV B	FORMED HOSE 1.375 ID 4-Ply Reinforced hose	POLYESTER	105RED1 107BLU9 105 BLU13	C1720

RESULTS:

Upon initial examination of the exterior of the hose there was no evidence of damage or rupture. The hose was positioned in a hydrostatic chamber and water pressurized to 35 PSI and held at that pressure for 30 minutes. No evidence of leaking or wicking was visible. The hose was then cut in half exposing entire interior surface area. The liner thickness within specification and was consistence throughout the length of the hose. There was no evidence of thin liner condition or liner breach. From the pressure test and review of the inside of this hose all characteristics indicate the sample was in conformity to specification.

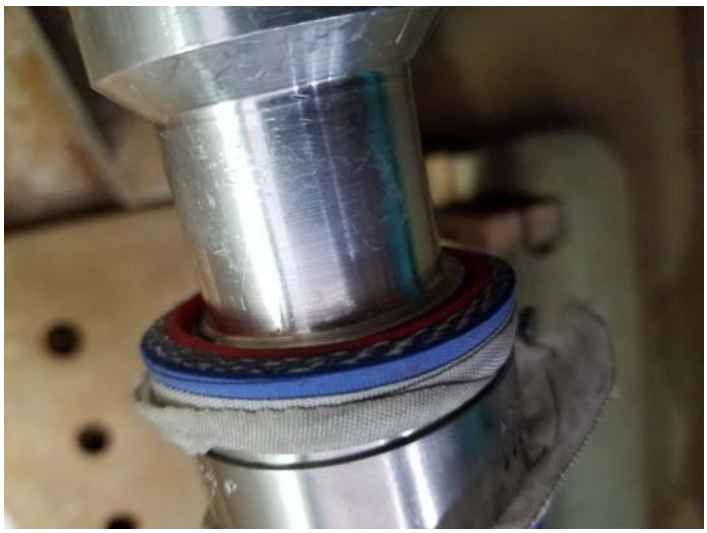
PHOTOS:

HOSE AS RECEIVED

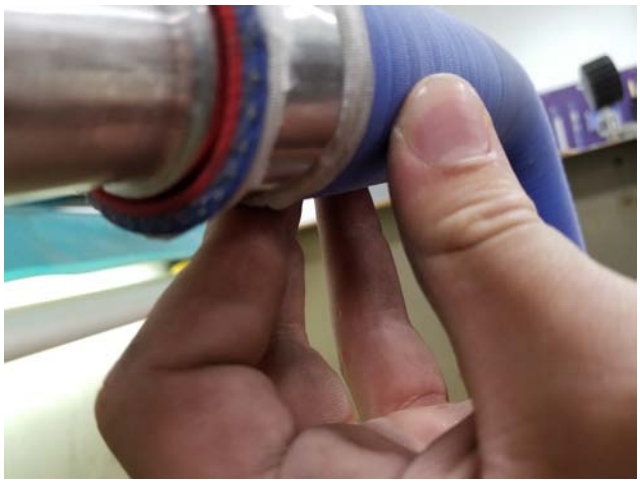


FIRST END VIEW OF HOSE

SECOND END VIEW OF HOSE



FIRST END VIEW OF HOSE DURING PRESSURE TEST



SECOND END VIEW OF HOSE DURING PRESSURE TEST

CUT SECTION VIEW

Date: 2/6/18

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ROW 7_16-11-1970 Burst Test
5.7.18

May 7th, 2018

TEST REPORT

Part Number:
16-11-1970

Purchase Order Number:
N/A

INTERNAL PHYSICAL TESTING DEPARTMENT

Prepared For:

MCI
1475 Clarence Avenue Door 10
Winnipeg, Manitoba R3T 1T5

Prepared By [redacted]
Test Technician

Approved By: [redacted]
Quality Manager

15151 South Main Street Gardena, CA 90248 • Phone: (310) 323-1801 • Fax: (310) 323-1804 • www.siliconehose.com

SUBJECT: Hydrostatic burst test's done for (3) hoses with 4 Ply Woven fabric.

PART NUMBER: 16-11-1970

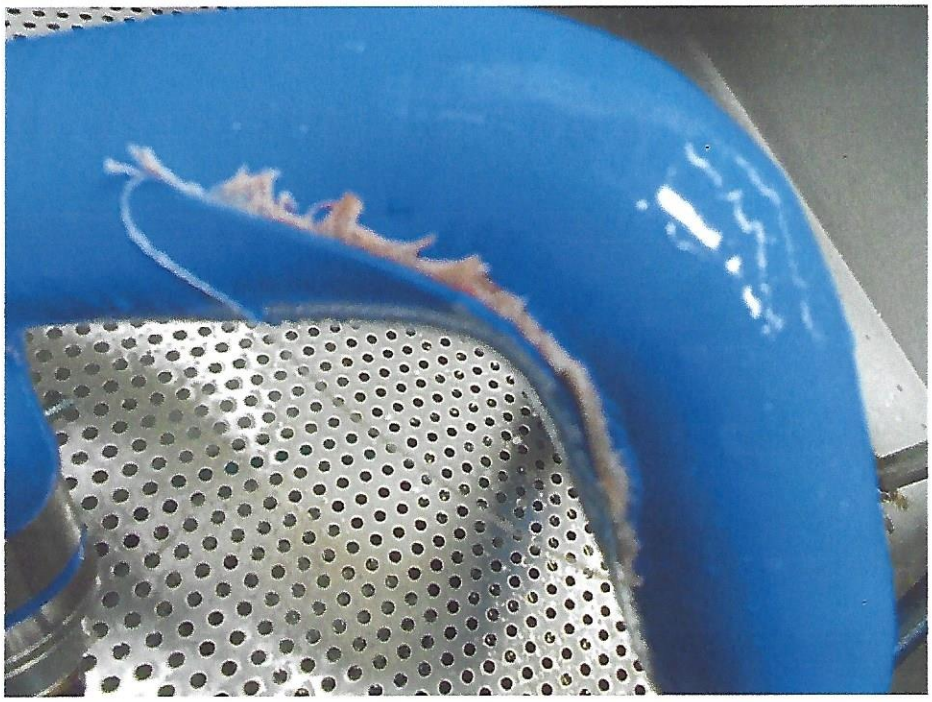
BURST STRENGTH:
Standard: MCI 712053
Test Method: ASTM 380-94(12)
Hose hydrostatically pressurized until failure.

Test Item	712053 Requirements (PSI)	Note	Results (PSI)	Pass / Fail
1	350	N/A	576	Pass
2	350	N/A	542	Pass
3	350	N/A	568	Pass

NOTES: N/A

Prepared By [redacted] Test Technician

Approved By [redacted] Quality Manager




ATLANTIS®
PSI
BAR
KG/CM²
ON/UNIT
RESET