

Chemical Resistance Test **DP Block**

TEST REPORT

PREPARED FOR:

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October 28, 2019
TÜV Job Number: 72153088
PO Number: 33914

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REVISION HISTORY

<u>Date:</u>	<u>Comment:</u>
28 October 2019	Original release of test report 72153088.



America

Chemical Resistance Test

Shi Xiang Lim
Data Panel
181 Cheshire Lane, Suite 300
Plymouth, MN 55441

PURCHASE ORDER: 33914

TÜV JOB#: 72153088

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PRODUCTS TESTED:

Two (2) DP Blocks were received in good condition and have previously undergone Salt Fog Testing. Samples are Identified as 52A and 53A.

DATES TESTED:

Chemical Resistance Testing was performed from 10/14/2019 to 10/24/2019.

TEST PROCEDURE:

Chemical Resistance Test

Customer Provided Specification: DSGN-3010-E Validation Testing Section: 5.5

Reference: IEC 60068-2-74 (1999+AMD 1:2018 CSV) Sections: 5; 8; 9; and A5.

- Functionality was verified before testing by applying 24.0VDC to and confirming that all lights turn on green then turn red with the exception of E1, E2, D1, D2, D3, and D4. All lights turn off except for E3, E4, Power, Comm and Stat light.
- Samples were cleaned with a standard degreaser (SD-20) before and after each chemical exposure.
- The samples were placed inside an environmental chamber and exposed to the 24hr thermal profile, outlined in **Table 1**.
- The samples were checked for functionality upon completion using the same procedure as before the exposure.

TEST PROCEDURE (CONT):

Table 1		
Contaminant Fluid	Test Fluid Description	Temperature (°C) (±2°C)
Engine Oil	Shell Rotella 10W30	70
Diesel Fuel	Readily available fuel	70
Hydraulic Oil	Mobile DTE 26	70
Ethylene Glycol	Standard Green 50/50 concentration	23
Urea Nitrogen	Prilled Urea dissolved in DI water until fallout occurs	23
Liquid Lime	Calcium Hydroxide	23
NPK Fertilizer	Readily available fertilizer NPK 20-10-10, dissolved in DI water until fallout occurs	23
Ammonia	35% Ammonium hydroxide HPLC	23
Calcium Chloride	Calcium Chloride dihydrate, Dissolved in DI water until fallout occurs	23

DATA AND OBSERVATIONS:

- All samples passed Function Checks before and after each chemical test.
- All samples were cleaned using SD-20 before each chemical was applied and after the 24-thermal profile.
- Below notes which chemical was applied to each sample.

Cycle	Sample ID	Contaminant Fluid	Temperature
1	52A	Diesel Fuel	70°C
	53A	Engine Oil	70°C
2	52A	Hydraulic Fluid	70°C
3	52A	Urea Nitrogen	23°C
	53A	Liquid Lime	23°C
4	52A	Calcium Chloride	23°C
	53A	Ammonia	23°C
5	52A	NPK Fertilizer	23°C
	53A	Ethylene Glycol	23°C

ACCEPTANCE LEVEL:

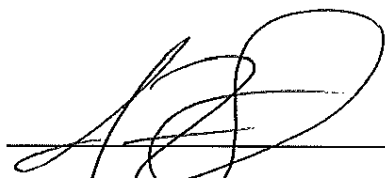
No acceptance criteria was provided by the customer.

TEST RESULTS:

TÜV SÜD America shall make no pass / fail conclusions regarding this test. Any and all such determinations shall be made solely by the customer.

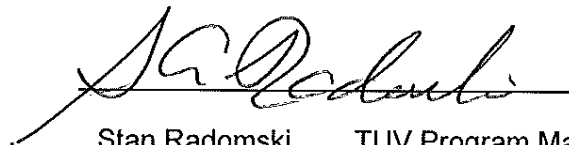
TEST EQUIPMENT:

Equipment Identification Number	Manufacturer and/or Description	Model No.	Serial No.	Calibration Due Date
ZE 1386	RUSSELLS Chamber Temp/Humidity	GD-32-3-3	10921147	06/05/2020
ZE 161	WATLOW Control Ramping	Series F4	2560	06/05/2020
ZE 1387	HONEYWELL Chart Recorder	DR45AT	9839Y8383380 0001	06/05/2020
ZE 1385	WATLOW Control Limit	SD4L-HJAA- AARG	18930	06/05/2020
ZE 1397	B&K Programmable DC Power Supply	BK9115	600422010687 320027	Reference Only
ZE 1506	Vaisala Humidity Transmitter	HMM100	K2010009	06/05/2020

APPROVAL SIGNATURE:


Josh Truselo, TUV Technician

October 28, 2019



Stan Radomski, TUV Program Manager

October 28, 2019

APPENDIX A: TEST PHOTOGRAPH(S)



Figure A1: Sample 52A Pre-Test (Front)

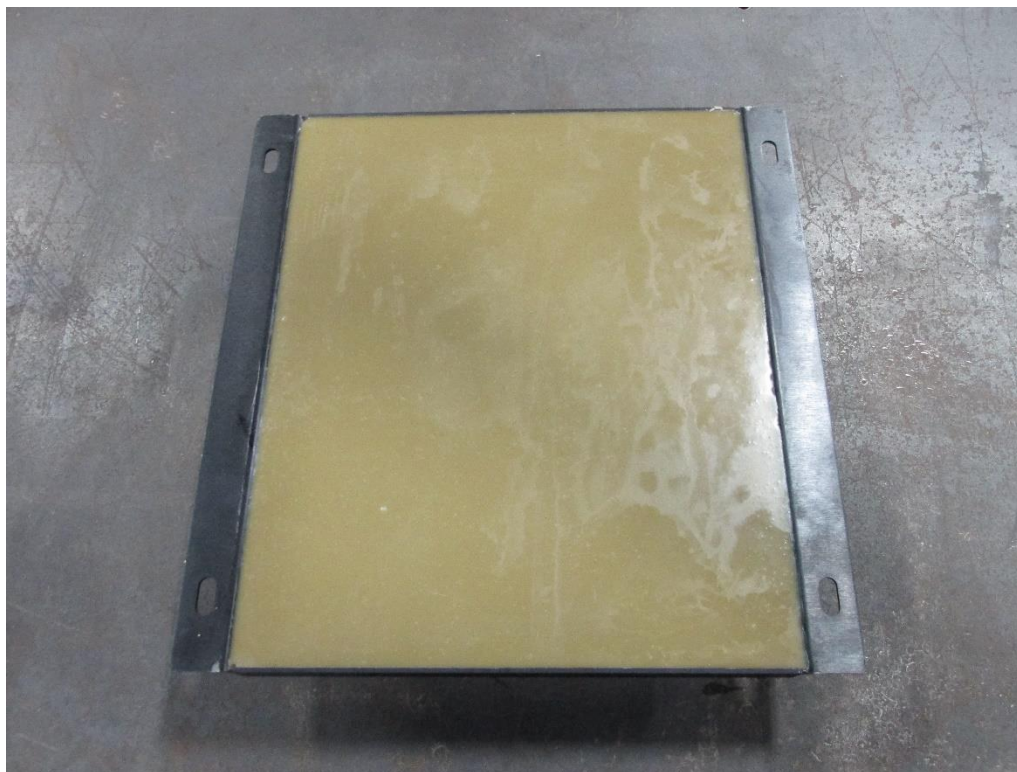


Figure A2: Sample 52A Pre-Test (Back)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)



Figure A3: Sample 52A Pre-Test (Top)



Figure A4: Sample 52A Pre-Test (Bottom)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)



Figure A5: Sample 52A Pre-Test (Left)



Figure A6: Sample 52A Pre-Test (Right)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)



Figure A7: Sample 53A Pre-Test (Front)

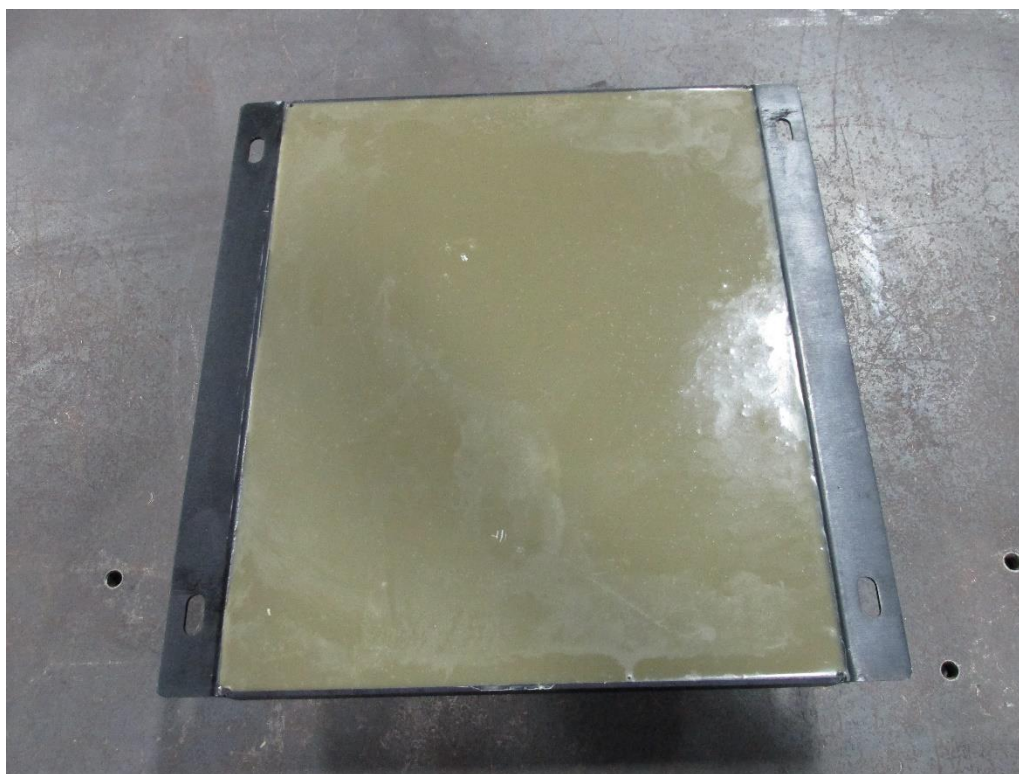


Figure A8: Sample 53A Pre-Test (Back)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)



Figure A9: Sample 53A Pre-Test (Top)



Figure A10: Sample 53A Pre-Test (Bottom)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)

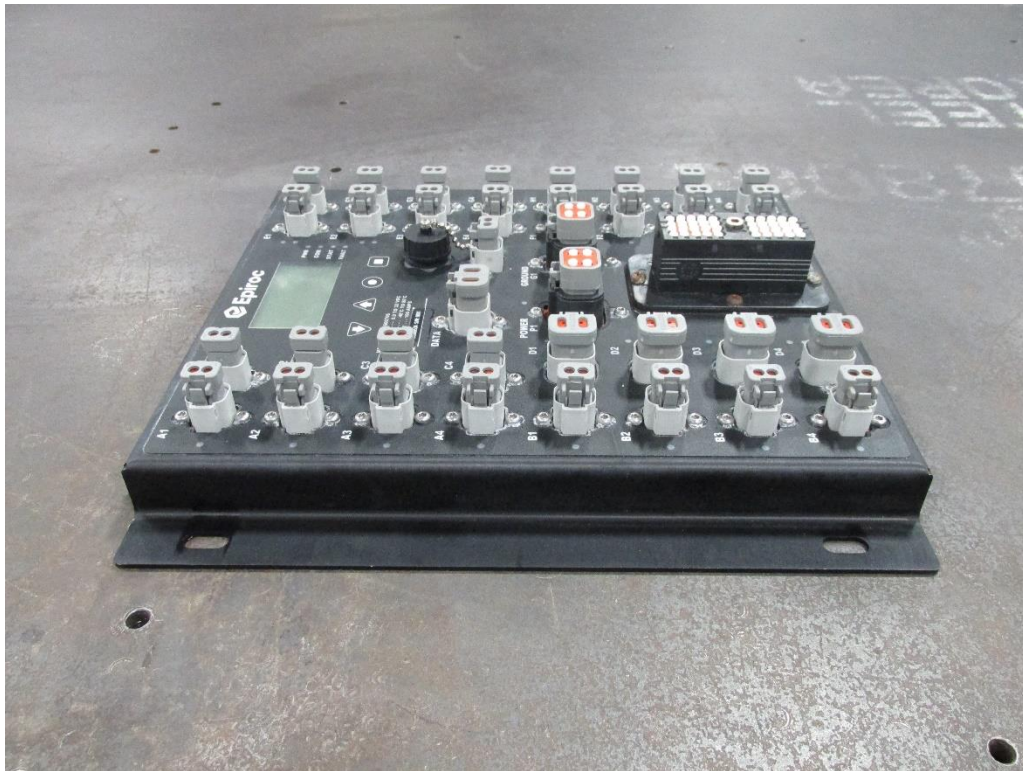


Figure A11: Sample 53A Pre-Test (Left)



Figure A12: Sample 53A Pre-Test (Right)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)



Figure A13: Representative of Functional Check



Figure A14: Representative of Diesel Fuel

APPENDIX A (CONT): TEST PHOTOGRAPH(S)



Figure A15: Sample 52A Pre-Soak Diesel Fuel (Front)

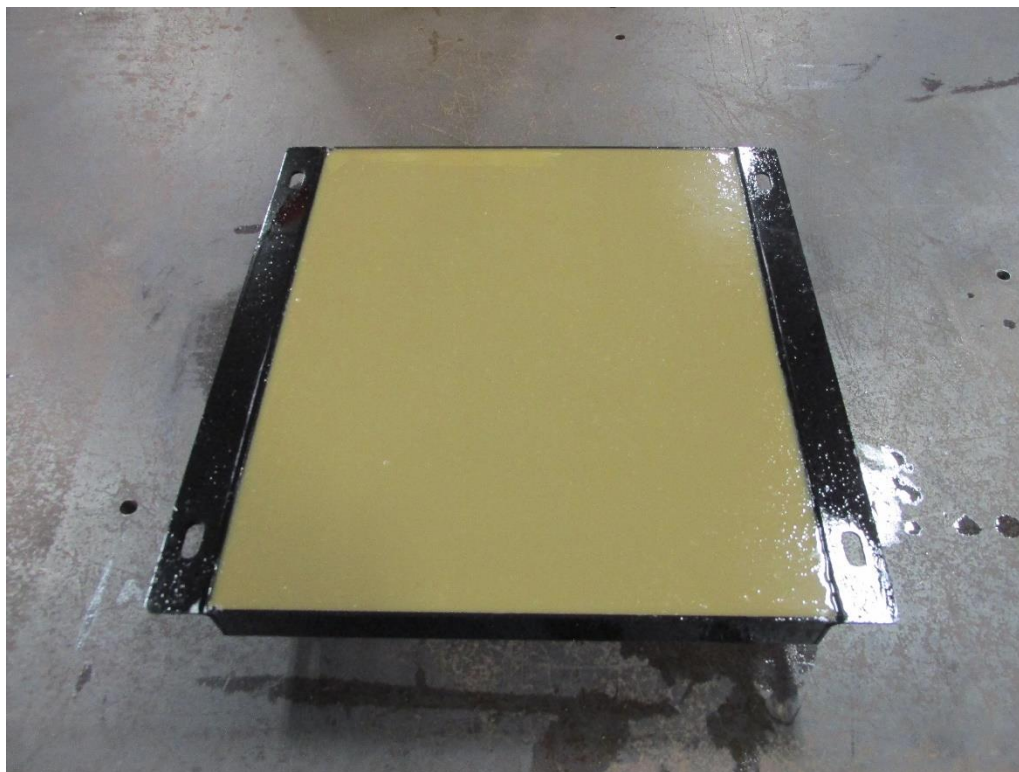


Figure A16: Sample 52A Pre-Soak Diesel Fuel (Back)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)



Figure A17: Representative of Motor Oil



Figure A18: Sample 53A Pre-Soak Motor Oil (Front)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)

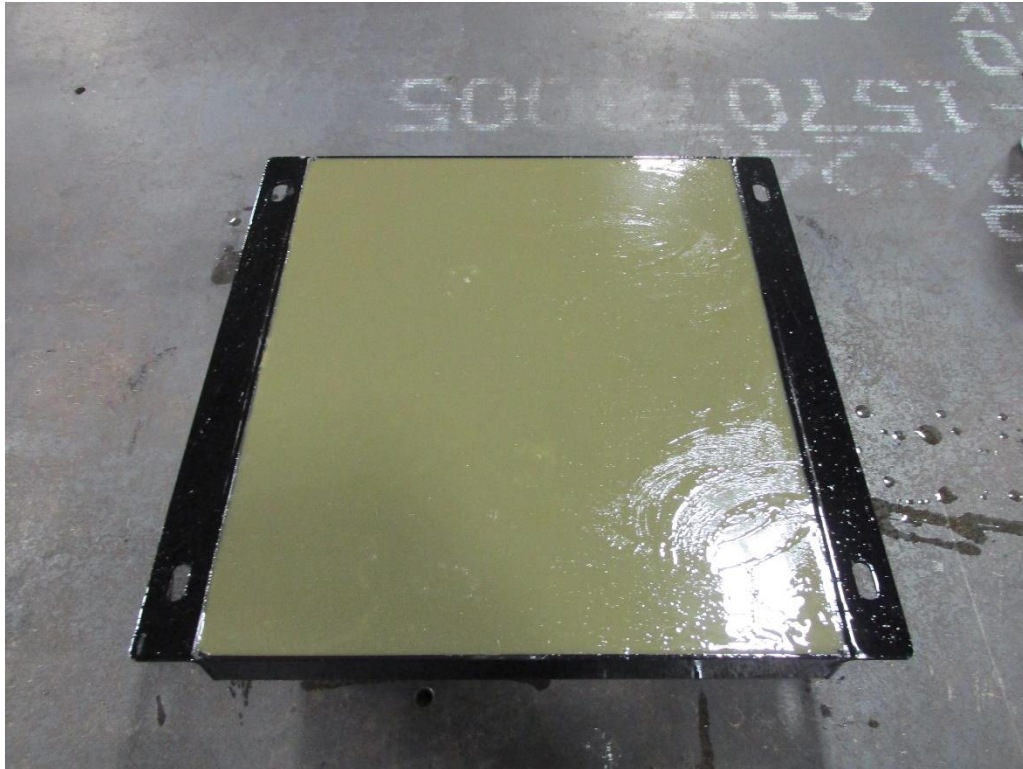


Figure A19: Sample 53A Pre-Soak Motor Oil (Back)



Figure A20: Test Setup

APPENDIX A (CONT): TEST PHOTOGRAPH(S)



Figure A21: Sample 52A Post-Soak Diesel Coated (Front)

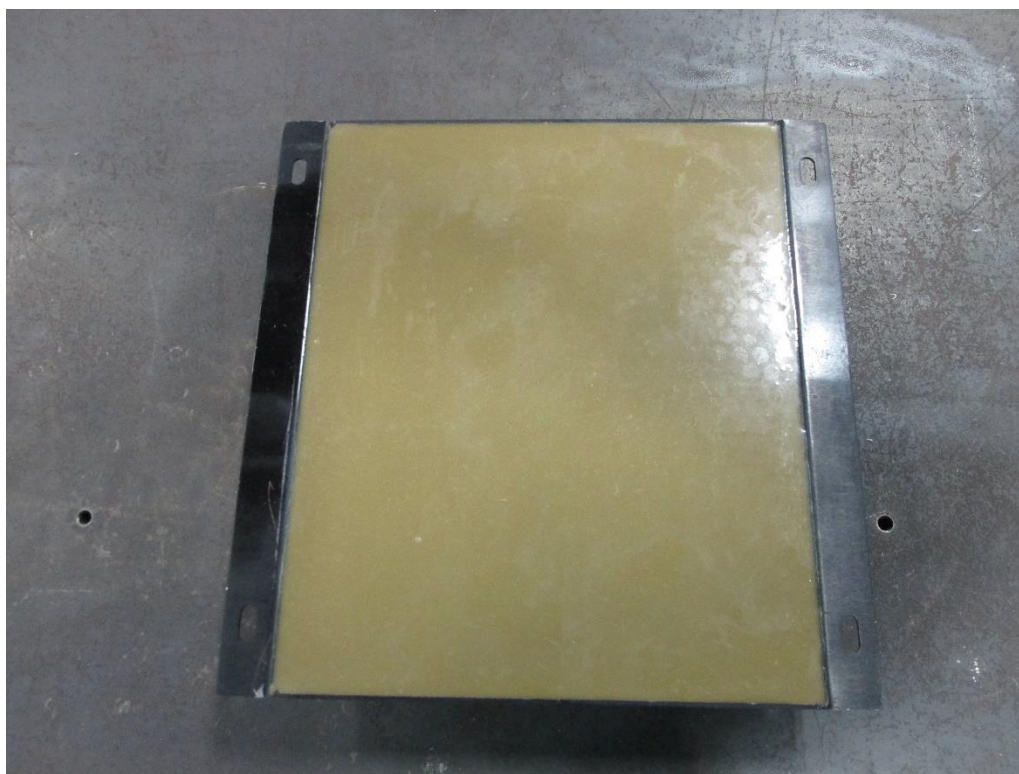


Figure A22: Sample 52A Post-Soak Diesel Coated (Back)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)



Figure A23: Sample 53A Post-Soak Motor Oil Coated (Front)

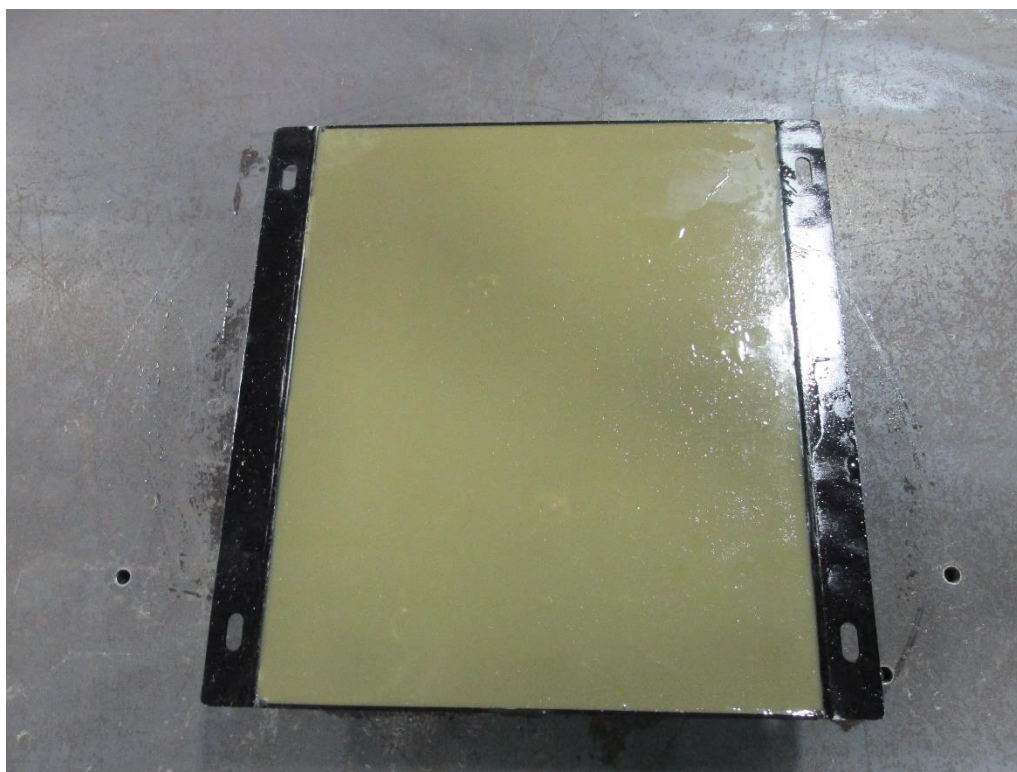


Figure A24: Sample 53A Post-Soak Motor Oil Coated (Back)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)



Figure A25: Representative of DTE 26 Hydraulic Fluid



Figure A26: Sample 52A Pre-Soak DTE 26 Hydraulic Fluid (Front)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)

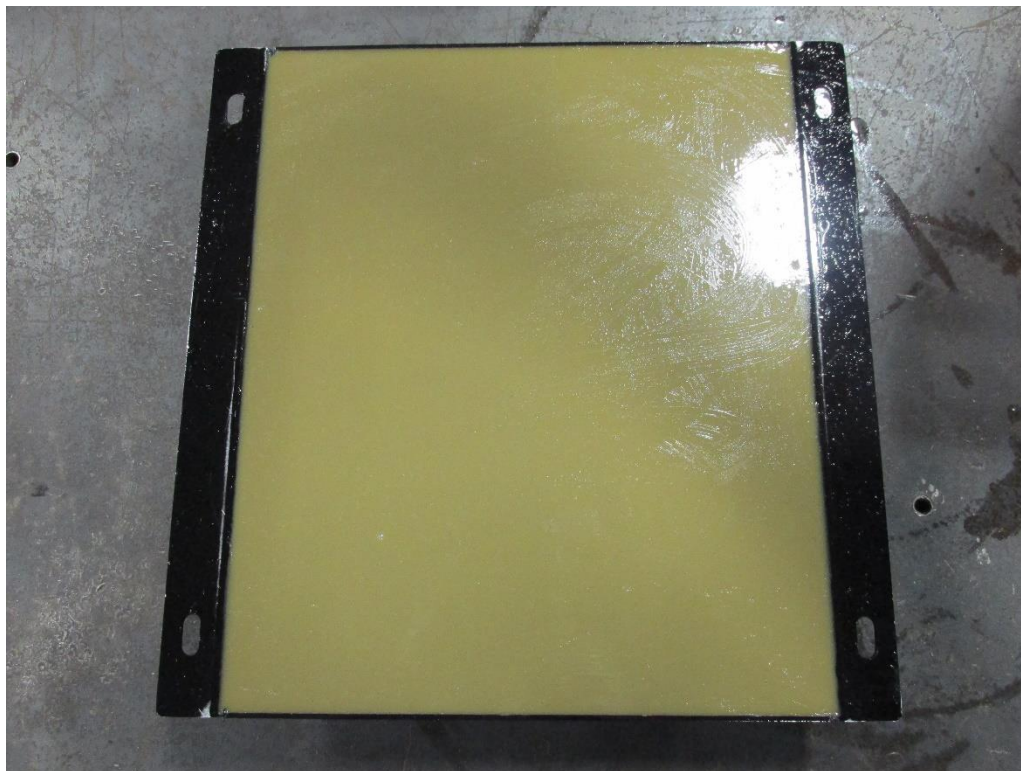


Figure A27: Sample 52A Pre-Soak DTE 26 Hydraulic Fluid (Back)



Figure A28: Sample 52A Post-Soak DTE 26 Hydraulic Fluid (Front)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)

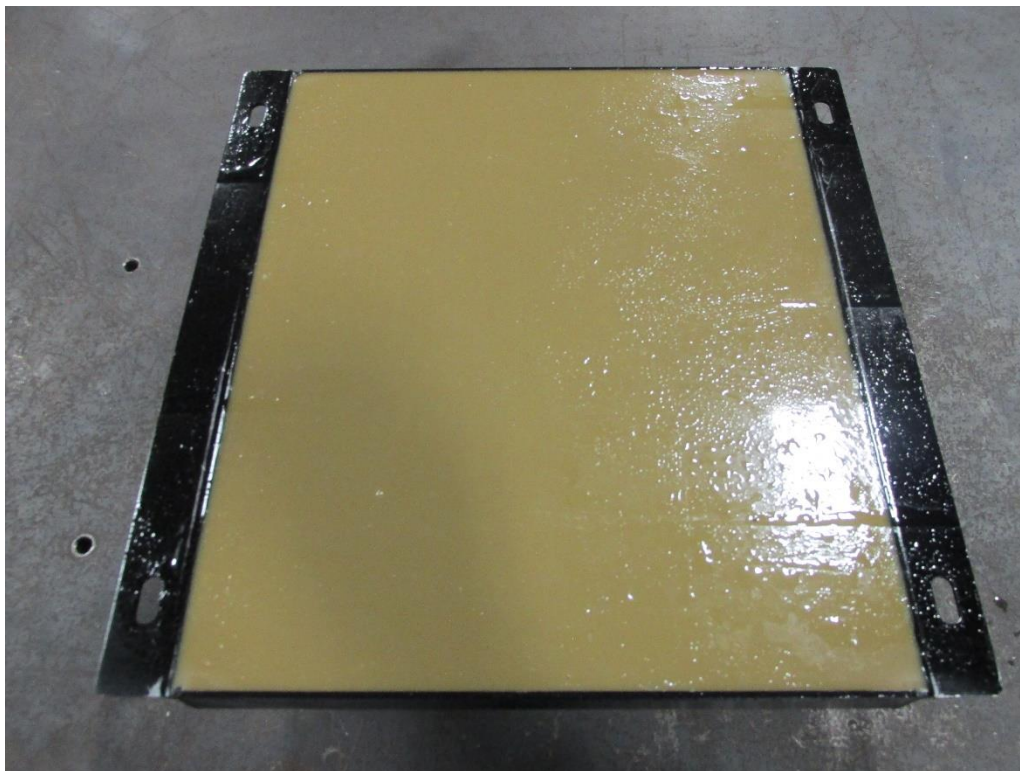


Figure A29: Sample 52A Post-Soak DTE 26 Hydraulic Fluid (Back)

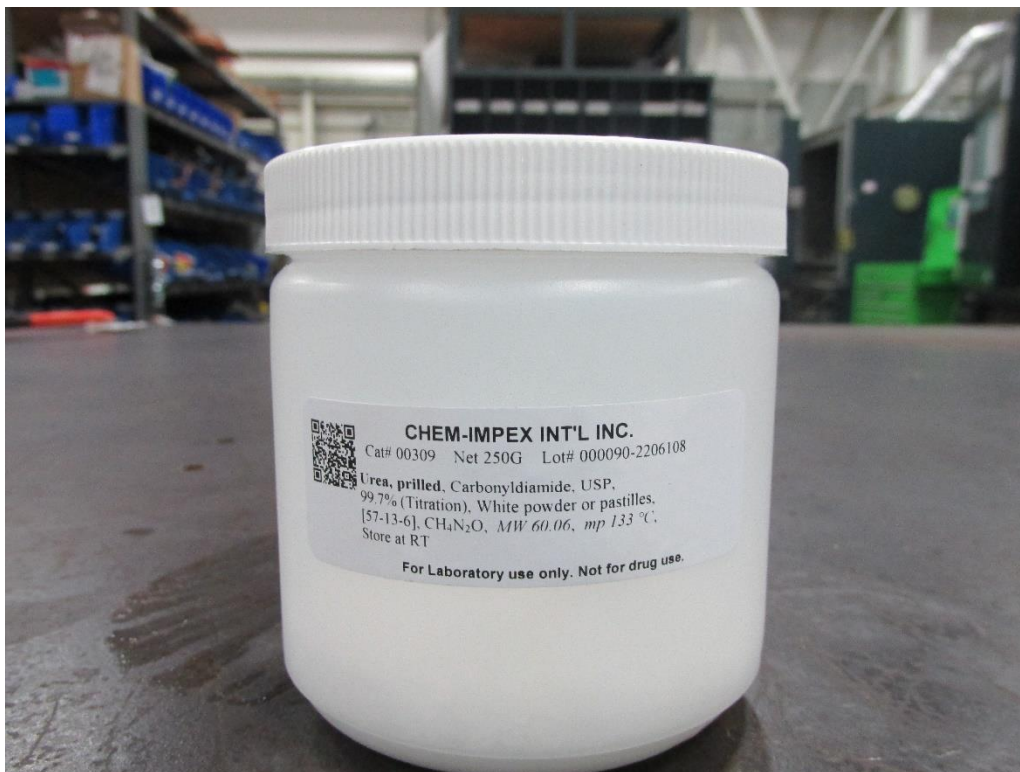


Figure A30: Representative of Prilled Urea

APPENDIX A (CONT): TEST PHOTOGRAPH(S)



Figure A31: Sample 52A Pre-Soak Prilled Urea (Front)

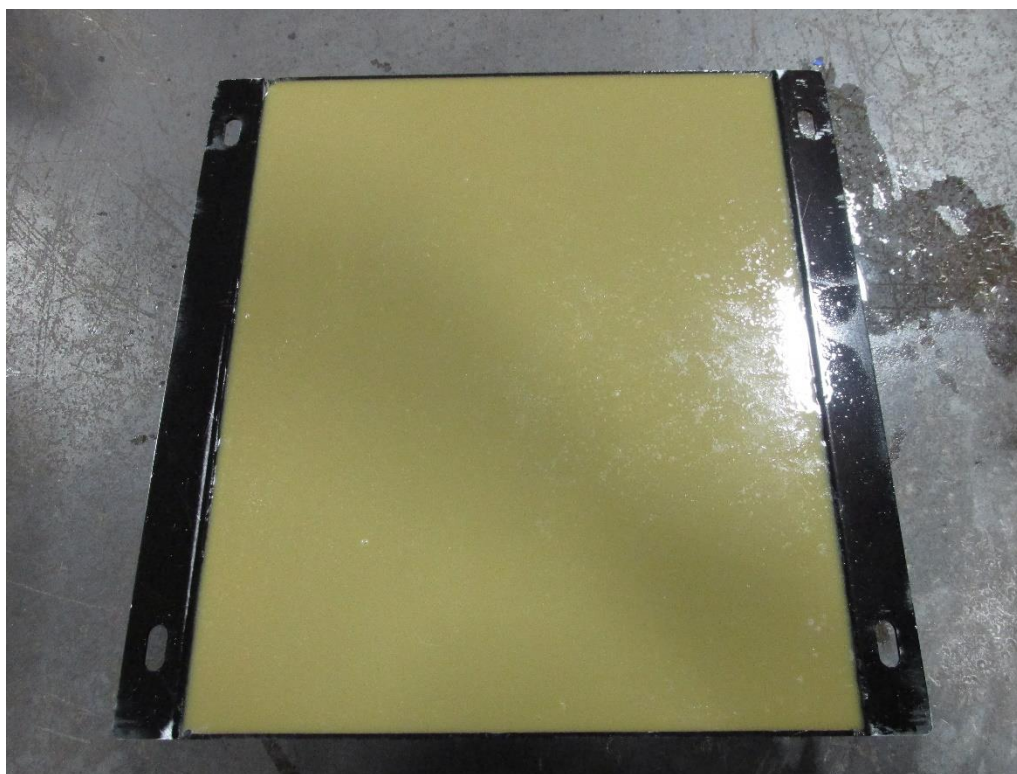


Figure A32: Sample 52A Pre-Soak Prilled Urea (Back)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)



Figure A33: Sample 52A Post-Soak Prilled Urea (Front)

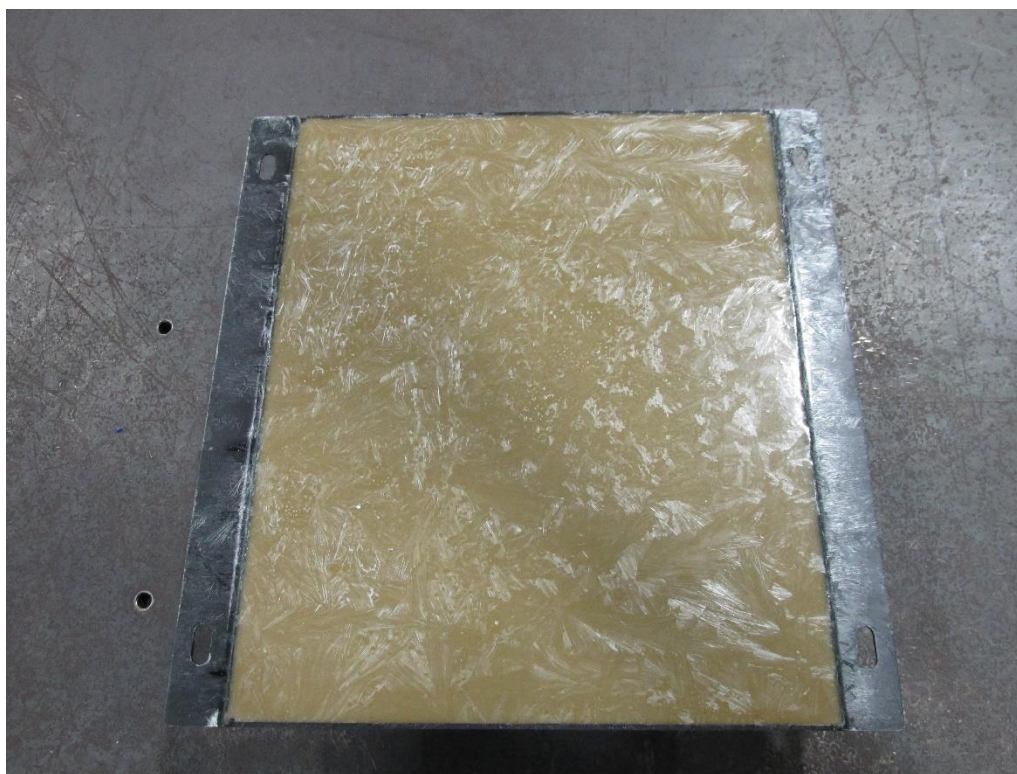


Figure A34: Sample 52A Post-Soak Prilled Urea (Back)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)



Figure A35: Representative of Calcium Hydroxide (Liquid Lime)

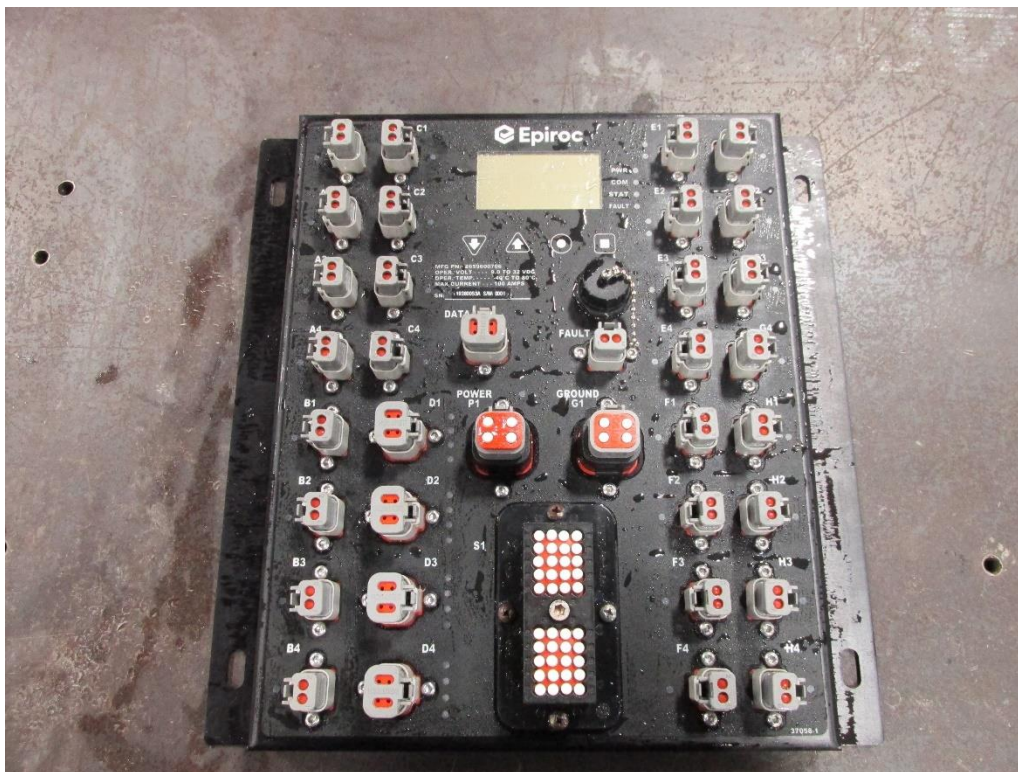


Figure A36: Sample 53A Pre-Soak Calcium Hydroxide (Front)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)

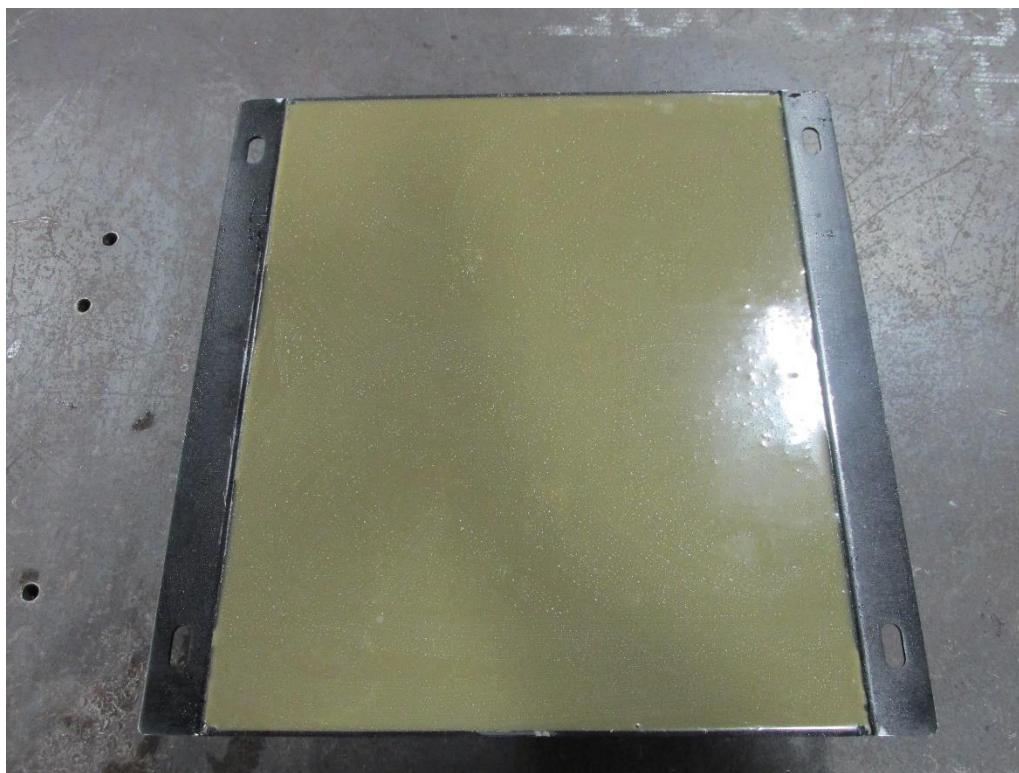


Figure A37: Sample 53A Pre-Soak Calcium Hydroxide (Back)



Figure A38: Sample 53A Post-Soak Calcium Hydroxide (Front)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)

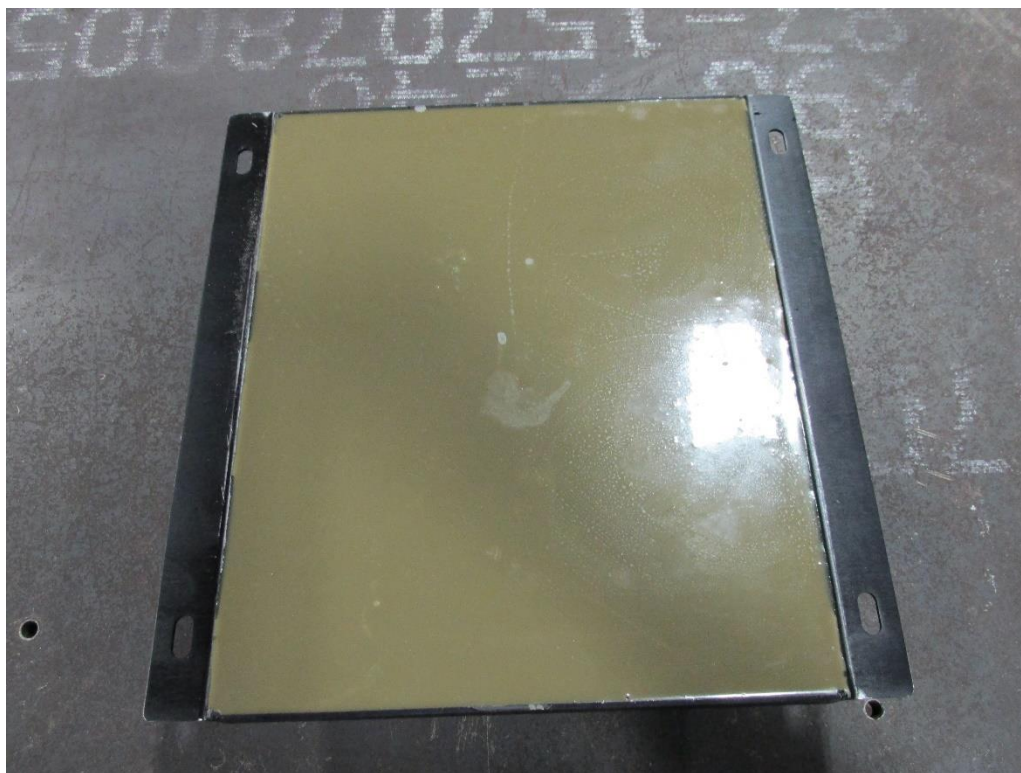


Figure A39: Sample 53A Post-Soak Calcium Hydroxide (Back)



Figure A40: Representative of Calcium Chloride Dihydrate

APPENDIX A (CONT): TEST PHOTOGRAPH(S)

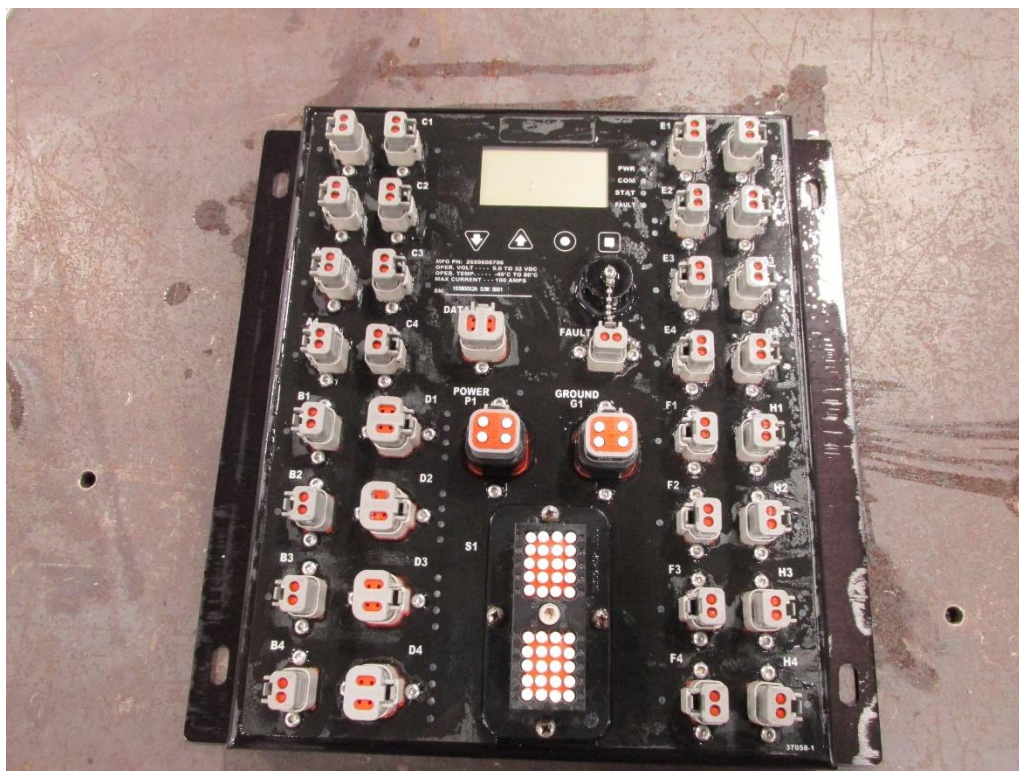


Figure A41: Sample 52A Pre-Soak Calcium Chloride Dihydrate (Front)

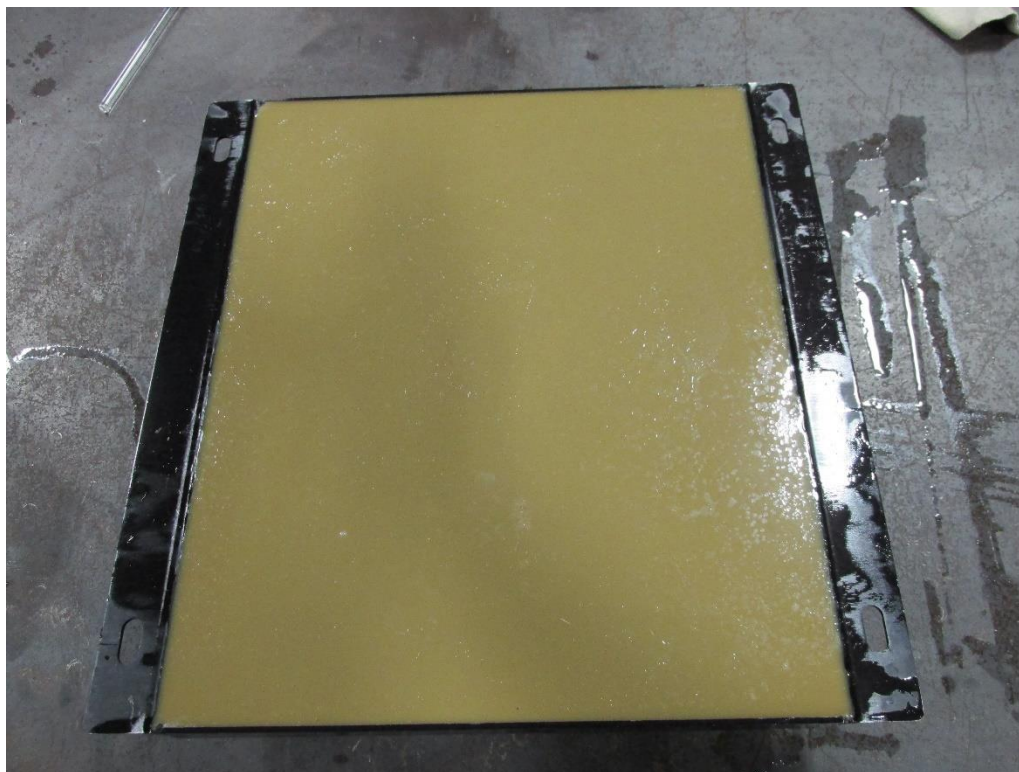


Figure A42: Sample 52A Pre-Soak Calcium Chloride Dihydrate (Back)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)



Figure A43: Sample 52A Post-Soak Calcium Chloride Dihydrate (Front)

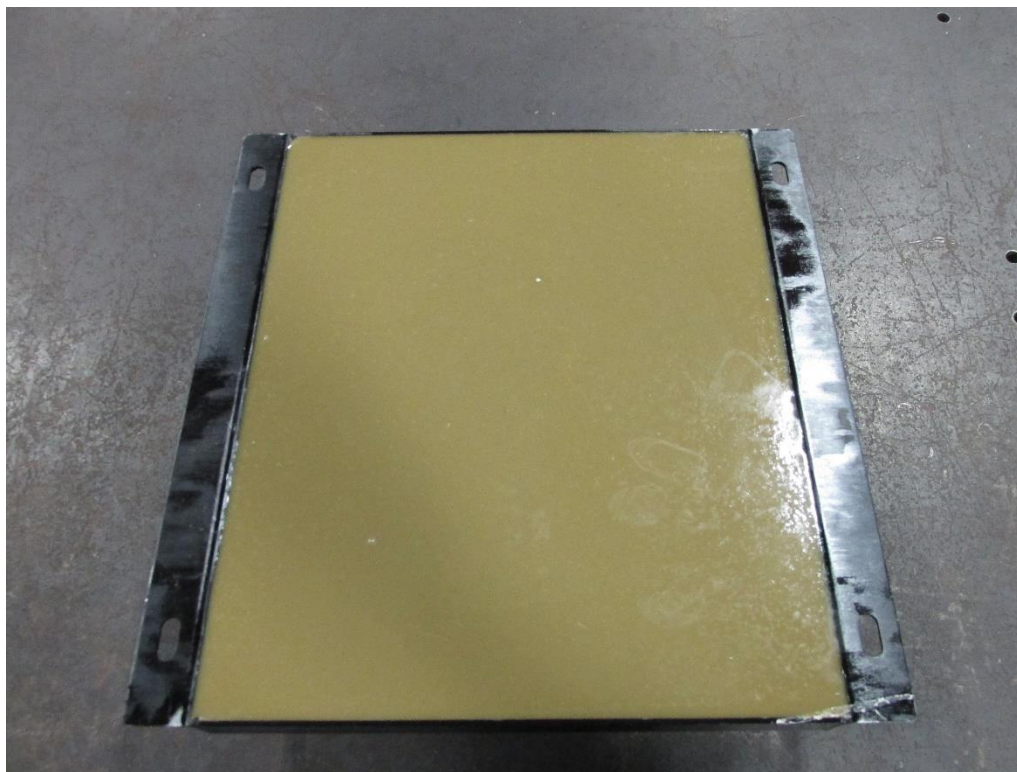


Figure A44: Sample 52A Post-Soak Calcium Chloride Dihydrate (Back)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)



Figure A45: Representative of 35% Ammonium Hydroxide



Figure A46: Sample 53A Pre-Soak 35% Ammonium Hydroxide (Front)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)

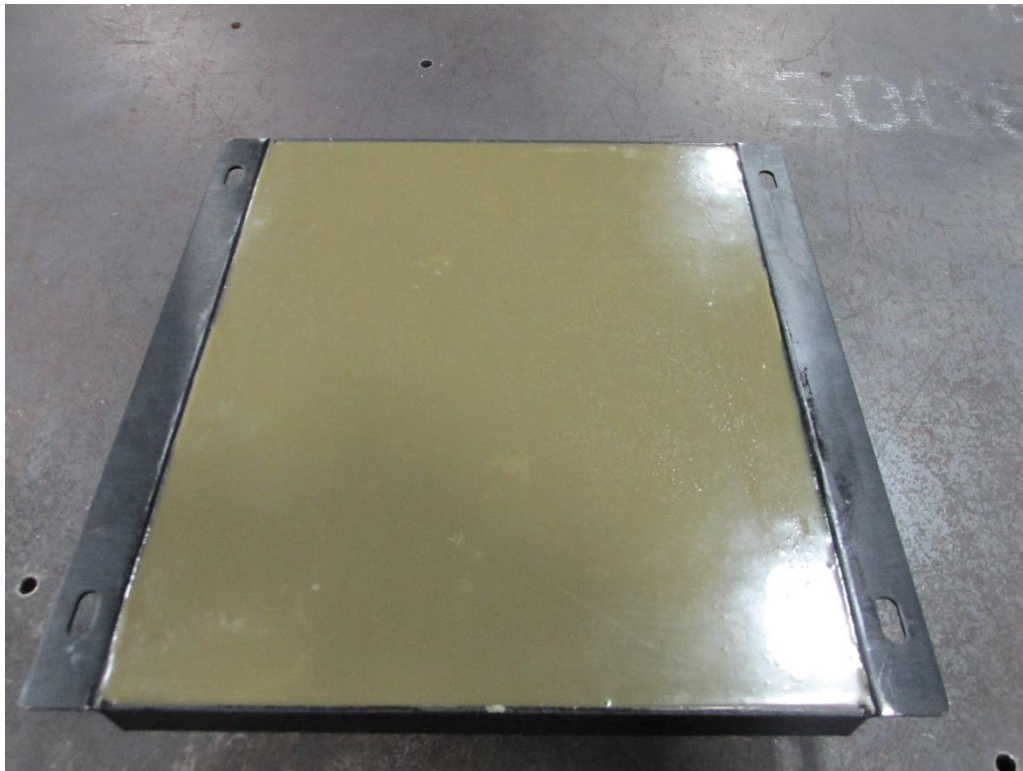


Figure A47: Sample 53A Pre-Soak 35% Ammonium Hydroxide (Back)



Figure A48: Sample 53A Post-Soak 35% Ammonium Hydroxide (Front)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)

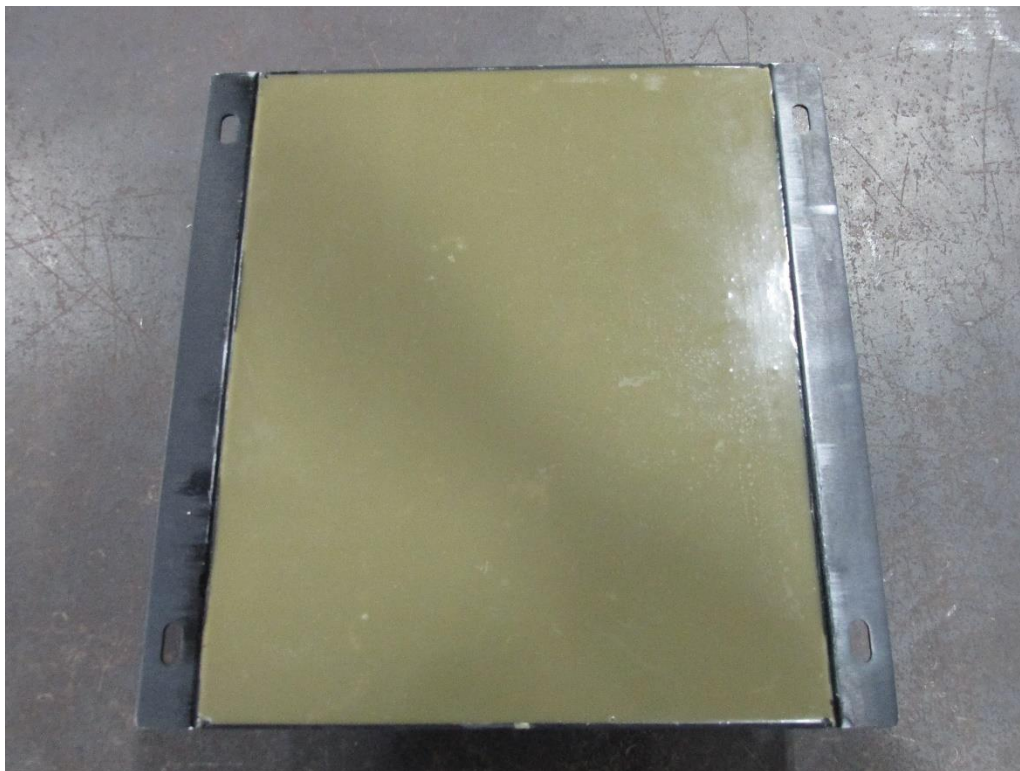


Figure A49: Sample 53A Post-Soak 35% Ammonium Hydroxide (Back)



Figure A50: Representative of 20-10-10 NPK Fertilizer

APPENDIX A (CONT): TEST PHOTOGRAPH(S)



Figure A51: Sample 52A Pre-Soak NPK Fertilizer (Front)

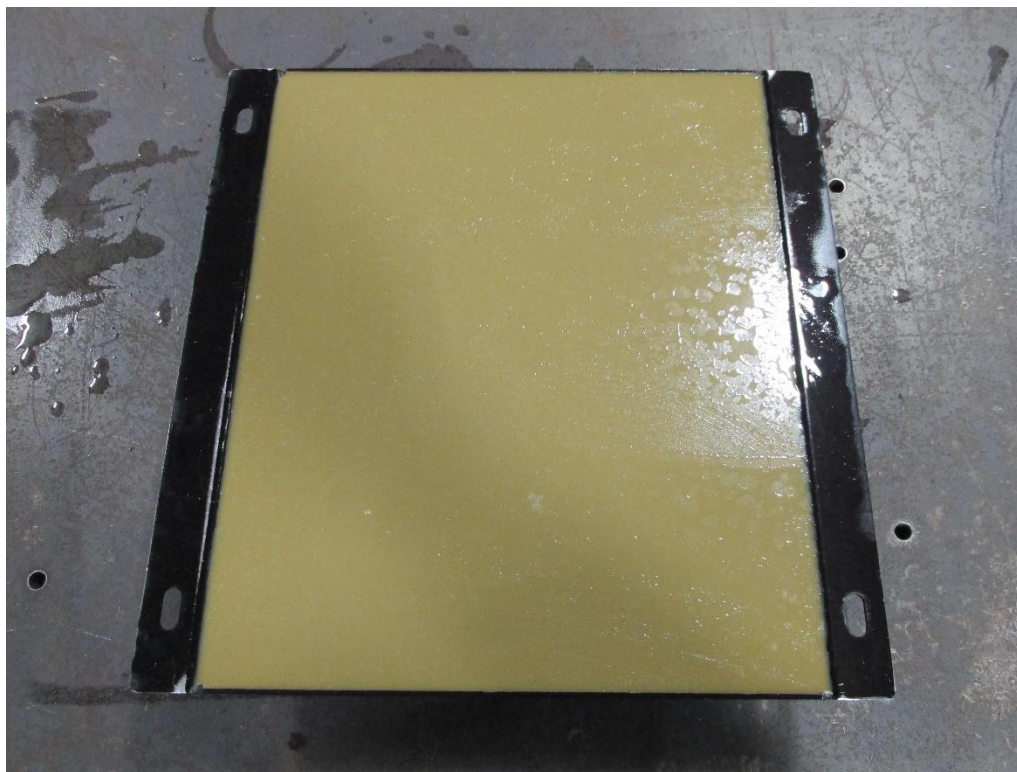


Figure A52: Sample 52A Pre-Soak NPK Fertilizer (Back)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)



Figure A53: Sample 52A Post-Soak NPK Fertilizer (Front)

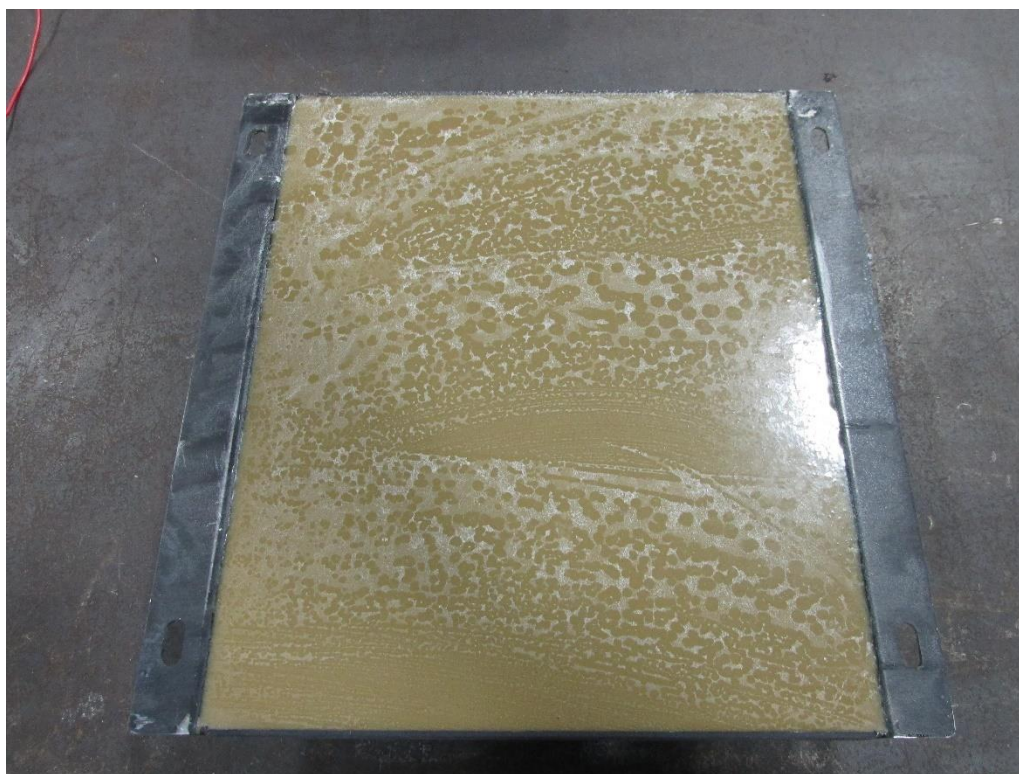


Figure A54: Sample 52A Post-Soak NPK Fertilizer (Back)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)



Figure A55: Representative of 50/50 Standard Green Ethylene Glycol



Figure A56: Sample 53A Pre-Soak 50/50 Green Antifreeze (Front)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)

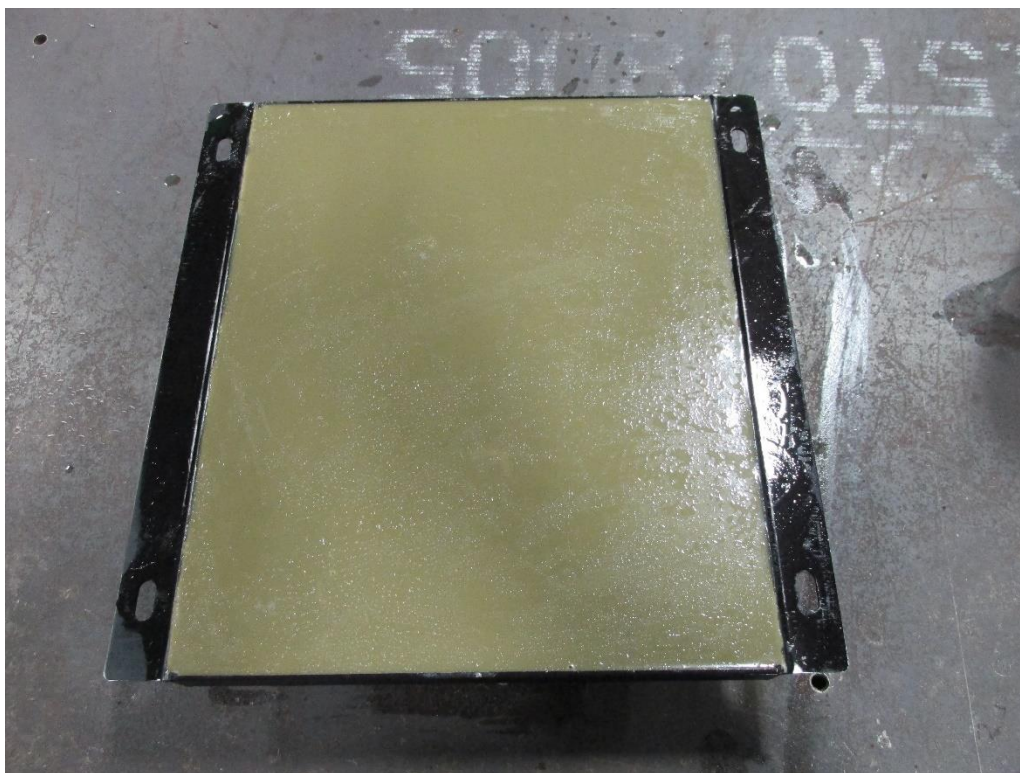


Figure A57: Sample 53A Pre-Soak 50/50 Green Antifreeze (Back)



Figure A58: Sample 53A Post-Soak 50/50 Green Antifreeze (Front)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)

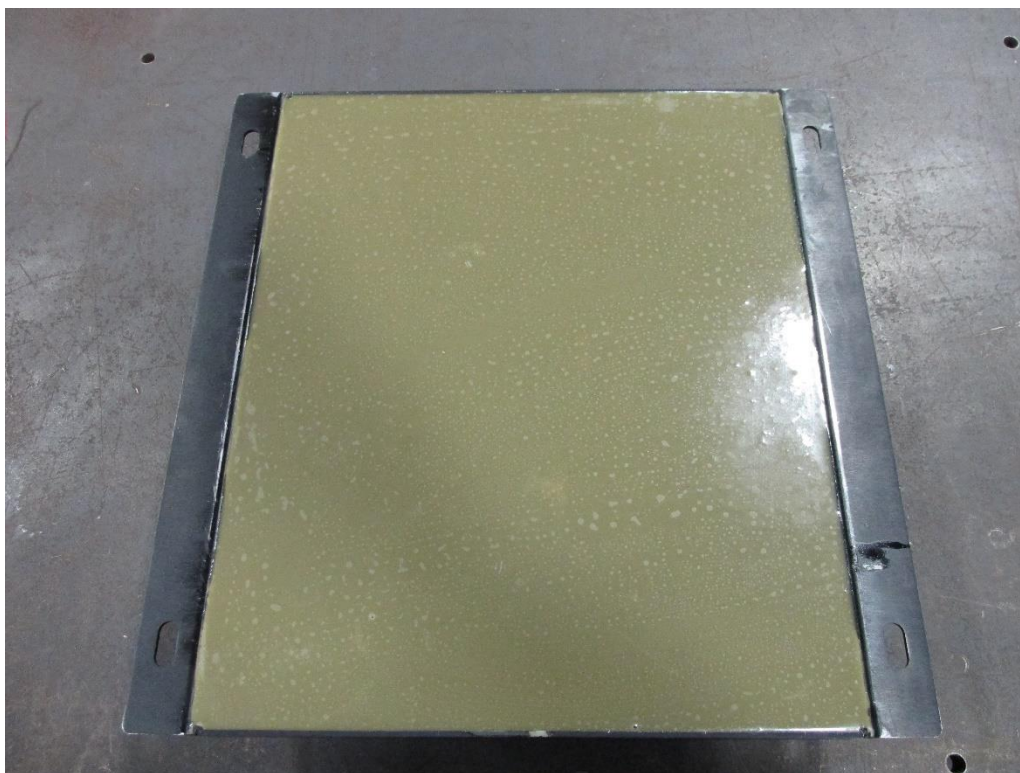


Figure A59: Sample 53A Post-Soak 50/50 Green Antifreeze (Back)]



Figure A60: Sample 52A Post-Test Cleaned (Front)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)

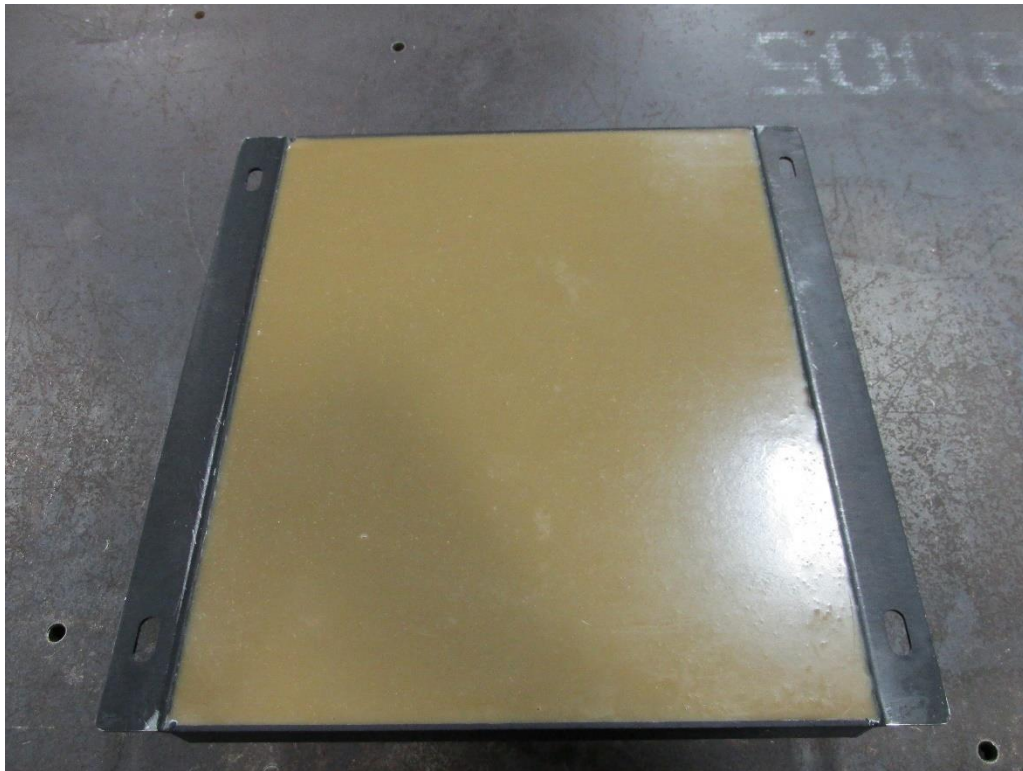


Figure A61: Sample 52A Post-Test Cleaned (Back)



Figure A62: Sample 52A Post-Test Cleaned (Top)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)



Figure A63: Sample 52A Post-Test Cleaned (Bottom)



Figure A64: Sample 52A Post-Test Cleaned (Left)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)



Figure A65: Sample 52A Post-Test Cleaned (Right)



Figure A66: Sample 53A Post-Test Cleaned (Front)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)

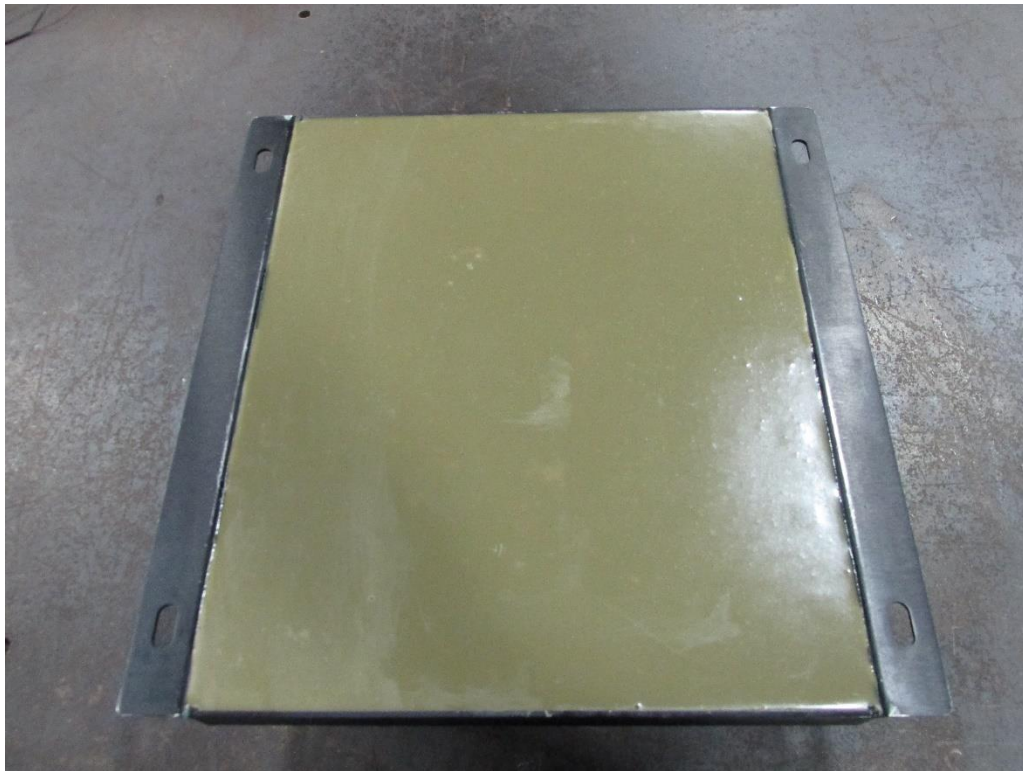


Figure A67: Sample 53A Post-Test Cleaned (Back)



Figure A68: Sample 53A Post-Test Cleaned (Top)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)



Figure A69: Sample 53A Post-Test Cleaned (Bottom)



Figure A70: Sample 53A Post-Test Cleaned (Left)

APPENDIX A (CONT): TEST PHOTOGRAPH(S)

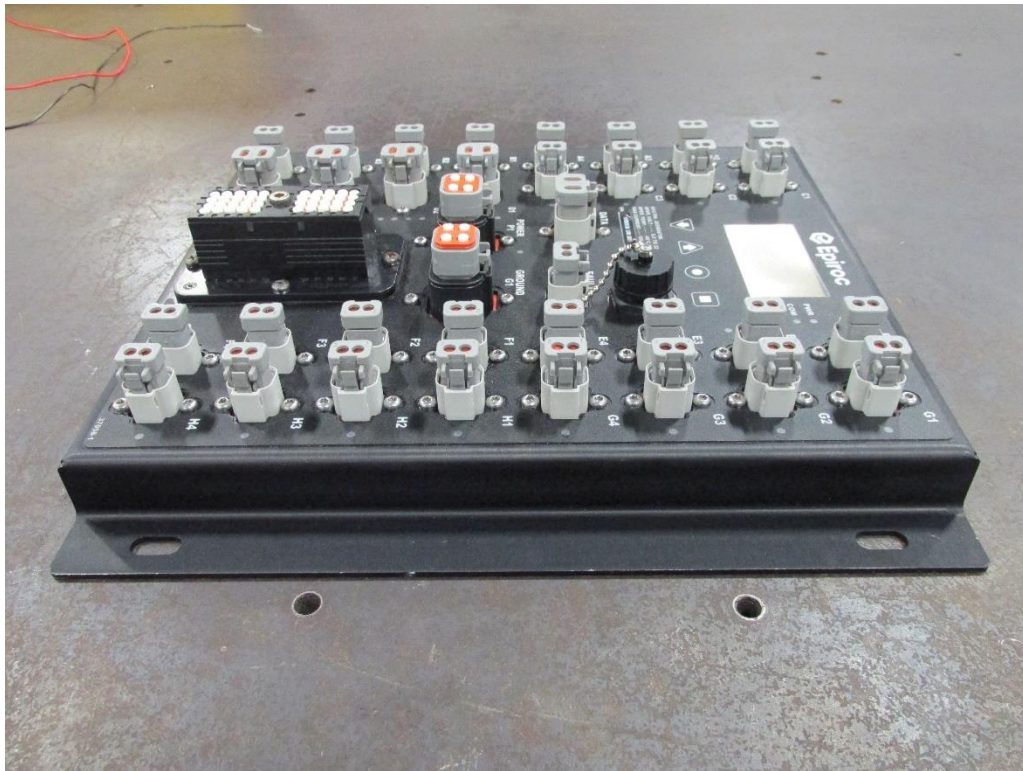


Figure A71: Sample 53A Post-Test Cleaned (Right)